

World Energy Issues Monitor | 2016

**A CLIMATE OF INNOVATION –
RESPONDING TO THE
COMMODITY PRICE STORM**

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FOREWORD

A CLIMATE OF INNOVATION – RESPONDING TO THE COMMODITY PRICE STORM

I said last year that high volatility had become the new normal facing energy leaders in 2016 and this provided the context in which we were expecting them to take investment decisions at an unprecedented scale. The developments highlighted in this year's World Energy Issues Monitor sketch out a context of continued uncertainty and dynamic change but within an emerging climate of innovation.

I am pleased that participation in this year's survey has again exceeded 1,000 energy leaders; including Ministers and CEOs from over 80 countries. For the first time we have deep-dives in Argentina, Brazil, Chile, China, Ecuador, Ethiopia, Finland, Kazakhstan and the Republic of Korea, taking the number of national level assessments to over 30 individual countries. I would like to thank all who have taken the time to respond to the World Energy Council's issues survey to provide the basis for our unique helicopter perspective of the latest perception changes in the energy sector.

This year we see that industry leaders remain most concerned about commodity price volatility, global recession and climate framework uncertainty with new market design and electric storage featuring as new items of focus. The quest to finance the transition to a more sustainable energy system remains an issue that keeps leaders busy at work, whilst there is a growing acknowledgement that adaptation to new resilience challenges, smart innovation and regional interconnection will be key parts of the solution. This will indeed challenge current market designs and lead to changing and emerging new business models. Carbon Capture and Storage is still among the issues losing traction and unconventional hydrocarbons have lost dynamics in the current price context. Interestingly we see the position of LNG remaining constant while expanding its role in the global energy mix in spite of this volatility.

2015 was a landmark year for the energy sector and this has defined the agenda for 2016 and the next decade. With the adoption of energy by the 193 countries of the UN General Assembly as a sustainable development goal, energy has for the first time been formally recognised as a critical enabler for development. In Paris, at the Conference of the Parties (COP21), 195 countries came together to reach a historic agreement. The world's leadership has never been clearer in its acknowledgement of human made Climate Change as a problem that we need to jointly address and jointly solve. This is recognised by the reducing uncertainty surrounding the Climate Framework issue in this year's Issues Monitor.

COP21 also has delivered a push for innovation. The Intended Nationally Determined Contributions put forward by 185 countries in Paris will further promote the adoption of renewables and clean tech. 20 of the world largest economies have also committed to double their clean energy research and development investment over the next five years. This was matched by equally impressive commitment from industry leaders who announced a Manhattan-type innovation drive. Therefore even without a legally binding deal the necessity for companies to be part of the innovation frontier is a powerful imperative and also a massive opportunity. This climate of innovation is clearly highlighted in the report by the steadily high expectation around the development of renewables and the heightened attention given to storage and market design issues that facilitate these developments.

After Paris, the World Energy Issues Monitor shows that we are entering a period of triple transition. Firstly, the transition of decarbonisation. Then there is what you might call the “market design transition”: increasing shares of zero-marginal-cost energy from intermittent renewables in combination with the decentralisation of systems; increasing use of smart data, and decreasing entry barriers for new suppliers. All of this will challenge the current market logic as a basis to deliver the investments that it takes to keep the lights on at all times. These new realities have impacts beyond electricity and also affect natural gas infrastructure, transport and other sectors. Thirdly, there is the resilience transition. The impact of extreme weather events, cybersecurity threats and the energy-water-food nexus on the energy sector are powerful drivers to adapt and innovate. This will result in different ways of thinking about infrastructure and critical system components. To navigate these transitions with limited resources defined by a sluggish growth context, investors and governments have to be very clear what their strengths and priorities are.

Meanwhile, oil investments are challenged by low prices and new questions. While demand for oil is mostly driven by transport, with increasing developments in natural gas, biofuels and e-mobility, competition is increasing as companies need to think about long-term infrastructure implications. Utilities are similarly torn between the new and the old. The rise of market design as an issue highlights the reality that to deliver and maintain a system back bone and develop the capability for demand-side response and prosumer solutions we will need a new approach. The latter in many cases seem in direct competition with what has been built to serve as critical infrastructure. This defines different businesses, with different types of investors, different customer profiles, different timeframes, and different priorities when it comes to policy frameworks, ultimately requiring very different skill sets.

In this climate of continued uncertainty and innovation it is clear to me that investors around the world place more emphasis on robust and balanced policy frameworks. The World Energy Council's Energy Trilemma, Scenarios, Resources and Resilience work resonates stronger than ever. The role that the World Energy Council has played advising UN SE4All, the COP process through our national level engagement, with the Clean Energy Ministerial, and importantly through our events in collaboration with governments, development banks and the private sector has helped to increase the level of understanding of the challenges and solutions. The challenge, as our 2016 Issues Monitor makes clear, is now moving from understanding to action.

A handwritten signature in white ink, appearing to read 'CF', is positioned above the name and title of Christoph Frei.

Christoph Frei

Secretary General, World Energy Council

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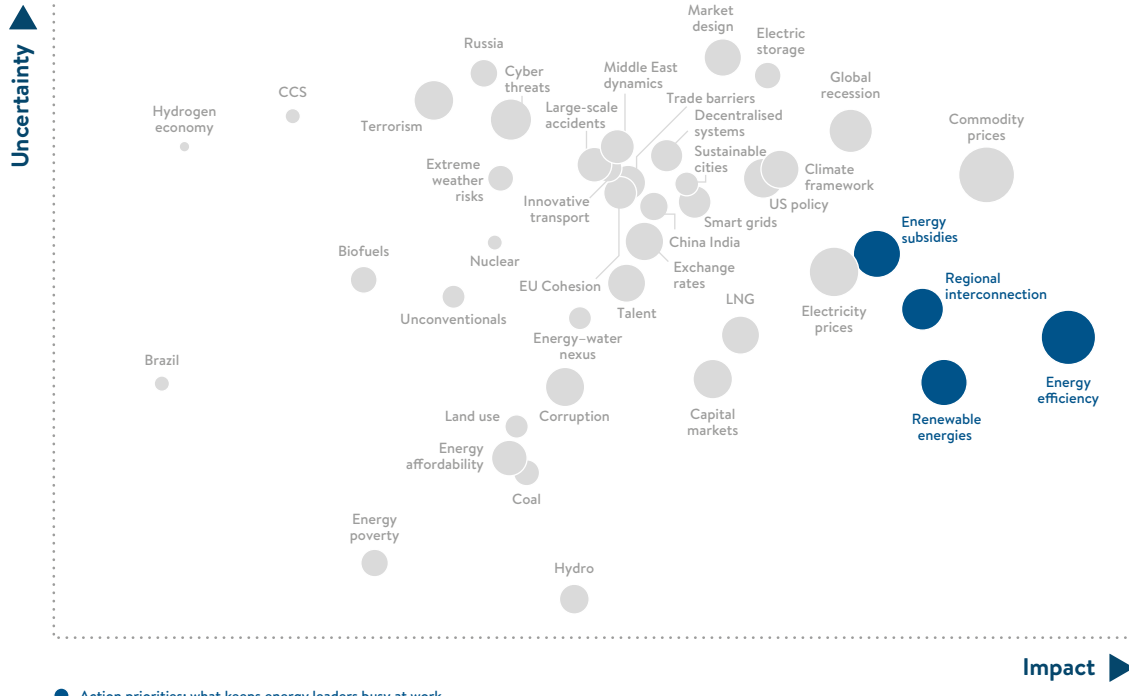
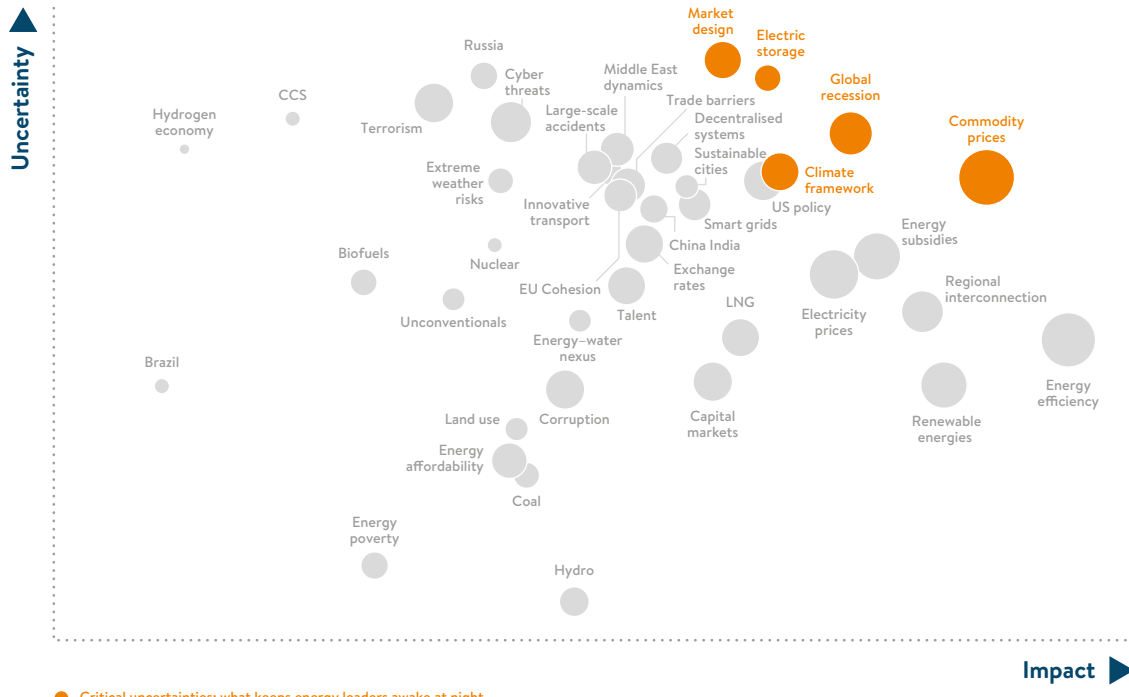
EXECUTIVE SUMMARY

THE 2016 WORLD ENERGY ISSUES MONITOR samples the views of CEOs, Ministers and experts from across the globe to highlight the critical uncertainties facing the sector. This year's report finds that industry leaders in 2016 are most concerned about commodity prices, the ongoing effects of economic slowdown and continued climate framework uncertainty, while issues of new market design and electric storage are rapidly gaining prominence.

KEY FINDINGS

- 1 **COMMODITY PRICES AND ASSOCIATED** volatility have replaced energy prices as the number one critical uncertainty on the energy agenda for leaders and experts globally. This movement of commodity prices, to a position of extreme importance in every region, reflects the global recognition for energy leaders of the severity of the current market environment. This puts enormous pressure on many key players throughout the energy sector.
- 2 **INNOVATION; IN PARTICULAR ISSUES** of storage, market design and climate resilience, have become increasingly important drivers of change within the energy transition. This is reflected by the strong move of this group of issues up the energy agenda.
- 3 **UNCONVENTIONALS HAVE LOST TRACTION** for industry leadership in the current price environment. However, the trends for shifting portfolio allocations around more flexible, shorter-cycle investments have important implications as more conventional business models are challenged.
- 4 **THE POSITIONING OF LNG** has remained stable in this year's Issues Monitor. The issue is recognised as a clear action priority, with a high impact despite the experienced market volatilities. What was previously regarded as an issue with significant regional implications has become an increasingly global issue, as volumes of exported LNG have grown and existing supply routes become increasingly challenged.
- 5 **GEOPOLITICAL CONCERNS ARE CLOSELY** linked to the current emphasis on commodity prices. Uncertainty around **Middle East dynamics** and a higher impact attributed to **US policy** has assumed increased importance in 2016. In contrast to previous year's reports, the latest geopolitical dynamics add further weight to supply side fundamentals.

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Less urgent ○○○ More urgent

6 THE EFFECTS OF THE GLOBAL RECESSION, which continue to be high on the agenda, are closely linked with the role of **China and India** and the impact of slowing demand. This is having an impact on the confidence for the energy sector as a whole.

7 THE RISK FROM CYBER THREATS has moved up the agenda this year, specifically in North America and Europe. A clearer understanding of the nature of cyber risk and mitigation measures for energy infrastructure is necessary, in an environment of increasing interconnectivity and emerging technologies.

8 THE EFFECTS OF EXCHANGE RATE fluctuations and currency risk on energy operations and investments show a clear divergence between OECD and non-OECD countries. Energy leaders in non-OECD economies perceive this issue with a notably higher level of concern. In particular, emerging markets are impacted by the combination of falling commodity prices and export volumes at the same time as a surging US dollar which has put increasing pressure on corporate balance sheets.

9 THE IMPACT OF THE CONFERENCE OF PARTIES (COP21) agreement in Paris and the adoption of energy as a UN Sustainable Development Goal have reduced uncertainty associated with the issue of a **climate framework**. However, energy leaders remain cautious about the words being translated into actions without clear price signals.

10 THE LATEST NATIONALLY DETERMINED CONTRIBUTIONS commitments presented to the COP21 meeting in December 2015 signal a clear indication of intent. This has increased the expectation for a significant scale up of **renewable energies**. This has translated into a reduced level of uncertainty amongst energy leaders in this year's Issues Monitor, moving renewables firmly to the action priority space.

Key regional disparities exist in the Issues Monitor; most noticeably for issues of coal, corruption, large scale hydro and nuclear, but also resilience issues such as the energy-water nexus and cyber threats.

IMPLICATIONS FOR THE ENERGY SECTOR

These findings reinforce the theme outlined in last year's World Energy Issues Monitor around a 'new normal' for energy prices and market realities. The effects of the issues on the energy transition are now beginning to play out both across regions and at the national level.

The report also finds that the ability to finance the transition to a sustainable energy system keeps energy leaders busy at work. There is a growing acknowledgement that adaptation to new resilience challenges (cyber threats, extreme weather risks and the energy-water nexus) will require attention and funding, while smart innovation and regional interconnection are also being recognised as being key parts of the solution.

The trends highlighted throughout this year's report, demonstrate that increased volatility caused by a range of macroeconomic factors, especially in relation to energy and commodity prices, are now an established environment in which energy leaders must make difficult investment, operational and technological decisions. In such circumstances it is clear that company and policy strategies will need to adapt to meet the new operating conditions.

INTRODUCTION

ABOUT THIS REPORT

The World Energy Issues Monitor provides a snapshot of what keeps CEO, Ministers and experts awake at night in nearly 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 has developed into an essential tool in understanding the complex and uncertain environment within which energy leaders must operate, and a tool through which one can challenge own assumptions on the key drivers within the energy landscape.

This seventh iteration of the monitor, builds on the pilot of the national assessment undertaken by six countries in 2013. The latest edition provides over 30 individual national monitors across six regions to highlight differing regional and national priorities. For 2016, Insights were provided by over 1200 energy leaders, across the Council's national member committee network. These insights and the findings from the World Energy Issues Monitor enable the World Energy Council to facilitate the dialogue among energy leaders on the critical issues affecting the global energy agenda.

HOW TO READ THE MONITOR

Categories and individual issues

The World Energy Issues Monitor assesses 41 issues in a high-level overview, covering four categories (see table 1 – the world energy issues survey):

- macroeconomic risks
- geopolitics
- business environment
- 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.

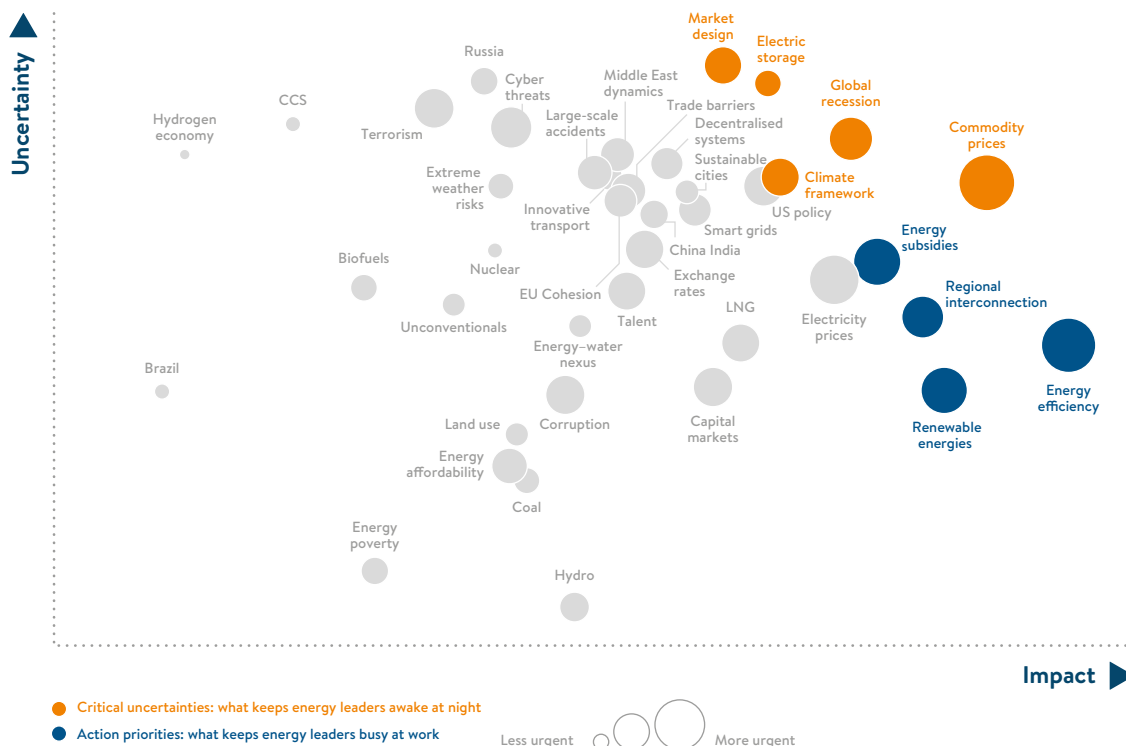
Zones within the Monitor

- **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 most busy (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.

Additional Issues Monitors

In addition to the critical uncertainties, issues of particular interest for dialogue include those tracked on specific monitors to capture evolution over time and those with large differences across regions.

EXAMPLE ISSUES MONITOR – HIGHLIGHTING UNCERTAINTY, IMPACT AND URGENCY



Chapter one

Assessing the global energy agenda

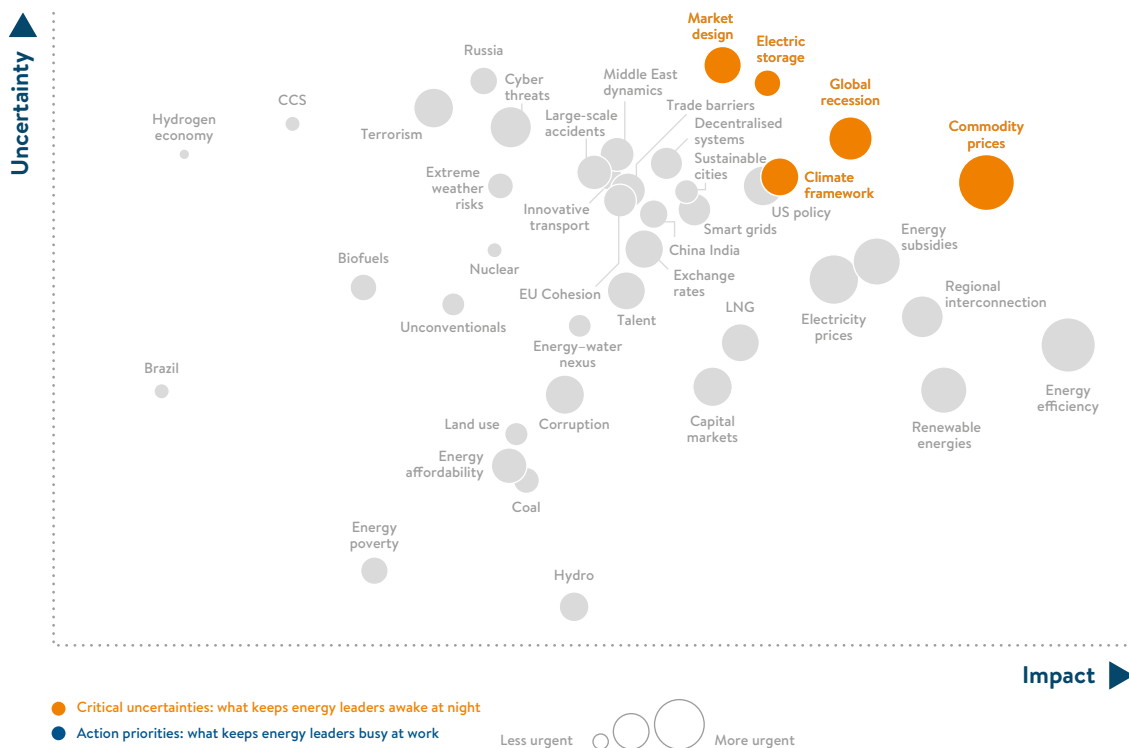
ASSESSING THE GLOBAL ENERGY AGENDA

The 2016 World Energy Issues Monitor finds that industry leaders are most concerned about commodity prices, the ongoing effects of economic slowdown and continued climate framework uncertainty. Issues around innovation, particularly those of new market design and electric storage, are rapidly gaining prominence. Meanwhile, CCS, unconventional and nuclear are suffering from the current context.

WHAT KEEPS ENERGY LEADERS AWAKE AT NIGHT?

The top critical uncertainties on the energy agenda in 2016 include commodity prices, global recession, climate framework, market design and electric storage.

FIGURE 1 – GLOBAL CRITICAL UNCERTAINTIES



Showing 41 issues and their perceived impact, uncertainty, and urgency for energy leaders globally. Critical uncertainties highlighted as commodity prices, global recession, climate framework, market design and electric storage

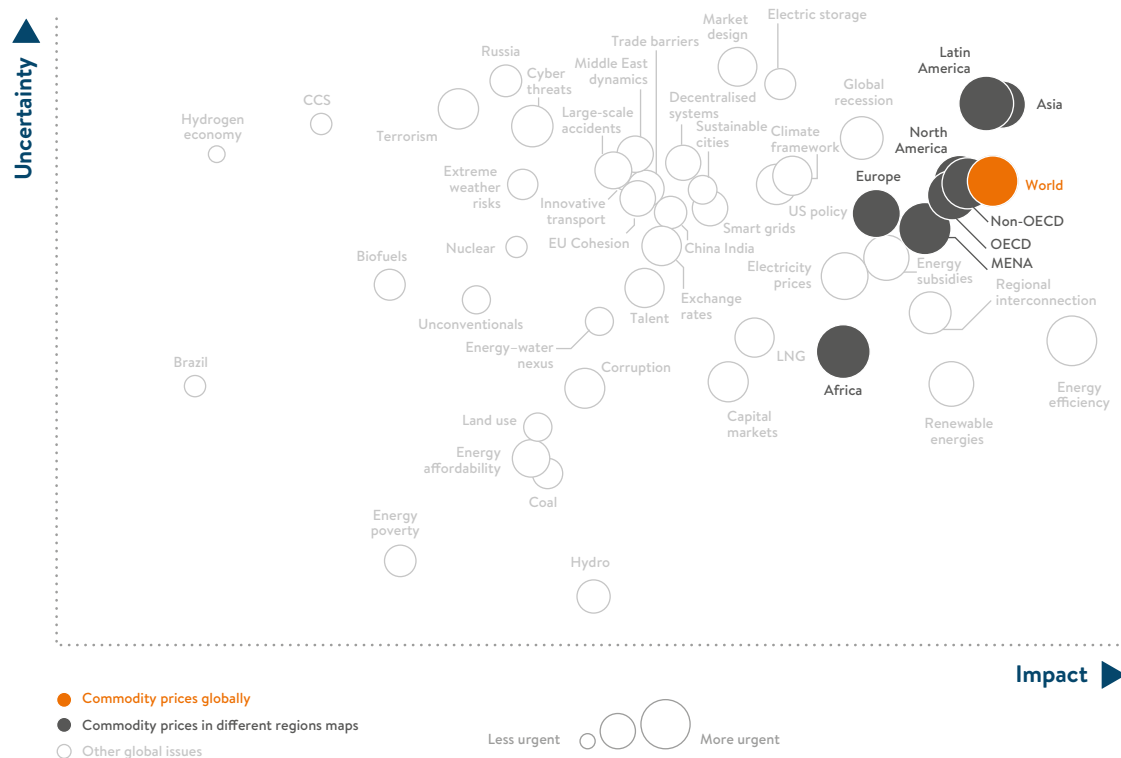
This year’s report shows that **commodity prices** and associated volatility has overtaken energy prices as the number one critical uncertainty on the energy agenda. The issue has become one of high impact in every region, as demonstrated by figure 2,

which reflects the severity of the current market environment in which energy leaders must operate.

The importance of price volatility had already been demonstrated in the last report, linked to the more than 30% drop in the price of oil over five months, falling below the US\$70 benchmark in November 2014. Only now can we see the full context of what such fluctuations entailed. On the oil side alone, Brent prices declined over 75% from a peak at US\$112/bbl in June 2014 to below US\$30/bbl in the first quarter of 2016. The expectations are that these adjustments are not temporary but rather continue to set the agenda beyond the immediate short-term, as reflected by the perception of reduced uncertainty around the issue in the latest report. For many executives this sets the context for the worst downturn in a generation; the implications of which are broad reaching and severe.

This reduced uncertainty around commodity prices highlights the potentially increasing importance attached to the absolute level of prices in the near term, rather than the aspect of volatility. This reflects the realities of the environment in which corporations and governments across the energy sector operate, as continued pricing pressures have placed increasing strain on revenues and budgets, the potential for further reductions in capital expenditure and delayed final investment decisions remains.

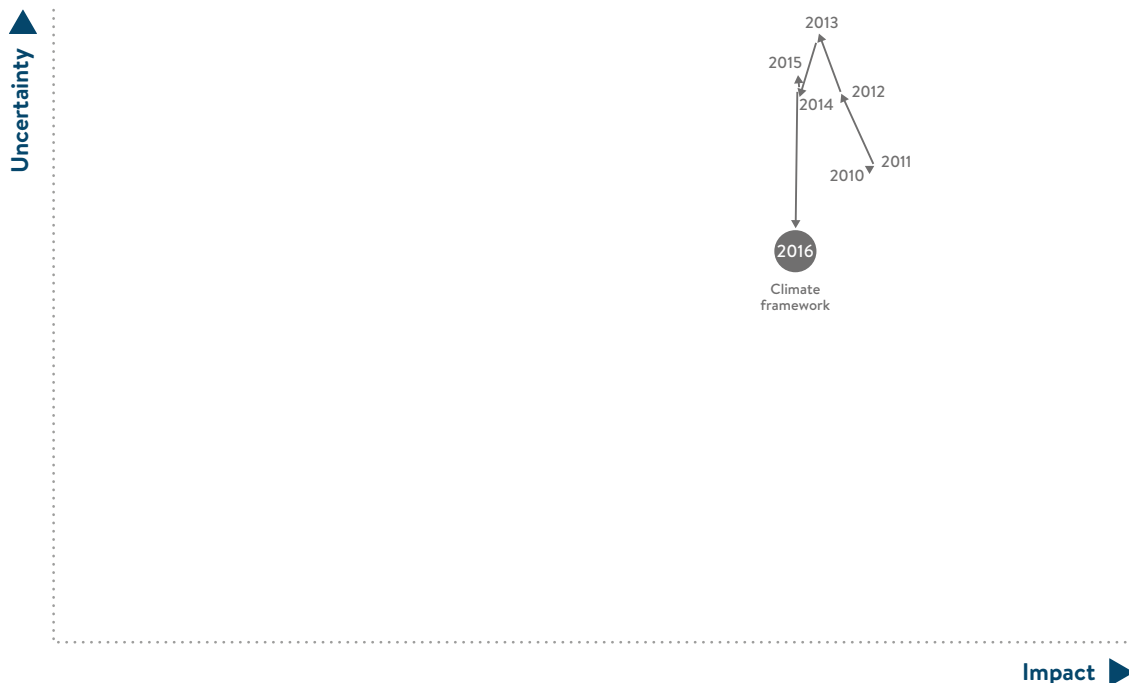
FIGURE 2 – COMMODITY PRICES AS A HIGH IMPACT ISSUE FOR EVERY REGION



The ongoing effects of **global recession** and rates of economic growth continue to be high on the agenda. This is closely linked to the role of **China and India** and a slowing demand side for the energy sector as a whole. This has both affected confidence and added weight to supply side fundamentals; supporting the new price equilibrium set out for many energy and non-energy commodities.

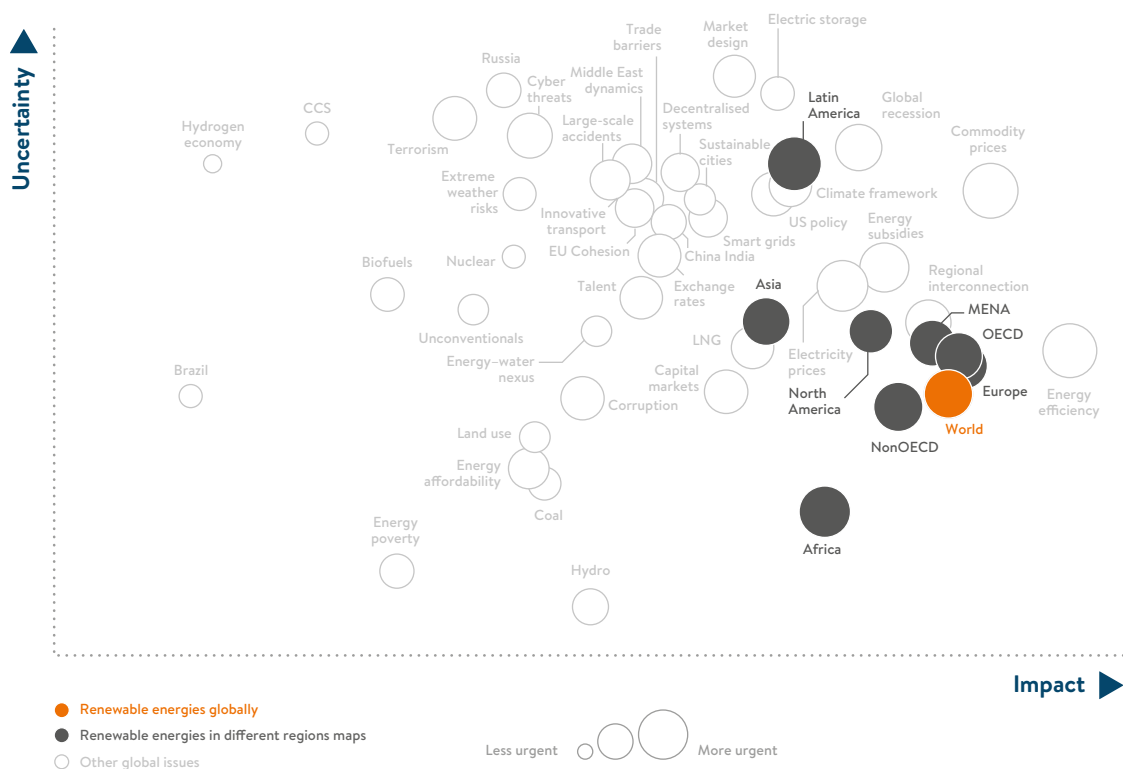
Climate framework has featured in the top right ‘critical uncertainties’ quadrant of the Issues Monitor since it was first introduced in 2009. The role of the Conference of Parties (COP21) in December, 2015, ensured that this trend has continued in the findings of this latest report. The agreement in Paris and the adoption of energy as a UN Sustainable Development Goal have reduced uncertainty associated with the issue of a climate framework. However, energy leaders remain cautious about the words being translated into actions without clear price signals. Therefore, the extent to which meaningful implications will take effect for national policies and industry is anticipated to remain an important issue for energy leaders in the future. In particular, it will be interesting to determine whether the trend of reduced uncertainty around climate framework, as highlighted in figure 3, continues in the year ahead.

FIGURE 3 – REDUCED UNCERTAINTY AROUND CLIMATE FRAMEWORK



For the first time, the global positioning of both **market design** and **electric storage** are closely clustered together with both a perceived high impact and high uncertainty. This clustering showcases the importance of issues associated with innovation and with increasing market shares of intermittent renewables, for energy leaders.

FIGURE 4 – RENEWABLE ENERGIES



Geographical tracking to show perceptions towards the issues of renewable energies in different regions

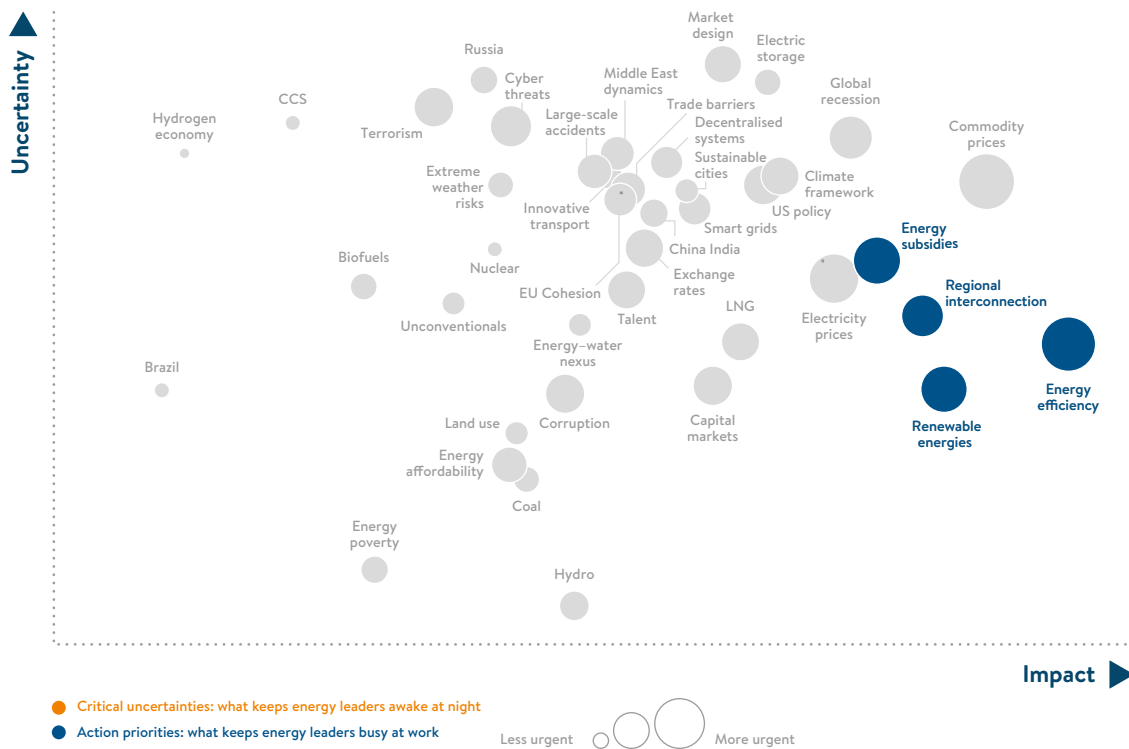
The role of electric storage to secure the supply of electricity becomes even more important in combination with increasing shares of renewable energies, an action priority issue in the latest issues monitor. The costs of energy storage technologies are forecast to reduce by as much as 70% by 2030.¹ However, at the same time, incentives to deliver required current storage and back-up capacity are challenged with traditional market designs, which is a driving factor of uncertainty. This demonstrates a closely interconnected relationship between the two issues; bringing both towards the top of the 2016 agenda. At the regional level, the issues of market design and electricity storage are attributed as critical uncertainties in both Europe

1. World Energy Council, 2016, E-storage: Shifting from cost to value

and Asia; while North America and the Middle East demonstrate a more certain view with greater emphasis on the need for action. In contrast, there is less concern from energy leaders in Africa and Latin America and the Caribbean, with particular note for the latter where the associated role of renewable energies has the highest degree of uncertainty of all regions – as demonstrated in figure 4.

WHAT KEEPS ENERGY LEADERS MOST BUSY?

FIGURE 5 – ACTION PRIORITIES



Highlighting top global action priorities as energy efficiency, energy subsidies, regional interconnection and renewable energies

Renewable energies feature as a high impact issue on the global energy agenda for the seventh successive year, but with a strong perception of reduced uncertainty around the issue in 2016. This places the issue firmly towards the top of the action priority agenda for energy leaders and builds on the importance of developments around both climate framework and innovation. The latest Nationally Determined Contributions commitments presented to the COP21 meeting signal a clear

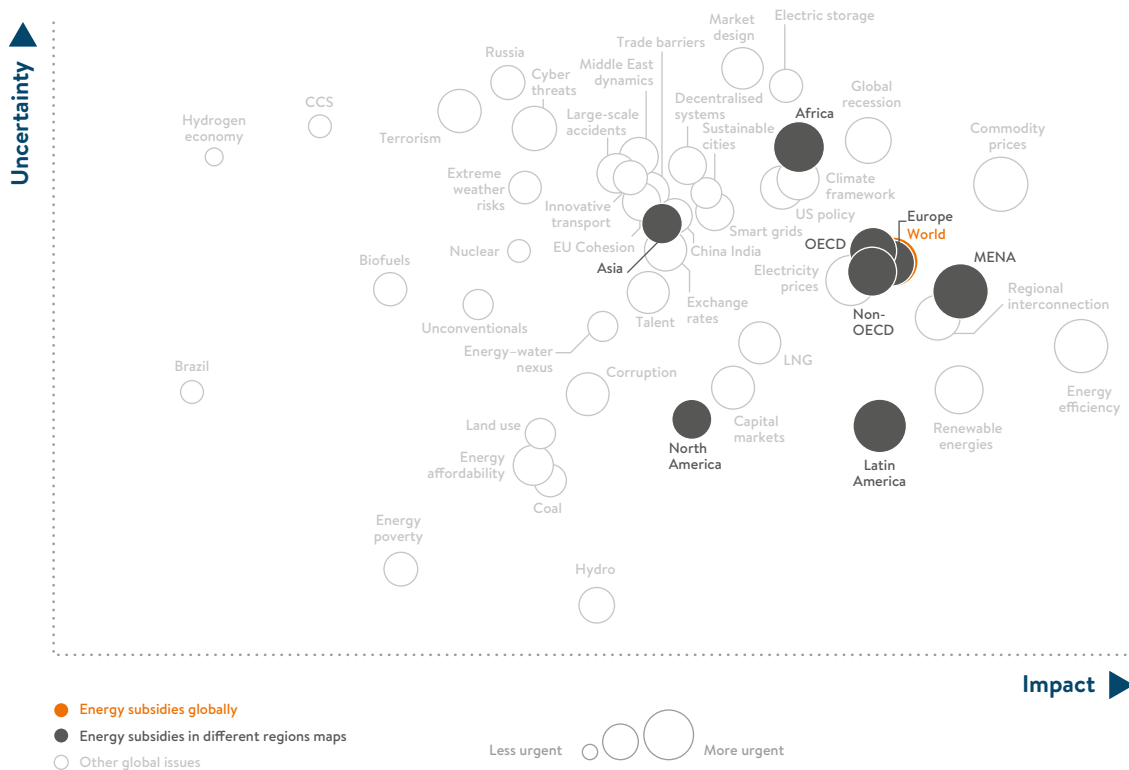
indication of intent. This has increased the anticipation for further scaling up of renewable energies, reinforcing the reduced level of uncertainty attributed by energy leaders.

Whilst of relevance for many energy leaders, market design is an issue of particular interest in North America and Europe, according to the latest issue monitor findings. In these regions, expectations around changing market designs and new business models, including decentralised systems, are increasingly an issue which governments and industry alike have to address. This is linked to traditional utility business models being challenged by the need to deliver a more flexible demand-side response as in many countries renewable energies have priority access to the grid and virtually zero marginal cost. In such locations this has both increased the share of intermittent renewables in the energy mix and reinforced the importance of conventional generation to balance the system. When considered in combination with the anticipated further scale up for the role that renewable energies will play, this explains the clustering, where energy leaders perceive an increased impact and uncertainty around market design, electric storage and decentralised systems.

These developments reinforce the importance of **energy subsidies** – an issue which remains an action priority on the energy agenda, showing a slightly reduced degree of uncertainty in 2016 when compared to the previous year. This shows the need for a progressive reduction towards technologies – both conventional and renewable – becoming non-subsidised in the future, with potential exceptions for those in stages of infancy, in order to enable necessary market competition. The potential effects of this issue also remain significant from a broader perspective; in its use as a tool to create or distort competition between different technologies and markets. The challenges of management of the system on an increasing market basis are huge. The role of governments in choosing preferred solutions and the political sensitivity associated with the issue still present major barriers to changes in approach. However, the right incentives must be found to create stable regulatory environments through which the necessary investment for long-term infrastructure can be generated. Individual countries will need to consider this as part of a holistic approach towards addressing the energy trilemma – balancing the demands between environmental sustainability, energy security and energy equity.²

2. World Energy Council, 2015, World Energy Trilemma: priority actions on climate change and how to balance the trilemma

FIGURE 6 – ENERGY SUBSIDIES



Geographical tracking to show perceptions towards the issues of energy subsidies in different regions

Energy efficiency continues to be perceived as the top action priority globally, remaining as one of the most stable issues with a relatively low variance in perceptions across all regions. This highlights the belief from energy leaders that it is an area that must, and can be, addressed. However, it also reflects the reality that it is an issue for which reality is still falling short of expectations. Over the past 20 years there have been average energy intensity gains of 1.3% per year.³ This falls short of the 2.6% objective highlighted as a benchmark contribution towards the transition to a sustainable energy system.⁴

3. World Energy Council, 2013, Energy efficiency policies: what works well and what does not

4. Sustainable Energy For All, 2015, Global Tracking Framework

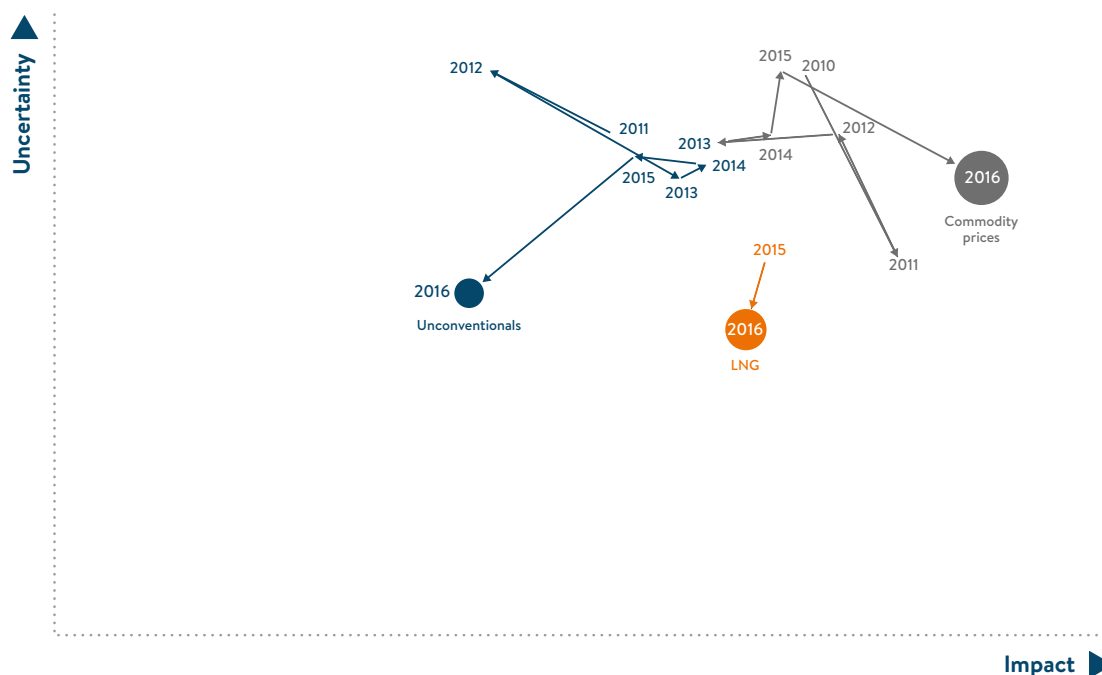
OTHER ISSUES OF INTEREST

The position in the Issues Monitor of **natural gas market dynamics** today stand in stark contrast to those for energy leaders in previous years, at the global level. In the latest 2016 findings, **unconventionals** have lost traction for energy leaders across the sector, with a perceived reduction in impact in the current price environment.

There is; however, a strong regional divergence around unconventionals. The issue maintains a high impact for energy leaders in both North America and Latin America, in comparison to counterparts in Africa, Asia, Europe and MENA. In North America, in particular, there is also an increasing degree of uncertainty around the role of unconventionals.

This reflects anticipation and uncertainty around the continued role of onshore natural gas production in the US, which presents as a challenge for energy leaders in the region. Energy leaders will need to continue to balance the ability to increase production and the implied setting of a future price ceiling with a more economically cautious approach for both operating companies and their banks. This final concern is especially relevant when linked to **capital markets**, an important high-impact issue in the latest findings, relating to the future role of reserve-based lending facilities, pressure on debt ratings and the potential for increasing ownership transitions from a debt to equity basis.

FIGURE 7 – COMMODITY PRICES, UNCONVENTIONALS AND LNG



Highlighting high annual change of commodity prices and unconventionals versus relative stability for LNG

In contrast to the volatility in the positioning of issues of commodity prices and unconventional energy sources, the positioning of **liquefied natural gas (LNG)** has remained stable in this year's monitor. The issue is recognised as an action priority, with a high impact despite the experienced market volatilities. What was previously regarded as an issue with significant regional implications has become an increasingly global issue, as export volumes have grown. The consequences for energy leaders globally focus around increasingly interconnected markets across regional hubs; further international growth of non-US natural gas supplies; as well as shifting portfolio allocations around more flexible, shorter-cycle investments.⁵ The implications of the latter will be crucial to monitor for energy leaders in the months ahead as more conventional business models in the industry are challenged and re-evaluated.

There is a clear regional clustering which shows the issue of LNG to be most impactful for North America, Latin America, Asia and MENA – highlighting the importance in both key supply and demand centres. Less emphasis is placed on the issue in the findings for Europe, where lower volumes limit the perceived impact, and Africa, where development is country specific and a number of nascent projects have yet to show full potential in locations such as Mozambique and Tanzania.

Concerns around **talent** are also higher on the agenda this year, demonstrated specifically by a higher degree of uncertainty for the issue in 2016. The current findings place this issue in line with restructurings and redundancies that many in the sector have had to undertake as a reaction to price volatility. The challenge for energy leaders is twofold; firstly, to enable the best short-term operational performance in line with increased financial pressure, reduced revenues and diminished capital expenditure. Secondly, the imperative to ensure that the necessary skills base is available from a longer-term development and succession stand point. Interestingly, energy leaders' opinions regarding the perceived impact of the issue have not collectively changed, which suggests that concerns are either aligned with shorter-term adjustments or that there is a time lag for the full effects of the impact on the sector to be determined.

KEY REGIONAL DISPARITIES

A number of regional disparities exist in the latest Issues Monitor. Firstly, around the area of geopolitics, which display a strong regional link to the politics affecting policy in the region most directly. Secondly, for specific resilience issues, including the energy-water nexus and cyber threats, as well as individual supply technology issues such as coal, large scale hydro and nuclear.

Geopolitical concerns are perceived with much controversy across the regions. This divergence of opinion is reflected by many of the issues being grouped around the centre of the issues monitor at the global level, but displaying a strong regional bias for concerns of the most immediate relevance. The highest change geopolitical issue from the last issues monitor report; **Russia**, has a diminished overall presence on the global agenda this year but maintains its high priority for energy leaders in

5. World Energy Council, 2016, Unconventional gas, a global phenomenon

specific countries in Europe regarding relations to the European Union (EU) and security of supply.

For energy leaders in 2016, geopolitical concerns are closely linked to the emphasis on the current commodity price environment as well as priorities for energy security. Uncertainty around **Middle East dynamics** and a higher attributed impact to **US policy** has assumed greater importance globally, with particular emphasis on Middle East dynamics in the Middle East region and US policy for North America, Latin America and Africa. In contrast to previous year's reports, the latest geopolitical dynamics add further weight to the supply side fundamentals. Beyond the potential for a change in current OPEC strategy, or alignment on production between specific countries, the focus for energy leaders is on the potential for swing production and role that the lifting of Iranian sanctions will play in the Middle Eastern region. Additionally, with the prospect of an upcoming election in the US, increased uncertainty around US policy might be expected given the strong divergence in potential implications for the energy sector – directly relevant in North America, but also further afield when considering issues of regional and global supply and trading.

Whilst macroeconomic factors are less dominant in the current iteration of the issues monitor, in comparison to the immediate post-financial crisis period, there is a clear regional divergence around the effects of **exchange rate** fluctuations and currency risk on energy operations and investments. This highlights the issue as being significantly more impactful for energy leaders in non-OECD countries, versus their OECD counterparts.

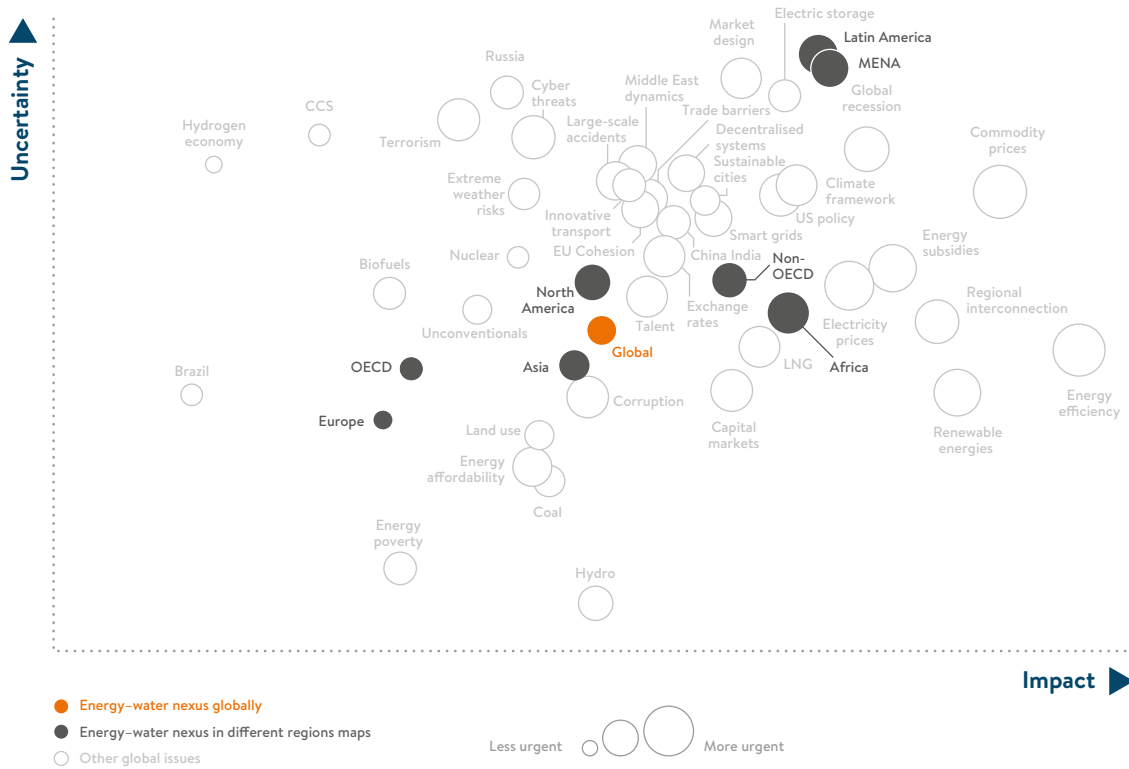
The most severe effects of exchange rates can be seen in the emerging markets space, where the issue is viewed as one of the top critical uncertainties. For energy leaders in these countries, the combination of falling commodity prices and export volumes with a surging US dollar has put increasing pressure on corporate balance sheets. In turn, this has created a feedback loop in which credit conditions tighten and companies are faced with increased debt levels. This has been further intensified by the dominant role that many of the companies in the energy sector play in contributing to the national budget as well as in the relationship as key trade partners between emerging market economies.

In 2016, there is a growing acknowledgement that adaptation to new resilience challenges (cyber threats, extreme weather risks and the energy-water nexus) will require attention and funding. The **energy-water nexus** is considered a critical uncertainty issue specifically for Latin America, the Middle East and Africa (figure 8). This links to localised stresses within the energy system, where any changes in water supplies in terms of volume, temperature or availability can have a significant impact on energy production and economics.⁶ The Council's 2016 publication on the energy water food nexus highlights how the nexus is a growing concern for decision-makers

6. World Energy Council, 2016, The road to resilience: the energy–water–food nexus

globally, and how learnings from these regions can help provide better risk management in energy infrastructures.

FIGURE 8 – THE ENERGY-WATER NEXUS



Geographical tracking to show the regional differences for the energy-water nexus

In contrast to the regions of importance for energy-water nexus, the risks from cyber threats have moved up the agenda this year, specifically in North America and Europe. A clearer understanding of the nature of cyber risk and mitigation measures for energy infrastructure is necessary, in an environment of increasing interconnectivity and emerging technologies.

IMPLICATIONS FOR THE ENERGY SECTOR

These findings reinforce the theme outlined in last year's World Energy Issues Monitor around a 'new normal' for energy prices and market realities. The effects of the issues on the energy transition are now beginning to play out both across regions and at the national level.

The report also finds that the ability to finance the transition to a sustainable energy system keeps energy leaders busy at work. There is a growing acknowledgment that adaptation to new resilience challenges (cyber threats, extreme weather risks and the energy-water nexus) will require attention and funding, while smart innovation and regional interconnection are also being recognised as being key parts of the solution.

The trends highlighted throughout this year's report, demonstrate that increased volatility caused by a range of macroeconomic factors, especially in relation to energy and commodity prices, are now an established environment in which energy leaders must make difficult investment, operational and technological decisions. In such circumstances it is clear that company and policy strategies will need to adapt to meet the new operating conditions.

Chapter two

Assessing the regional energy agenda

Regional break-down of countries contributing to the Issues Monitor:

AFRICA

Botswana
Cameroon
Chad
Congo (Democratic Republic of)
Cote d'Ivoire
Ethiopia
Ghana
Kenya
Mozambique
Namibia
Niger
Nigeria
South Africa
Swaziland
Tanzania
Tunisia
Uganda
Zimbabwe

ASIA

Australia
China
Hong Kong
India
Indonesia
Japan
Kazakhstan
Korea (Rep.)
Malaysia
Nepal
New Zealand
Pakistan
Philippines

Singapore
Sri Lanka
Thailand

EUROPE

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

LATIN AMERICA AND THE CARIBBEAN

Argentina
Bolivia
Brazil
Chile
Colombia
Dominican Republic
Ecuador
Peru
Trinidad & Tobago
Uruguay
Venezuela

MIDDLE EAST AND NORTH AFRICA

Algeria
Bahrain
Egypt
Iran
Iraq
Israel
Jordan
Lebanon
Morocco
Qatar
Saudi Arabia
United Arab Emirates

NORTH AMERICA

Canada
Mexico
United States

REGIONAL INTRODUCTION

Moving from the global analysis to look at the more regional picture, of particular interest is the illustration of key regional disparities within the Issues Monitor. Aside from geopolitical priorities, which display a natural regional bias, a high degree of variation in responses from energy leaders is demonstrated throughout the regional analyses for issues of innovation (e-storage, innovative transport, smart grid, and market design), resilience (energy-water nexus, extreme weather risks and cyber threats) as well as specific supply technologies (coal, large scale hydro and nuclear). We have highlighted in the global analysis that innovation is a growing area of focus globally. Our regional analysis expands on this especially in the perceived importance of market design and electric storage in differing contexts. The issues surrounding resilience and technology choices also exhibit significant regional variation with varying degrees of impact.

1. Innovation and market design

For the first time, issues around innovation take a leading role on the energy agenda in 2016. Both **market design** and **electric storage** are perceived with both high impact and high uncertainty at the global level, showcasing its importance for energy leaders globally. However, when comparing regional priorities for innovation issues, including e-storage, innovative transport, smart grid, and market design, the differences are quite important. Europe and North America are placing great emphasis on these innovation issues (except for innovative transportation) compared to other regions. These issues are seen with lowest priority in Africa and Latin America. Asia – the region with largest number and fastest growth of megacities – is placing the highest emphasis on innovative transportation and sustainable cities. Market design in particular is among the top insomnia issues in Europe and North America where market shares of intermittent renewables have grown most rapidly.

2. Resilience

In 2016, there is a growing acknowledgement that adaptation to new resilience challenges – **cyber threats**, **extreme weather risks** and the **energy-water nexus** – will require attention and funding. A particularly strong El Nino currently affects Latin America's and Africa's water and hydro power availability. This has contributed for the energy-water nexus to be considered a critical uncertainty issue, especially for Latin America, the Middle East and Africa. In contrast, the risks from **cyber threats** have moved up the agenda particularly in North America and Europe. A clearer understanding of the nature of cyber risk and mitigation measures for energy infrastructure is necessary, in an environment of increasing interconnectivity and emerging technologies - we envisage that this issue will continue to grow in prominence for such regions.

3. Technology challenges – large scale hydro

Large-scale hydro is understandably an issue closely aligned to localised resource availability. The regional findings for this issues monitor report demonstrate a strong divide whereby the impact of the issue is prioritised by energy leaders in non-OECD countries versus their OECD counterparts. Hydro is the top action priority for energy leaders in Latin America, followed in priority for those in Asia and Africa who perceive the issue with similar low uncertainty but a relatively lower degree of impact. The issue finds least traction for Europe, the Middle East and North America.

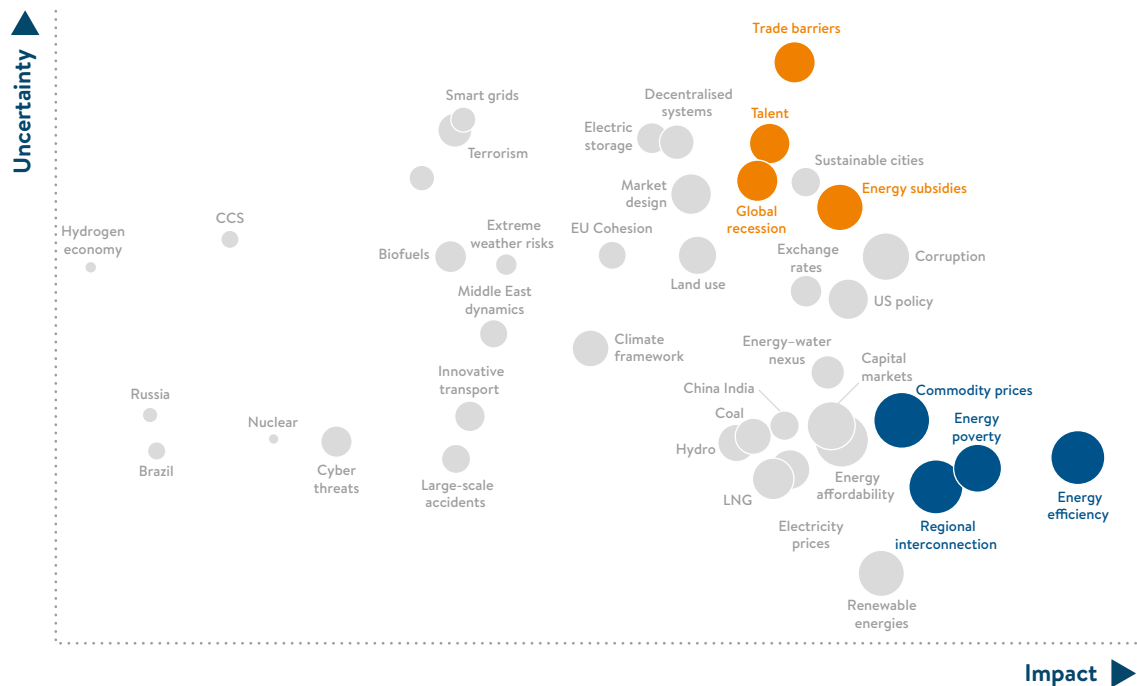
4. Technology challenges – coal

In 2016, the global positioning of **coal** is losing its previously global high impact position with the exception of Asia and Africa. The findings from Latin America and the Middle East show the issue to be largely irrelevant for energy leaders, while in both Europe and North America the results are closely aligned with the global position – implying a continued but limited impact. This supports the findings around the sustained need for conventional generation in order to balance the energy system.

5. Technology challenges – nuclear

Whilst the global positioning of **nuclear** has lost its previously global high impact position, the issue is still considered with high impact but also high uncertainty for energy leaders in North America, where the complexities around any future increase of nuclear generation adds to uncertainty. In Asia, the anticipated centre of future supply growth, and Europe, with a maturing and reduced role post-Energiewende, the issue has both a more moderate impact and uncertainty. This contrasts to the low impact perception of nuclear in Africa, Latin America and the Middle East.

AFRICA



Africa’s economies continue to demonstrate resilience in 2016. Most countries manage to sustain their growth and the overall continent remains among the world’s fastest growing regions. Nevertheless, power crises across the continent and high electricity tariffs emerge as the most limiting factors to the economy’s ability to grow at a faster rate.

As oil and **commodity prices** continue to decline and their budgets funding is becoming challenging, governments of exporting countries are seeking to build up resilience and to further diversify their economies, although with varying success.

Political governance performance is stalling overall, with diverse trends of its key components (e.g. slight progress in human rights and human development – high jump in **corruption**). A new President of the African Development Bank has been elected. His first focus was to launch a “New Deal for Energy in Africa” to solve Africa’s huge energy deficit and to end **energy poverty** by 2025.

The top critical uncertainties emerging this year are: **energy subsidies, trade barriers** and **global recession**. While African energy leaders have not individually too much influence on **trade barriers** and **global recession**, which remain regional and global issues, specifically governments should drive critical policies and regulatory reforms to better manage **talent** and **energy subsidies**.

Energy subsidies continue keeping its position in the high uncertainties space, because energy prices remain high at the consumers' levels, governments keeping using subsidies as a social and economic political instrument to avoid social tensions.

Energy efficiency, energy poverty, regional interconnection and commodity prices are the most important need for action issues. They are crucial issues to be given high priority by energy leaders because they can foster the sustainable development of the continent.

Energy Efficiency remains a high energy policy priority objective for all countries, seeing its multiples benefits, including its prominent role on climate change issues / GHG reductions. For Africa, it has constantly been perceived as high action priority issue and remains high in government policies, seeing the huge potential along the whole energy chain and the low level of achievement so far. For example, it is interesting to note that the African level of energy intensity is still quite high: 30% above the world average and more than double the one of Europe.

Energy poverty remains the major energy issue for Africa, triggering great concerns for the leaders. Some progress has been achieved in the last last years, but the magnitude and complexity of the problem are such as there is still a lot to do to achieve universal access within a reasonable timeframe. It is thus recognised as a fundamental challenging issue and keeps a right and meaningful place in the new UN Sustainable Development Goals adopted in September.

Regional interconnection offers huge opportunities to African region and nations and can deliver the three dimensions of the Trilemma for all the PIDA-PAP priority projects. In that perspective, the *World Energy Council white paper on Regional Energy Integration in Africa* recommends a proactive approach to do this, by establishing dialogue and cooperation with all the stakeholders to make these projects happen in a sustainable and accelerated way.

Commodity prices have declined sharply this year, impacting in some extent, economic growth in certain mining and oil producing countries that have not built up resilience.

Additional major issues of interest are: **US policy, Capital markets, Renewable energies, Energy affordability, China / India and Hydro**. As for the previous years, those issues continue to be critical; and accordingly, policies should be strengthened and better coordinated in a regional perspective to maximise their impact, regionally and nationally.

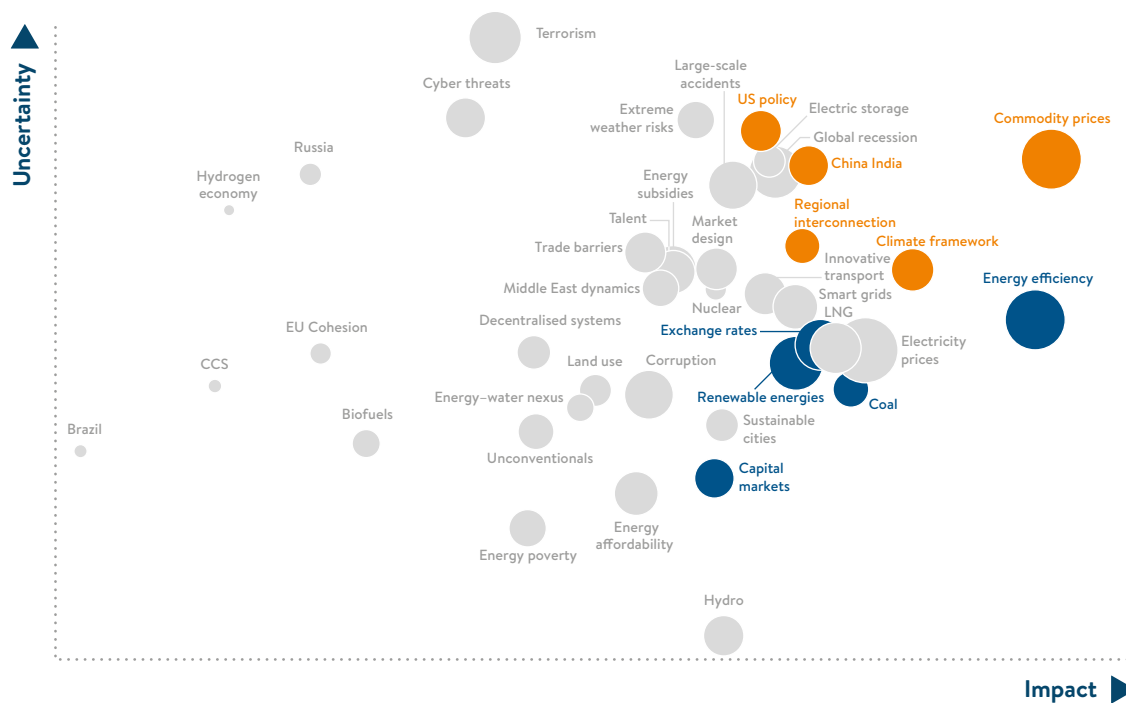
Similarities in position between the African and the world maps include the following key issues: **Energy Efficiency, Regional Interconnection, Renewable Energy, US policy and Global recession**. On the contrary, against the world map, issues showing major differences in position include: **Energy Poverty, Corruption, Talent, Smart grid, Electricity storage, Nuclear, and Russia**.

Moreover, African energy issues of relevance, critical to the sustainable development of the energy system include: **extreme weather risks, energy-water nexus, regional energy markets creation, and regional energy integration**.

The most relevant year-to-year changes and specific observations are related to the following issues:

- **Corruption**, made a significant move appealing for strong actions, because perceived as a plague scourge which put a brake on Africa's development. To put the scale in perspective, the cost of corruption in Sub-Saharan Africa, estimated roughly at \$150 billion/yr, exceeds the \$112 billion/yr of total investment in energy supply.
- **Decentralised systems** moved from priority action area to critical uncertainties, although priority should continue to be put on this issue along with mini and micro-grids, because they play an important role for electricity supply and distribution in African rural and remote areas.
- **Extreme weather risks** are losing ground in terms of priority actions and also moving to higher uncertainties. This sounds very surprising, because they continue to represent palpable emerging risks that are escalating in frequency and severity, impacting many parts of Africa due limited adaptation capabilities and low level of development.
- **Climate framework** moved from high to much lesser uncertainties, but with no change in impact. Current talks on CC and COP21 in Paris might be influential on the perception of what really CC would represent globally in terms of risks and devastating consequences.
- **Coal** moved from high uncertainties to priority actions. Many African countries are now considering coal to diversify their energy mix and to reduce their electricity generation costs, although most of them sound less concerned by national GHG emissions.
- **LNG** gained ground this year, moving to priority actions. The LNG outlook is indeed improving in 2016 with increased activities from existing exporters (Algeria, Nigeria, Egypt, Eq. Guinea, Angola, Gabon) and projects of new players coming on stream in East Africa (Mozambique and Tanzania) after several years of delays.
- **Unconventionals** has moved to high uncertainties – the slump in oil prices has discouraged investors, energy companies and governments to continue exploring more costly and environmentally risky unconventional projects (south Africa and Algeria).

ASIA



For the 2016 Asia Issues Monitor, there are four critical uncertainties at the top of the agenda for the energy leadership in the region: commodity prices, US policy, China & India and regional interconnection.

Commodity prices. This year, the definition of the commodity prices issue was adapted to relate to prices regarding energy and energy-related commodities, not prices of commodities in general. Thus, we see a strong link with the positioning of energy prices within previous issues monitor findings, but with an increasing divergence to the issue of electricity prices. In the last year's survey, energy prices was by far the most critically uncertain issue in Asia, and commodity prices occupies a similar position this year, but with a lesser degree of uncertainty. This change reflects the continued drop in the prices of crude oil that began during the summer of 2014, which now become a more normal environment in which leaders must operate.

US Policy broke away from the central grouping apparent in previous iterations of the issues monitor, to become one of the critical uncertainties for 2016. The US EPA proposed the Clean Power Plan in June 2014 and it was finalised in August 2015. The current administration's very tough policy on CO₂ emissions, and hence on coal-fired power generation, combined with the domestic shale gas production, has resulted in the rapid increase of coal exports from the US to not only Europe but also Asian countries, particularly to China. The US is also gradually lifting the ban on the export

of shale gas to non-FTA countries such as Japan, while the lifting of the ban on crude oil exports is under debate. These changes in the US energy policies have a strong potential to affect the energy situation throughout the world, including for Asia.

China/India has become increasingly uncertain in the latest issues monitor for Asia, although the high perceived impact of this topic remains almost the same as the last year. The reason appears to be the economic slowdown of China, the largest economy in the region, although the prospects of Indian economy are robust.

Regional Interconnection has witnessed a marked change in perception over the recent years in Asia and figures as one of the critical uncertainties, as energy leaders and experts for the countries are increasingly realising the importance and relevance of the issue.

On the action priority side, for what keeps energy leaders most busy at work, in the latest Asian context, energy efficiency, capital markets and renewable energies dominate the agenda.

Energy efficiency has the ability to significantly advance progress in all three areas of the World Energy Trilemma – energy security, energy equity and environmental sustainability. The fact that this issue of energy efficiency has been a dominant one in the need-for-action space for over five years clearly indicates that there is a shared perception among the energy leaders, but also questions the extent to which progress is being delivered.

Capital Markets made a significant jump in perception, from a relatively neutral positioning in the centre of the map in 2014 to action priority space this year. It is estimated that, between 2010 and 2020, Asia's overall national infrastructure investment needs will be \$8 trillion,⁷ for which infrastructure for electricity alone accounts for 51% of the total. The establishment of a China-led Asian Infrastructure Investment Bank (AIIB) has shed new light on the need to address this huge financial requirement.

The role of the issue of **Renewable Energies** seems to be a foregone conclusion in many respects, now that renewable energy would need to be scaled up if countries in the region are to meet their climate change targets. Thus, it is not surprising that the issue has been identified as a priority item in the most recent issues monitor.

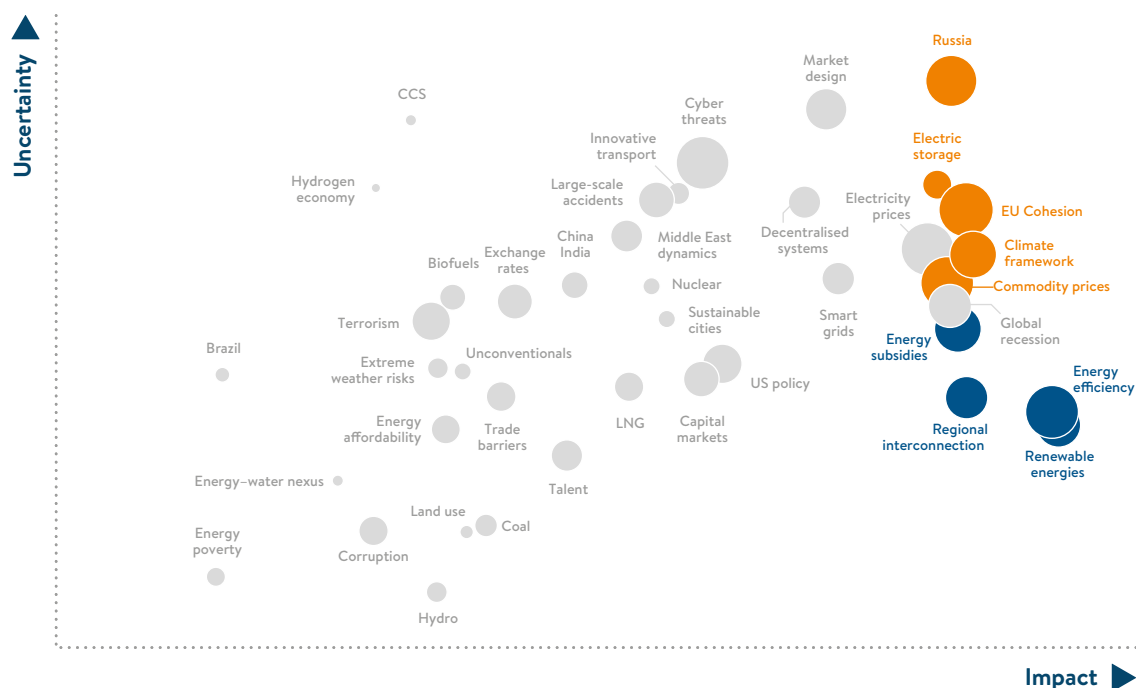
When viewed in comparison to the world map, the results for energy leaders in Asia are broadly aligned, with notable exceptions for **hydropower** and **coal**. Both of these issues have stronger impacts in Asia compared to in the world and with good reason. According to the World Energy Council's recent hydropower report, Asia has the largest remaining unutilised potential, estimated at 7,195 TWh/year, making it the likely leading market for future development of hydropower.⁸ Furthermore, regarding coal, World Energy Council's World Energy Scenarios reveal that since the 90s, most of the

7. ADB and ADDBI, 2009: Infrastructure for a Seamless Asia

8. WEC, 2015: World Energy Resources – Charting the Upsurge in Hydropower Development

growth has been coming from India, China, Korea (Rep.) and Japan and estimates that 54 to 77% of investment needs for coal-fired power generation by 2050 will be in Asia.⁹

EUROPE



European energy markets are on one hand largely influenced from the global geopolitical situation, but on the other hand from specific regional uncertainties. Over the past year, we have seen the continuation of political unrest in the areas surrounding Europe, and immigration to Europe has had an effect to the whole region. Energy prices have remained low, and the discussions about the energy market design have gained ground. At the same time technological progress has started to influence the investment decisions in the market. From a global perspective the outcomes of COP21 are very important for Europe, but uncertainties remain as to the finalisation of agreements and what the implications of this will be for governments and business leaders.

The impact of these issues are very likely to be reflected in the energy markets in the coming years. However, one can already observe the rapid rise of new issues; including market design, cyber threats, commodity prices, and decentralised systems along with electric storage, which come to the current agenda with greater impact.

9. WEC, 2013: World Energy Scenarios

The highest uncertainties in 2016 are still associated in Europe with geopolitical challenges and energy security. In this context it is noteworthy, that in parallel with concerns about **Russia**, the uncertainties about the **EU cohesion** have increased substantially. This can be explained by the increasing political discussions about the future of the European Union, different political perceptions within the EU towards Russia and by the struggles with immigration. This has also influenced the discussions about the European Energy Union, where integration and the **market design** debate has become increasingly complicated.

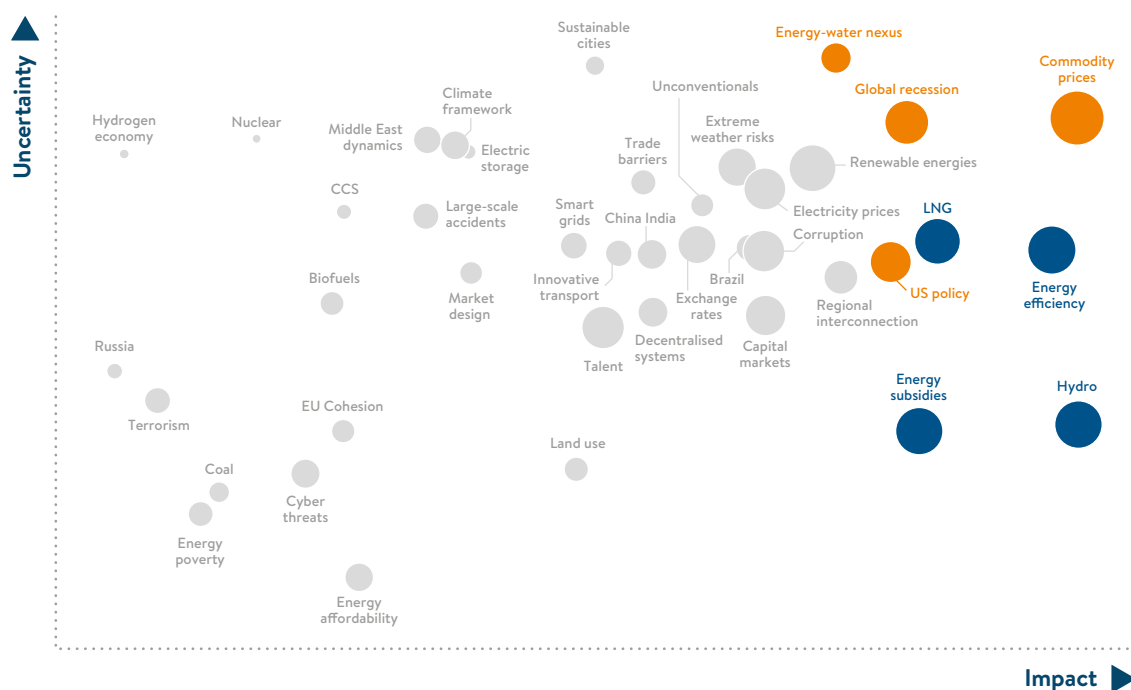
Considering investment areas, it is positive to note the decrease of the uncertainty around **regional interconnection** for energy leaders in Europe. The List of Projects of Common Interest, approved and financed by the European Commission, has well supported investments into new interconnectors. Alongside this, the investment climate in energy efficiency and renewables projects remain to be supportive for new developments, especially considering the decrease in prices of new technologies.

Compared to other regions; for Europe, the largest deviations can be observed in perceptions towards **Russia**, which can be explained by political motivations. Another area of wider difference is around the perceptions towards **capital markets**, where the impact level for European markets is considered to be clearly lower than in other regions of the world.

One can also observe that **decentralised systems** are perceived in Europe to have larger impact than in another regions in the world, along with the issues of **electric storage** and **market design**. This can be explained by the knowledge about the technological development and wider political discussions around the application of such solutions in electricity markets. In this context it must also be noted that **unconventionals** have strongly lost ground in Europe, although the impact they have delivered from the US to the global markets is clearly recognised.

As a final general observation it is remarkable that the global issues that prevailed at the top of the energy agenda a few years ago for European energy leaders, have now shifted away and regional issues have increasingly gained greater importance.

LATIN AMERICA AND THE CARIBBEAN (LAC)



The past year has been a difficult year for energy leaders in the region of Latin America and the Caribbean (LAC). Falling oil and other commodities prices have deeply affected exports and national budgets leading to tight economic situations in many countries, especially those highly dependent on exports. Most countries have experienced very slow economic growth, rising inflation, unemployment and deteriorating terms of trade. This is clearly reflected in the issues monitor whereby **commodity prices** are the critical uncertainty for energy leaders in region due to the large direct effects these have on national income as well as indirect effects in many sectors. Governments in the region have struggled to balance their budgets and have had to cut spending significantly, issue debt and look for alternate funding sources. State oil and energy companies have seen themselves in a similar situation.

One big effect of falling oil prices has been a strong devaluation of local currencies; Colombia and Brazil are good examples of countries whose currencies have lost more than 40% of their value within a few months. This concern is very clear when comparing LAC 2015 map and 2016 map, **exchange rates** has had a very significant increase in both uncertainty and impact moving from weak signals towards the critical uncertainties area.

Global recession is another critical uncertainty in the region; concerns about weak demand for South American exports in the world are a great source of uncertainty

in the sector. **US policy** also has a big impact in the region; political approaches of the US to countries in LAC, such as the recent policy changes towards Cuba, affect regional dynamics. Furthermore, uncertainty around the Federal Reserve and its monetary policy concern the region, especially since increases in interest rates may lead to lower foreign investment flows in the region, which is much needed to reactivate the economies, especially in critical areas such as energy infrastructure.

Corruption scandals in LAC have affected confidence in the countries. **Brazil's** scandal has led the current government to a very difficult situation and extremely low approval rates. This scandal is directly related with the energy sector and is clearly reflected in the map, with corruption being near to a critical uncertainty. It is worth noting these scandals have not only taken place in Brazil; other countries have experienced similar issues. However; having corruption as an important issue may be a signal of hope for the region, meaning that the problem is being recognised and there is a call to address the issue.

Hydro continues to be an action priority issue. LAC has a very large hydro potential; countries such as Ecuador have had strong policy to take advantage of these resources, with eight new hydro plants due to begin operation in the country next year. Despite the enormous potential for generating clean energy through hydro in the region and the traditional political support for this source, it is very vulnerable to hydrological cycles and **extreme weather events** like el Niño. The latter is no surprise and the positioning for the **energy-water nexus** in the region further reinforces this. This is one area where action is needed to adapt and have resilient energy systems which will allow to adequately deploy the potential of hydro in Latin America. The other issue with large hydro is the growing difficulty to develop large scale projects due to social and environmental problems – projects in Chile and Panama have recently been stopped for these very issues.

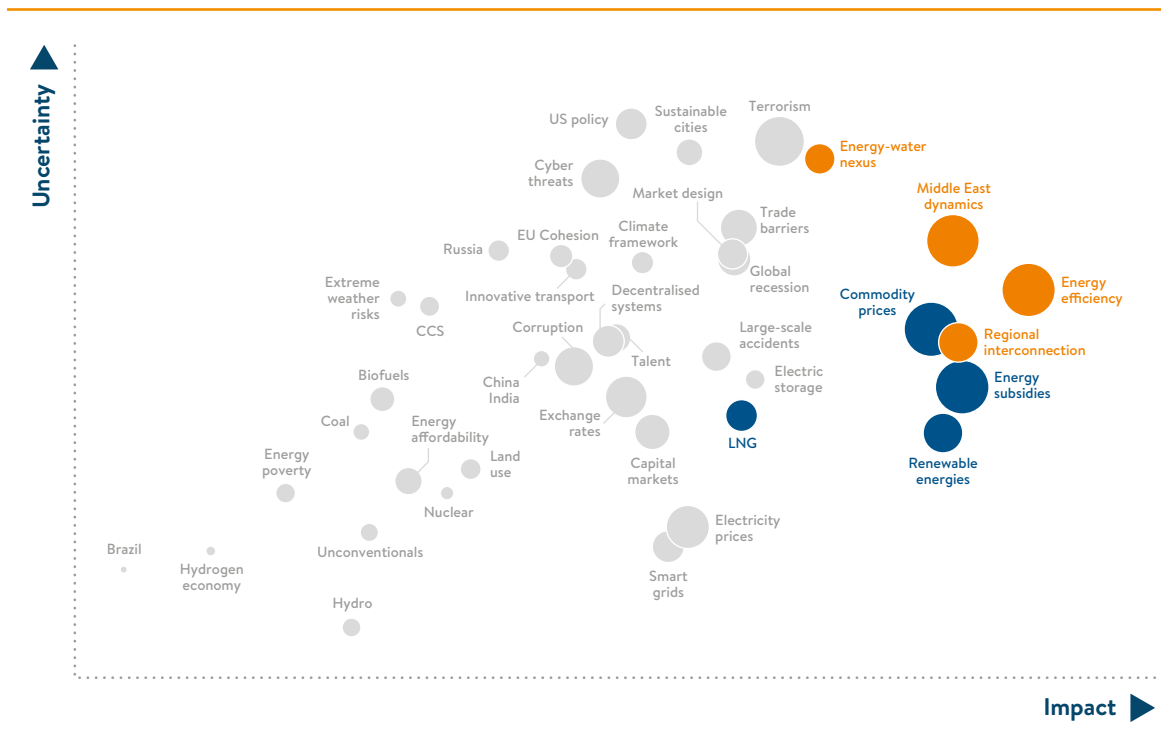
It is surprising to see the position of **regional interconnection** in the map. This has been a widely studied topic in Latin America and its benefits have been clearly identified; however, due to lack of political will many projects have not been developed. Interconnections could be extremely important to address some of the uncertainties shown in the map around issues including extreme weather events and the water-energy-food nexus. One clear example is the current el Niño the region is experiencing. This event leads to drought in Colombia and heavy rainfall in southern countries. Interconnections would be extremely important to be able to address this phenomenon and avoid energy shortages in a particular country. An example of this situation is the decision taken by Colombia in the past days to import energy from Ecuador due to the stress in its generation system caused by low rainfall and damages in two generating plants

Energy Efficiency is another action priority item in Latin America. It is clear that this is not an issue which brings uncertainty but which needs action to fully develop its potential. Ecuador has already taken the lead with strong policies in this regard; however, other locations such as Colombia and Chile are also increasingly addressing efficiency as it has become a key action priority.

When comparing leaders priorities in Latin America with the global priorities, critical uncertainties are very similar with commodity prices, global recession and US policy being on top in both. It is interesting to note critical uncertainties at global and regional level are mostly macroeconomic issues, while need for action are business environment and technology issues. This reflects that energy leaders understand the impact and potential of business environment and technology issues, with a focus not on the level of uncertainty but rather around the need to start acting and delivering.

Finally, the LAC issues monitor shows some issues which should be higher on the regional agenda but which energy leaders have classified neither as an action priority nor a critical uncertainty. Firstly, **energy poverty** and **energy affordability** both decreased in their impact and uncertainty, when compared to 2015, placing them in the weak signals space. It is well known that Latin America has a lot of work ahead on the energy equity dimension of the World Energy Trilemma, and as such these issues should be moving to become a higher priority in the energy leaders' agenda; however, they are currently showing a contrary movement. The other issue demonstrating a similar trend is climate framework. It is surprising to see how this issue has decreased in both impact and uncertainty during a year in which negotiations and the potential implementation of a new climate agreement has been a consistent and important part of the agenda.

MIDDLE EAST AND NORTH AFRICA (MENA)



The MENA Issues Monitor has witnessed an interesting evolution in the 2016 regional map. Firstly, in the action priority area, a number of core energy issues remain the top priority for leaders in the region.

In an environment of continued falling oil prices through the past year, the issue of **commodity prices** falls in terms of uncertainty but remains high in terms of impact. Regional leaders clearly accept that we are now in a new oil price scenario but one that is of concern for local economies. This is reflected in the need for an increased focus on **renewable energy**, an issue that has had a remarkable evolution on the MENA Issues Monitor map since 2013, making its way from a weak signal to the highest need for action in the region.

The issue of **energy subsidies** remains a high impact issue but with greater uncertainty as it comes onto the political agenda of many regional policy makers. Lower energy prices provide an opportunity for governments to cut subsidies and already the United Arab Emirates have taken a lead in deregulating gasoline prices. Other countries are looking closely at this issue and it is likely to rise both in terms of uncertainty and impact as policymakers grapple with a challenging issue moving forward.

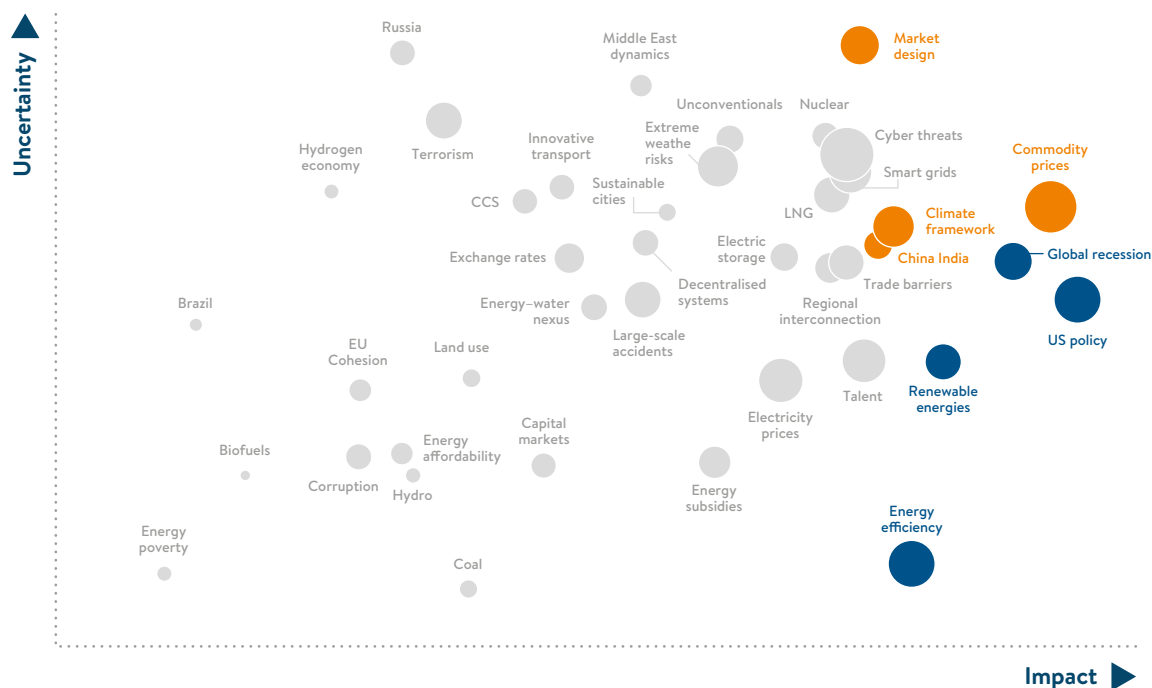
Of some surprise is the fact that the issue of **climate framework** shows a perception of reduced impact but greater uncertainty. In the run-up to COP 21, which has dominated much of the agenda over recent months, the increased level of uncertainty is understandable. For its part, the reduced impact of climate framework talks could be explained by a greater understanding and acceptance in the region that moves to reduce carbon emissions are to some extent inevitable and at the same time do not necessarily pose a major threat.

The reduction in the role of **LNG** both in terms of uncertainty and impact is at first sight surprising. Gas is critical to the economic growth of the region and many countries are in deficit. The growing regional trade in LNG is underpinning moves towards regional energy integration. LNG's move to the centre of the Issues Monitor reflects the success of this growing intra-regional trade in securing improved regional energy security.

In the area of Critical Uncertainties, it is interesting to see the evolution of **regional interconnection** and **energy efficiency**. These highlight concerns of energy policymakers with challenging regional dynamics and the need to keep a tighter control on regional energy consumption and to maximise efficiencies and economies of scale from regional interconnection, in order to best capitalise on the amount of oil and gas available for export.

Finally, weak signals from **unconventionals** both in terms of impact and uncertainty reflect how this issue has moved to establish itself as a relatively minor signal for the region. Energy stakeholders in the Middle East clearly understand its role but prioritise other issues as critical uncertainties, such as the **global recession**.

NORTH AMERICA



Disruptive forces accelerate change in North America energy market

In any given year, falling commodity prices, technological disruptions or evolving climate change considerations would represent major challenges for North American energy market participants. In 2015, the concurrent impacts of these forces on public, private and sovereign energy sector entities brought fundamental issues such as aging infrastructure, capital prioritisation, environmental and financial sustainability goals and complex barriers to expanding energy markets to the forefront.

For the U.S. and Canada, the reduction in oil and gas sector employment and well head activity was offset by continuing efficiency gains. This resulted in another year of near record levels of hydrocarbon production across the continent. North America’s production surge continues to play a key role in low commodity prices as global demand for oil now trails output by roughly 1 million barrels per day.

North American demand for natural gas has increased for power generation, but abundant supplies saw U.S. prices consistently below \$3 mm/BTU throughout the year. On the oil side, prices have fallen more than 70% since mid-2014 to levels not seen since 2003. Short term price recoveries have been undermined by the slow pace of economic growth in Europe, China and the remaining BRICS economies. In Mexico, efforts to improve the efficiency of the energy sector through privatisation have run into valuation challenges for potential investors.

Uncertainty over energy prices was identified as a key factor across North America with job cuts in the U.S. and Canadian exploration, production and services sectors of particular concern. Also, lower priced natural gas generation continues to help drive the retirements of significant levels of coal and single-unit nuclear generation capacity. Canada's oil and synthetic crude production is also being constrained by pipeline capacity issues with expansions being hindered by environmental and political groups. This issue is also being mirrored in the U.S. with 78% of respondents to the 2015 Black & Veatch Strategic Directions: Electric Utility Report citing opposition by these groups as a major factor in dampening pipeline expansion efforts.

In Mexico, the transition from a state monopoly in energy and addressing climate change are key factors facing the industry. There is a hope that increased production from a competitive marketplace will help stabilise revenue, while a new legal framework will help minimise the concern over corruption that could distort the marketplace. There is a concern about the financial impact on the Mexican energy industry resulting from the volatility of energy commodity prices. Key issues also cited by energy leaders are U.S. energy policy, commodity prices and global recession.

Climate concerns continue to influence government activity. Mexico announced at the COP21 in Paris that it would voluntarily reduce greenhouse gas emissions by 25% for 2030. Included in the actions to achieve this goal, Mexican regulators have deemed that by 2040 clean energy will be utilised for 35% of electric generation. The climate change framework for Canada is also creating uncertainty for the energy industry. In 2015, the government pledged that emissions would be reduced 17% from 2005 levels by 2020 and 30% by 2030.

In the policy area, the U.S. EPA's Clean Power Plan, which intended to regulate carbon dioxide emissions from fossil-fuelled power generation facilities, is currently being challenged in the courts. This is creating greater uncertainty for power producers with the government committing to lower carbon emissions and pledging to lower those emissions to 30% by 2020 compared to 2006 totals.

Additionally, though the particularities of each nation are unique, the role of energy exports is an issue of growing immediacy across the region. U.S. energy producers are seeking opportunities to access international crude oil markets and speed LNG export development. Although recently approved regulations have created an opportunity for oil export, there are still lengthy LNG regulatory processes.

The links between electric storage, renewable energy and energy efficiency also underscore a fundamental change impacting the electric industry. The decrease in the cost of renewable technologies is expected increase the use of these technologies in electric generation in North America. The rapid growth of distributed generation, particularly rooftop solar, has begun to complicate the traditional utility model as flexible regulation trails the innovation of the marketplace.

In fact, more than half of Black & Veatch electric utility industry respondents believe that a majority of all U.S. power generation will come from distributed generation by 2020. The five-year extension of the Renewable Energy Production Tax

Credit (wind) and Business Energy Investment Tax Credit (solar) and expanding state renewable portfolio standards continues to spur development of these resources. In addition nearly one-third of the electric utility respondents were reviewing their policies on net metering that allows customers to sell power back into the grid creating issues in the utility financial model.

Industry leaders must be visionary and nimble to successfully navigate the complexities they face across this evolving world energy market.

Chapter three

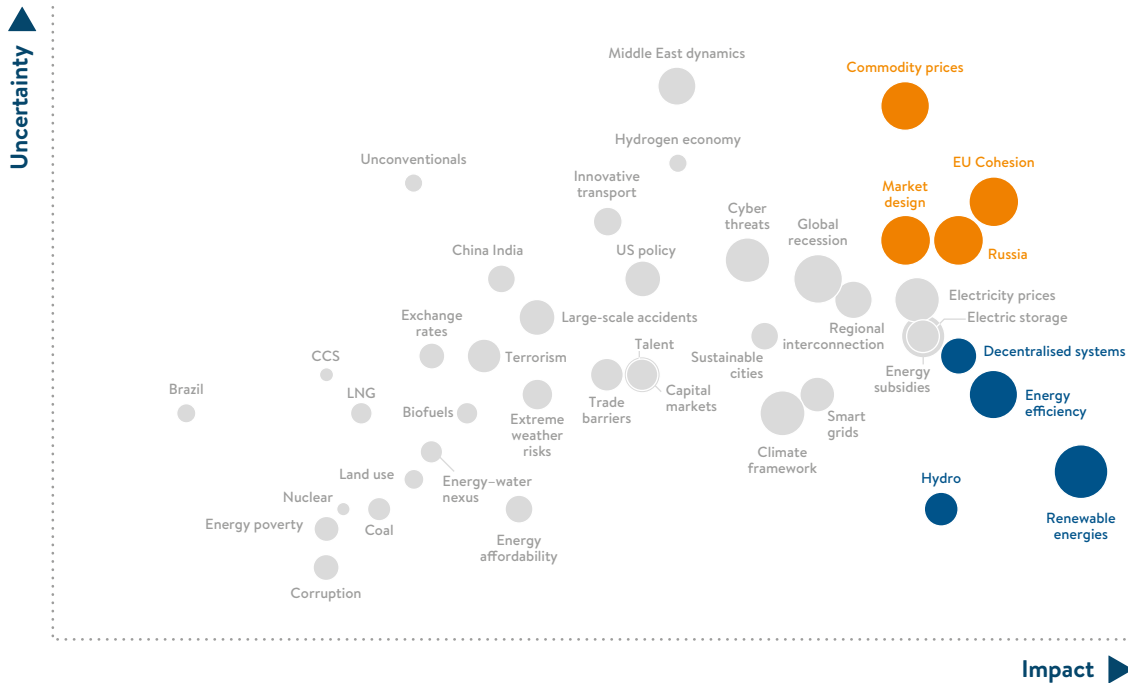
Assessing the national energy agenda

The following issues monitors build on the global and regional perspectives, to provide an insight into the priorities and critical uncertainties for energy leaders at the national level. Developed from the six national member committees who undertook this process as a pilot in 2013, this latest edition of the World Energy Issues Monitor now explores the main concerns and context in which decisions must be taken for 36 individual countries in 2016.

The following national member committees have undertaken the country level assessment for this latest World Energy Issues Monitor 2016 report:

- Argentina
- Austria
- Belgium
- Brazil
- Canada
- Chile
- China
- Colombia
- Ecuador
- Estonia
- Ethiopia
- Finland
- France
- Germany
- Hungary
- India
- Indonesia
- Italy
- Japan
- Kazakhstan
- Korea (Rep.)
- Lebanon
- Lithuania
- Mexico
- Namibia
- New Zealand
- Nigeria
- Poland
- Portugal
- Serbia
- South Africa
- Spain
- Switzerland
- Thailand
- Turkey
- United Kingdom

AUSTRIA



There are a number of aspects affecting the discussion on energy policy in Austria in 2015 including the United Nations Framework Convention on Climate Change in Paris (COP21) and the need for ambitious climate targets which should apply equally for all the countries in the world.

Another aspect is the implementation of the Energy-Efficiency-Law, which was passed by the Austrian National Council in 2014. It stipulates that the energy consumption in Austria should be decreased by 0,6%. It further stipulates that energy suppliers have to save 0,6% of the amount of energy that they were supplying to national customers compared to the year before.

Further aspects that are shaping the discussions on energy policy in Austria include is the discussion on the separation of the German-Austrian electricity market, the deterioration of primary energy prices and electricity wholesale prices and the Ukraine-Crisis and the worry about secured gas supply in Austria.

The Renewable-problematic, questions of secured gas supply (Russia- Ukraine-Conflict), uncertainties concerning future developments in energy prices and energy costs, the need for a new European electricity market design and the issue of energy efficiency are reflected in the National Map for Austria.

Besides that, there is a strong need for consistent and coherent EU-Energy Politics. The separation of the German-Austrian electricity market would be a wrong signal for instance.

Compared to the World-Map, the problematic area of electric storage might have a higher significance in Austria, because of the number of its storage power stations and its pumped storage (hydro) power stations, which makes Austria regard itself as some kind of “battery” for the CWE-region. On the one hand, those kinds of power stations are needed for a successful energy transition but on the other hand they are under considerable economic strain due to the present market distortions.

Besides the need for ambitious climate targets which should apply equally for all the countries in the world, the electricity market design and the dependence on Russia are seen as to be the greatest uncertainties.

Concerning those uncertainties, there is definitely a need for actions. Austria is also worried about the future development of Ukraine. Austria satisfies about 80% of its natural gas demand by imports. More than half of those gas imports came from Russia in 2014. At the same time, Austria is an important corridor for the transportation of Russian gas.

Besides that, Austrian future perspectives about its power industry are being discussed right now. The Austrian electricity sector struggles with unclear frame conditions concerning energy policies and climate policies, as well as low spreads and a lack of planning abilities concerning investments.

It is necessary to coordinate and harmonise the design of energy systems on the European scale. The CO₂-market should be the guidance system to achieve the energy transition and it should support the development of renewable energies and manufacturing technologies, which are poor on CO₂. Renewable energies should be integrated into the competitive markets as fast as possible. If certain technologies are ready for the market, subventions should be limited in time.

To guarantee secured electricity supply, the development of power grids is essential. There is also a strong need for reducing market barriers such as Peak Load Pricing, the resolution of gas acquisition contracts which are not market-compliant and long-term dependent on oil prices, etc.

Due to climate change it is necessary to introduce some further agreement after the Kyoto-Protocol which is running out in 2020. If there are no equal global efforts for climate protection after 2020 by the most important countries, there is probably a need for continuing the climate protection policy of the European Union in order to prevent the weakening of the industrial location of Europe.

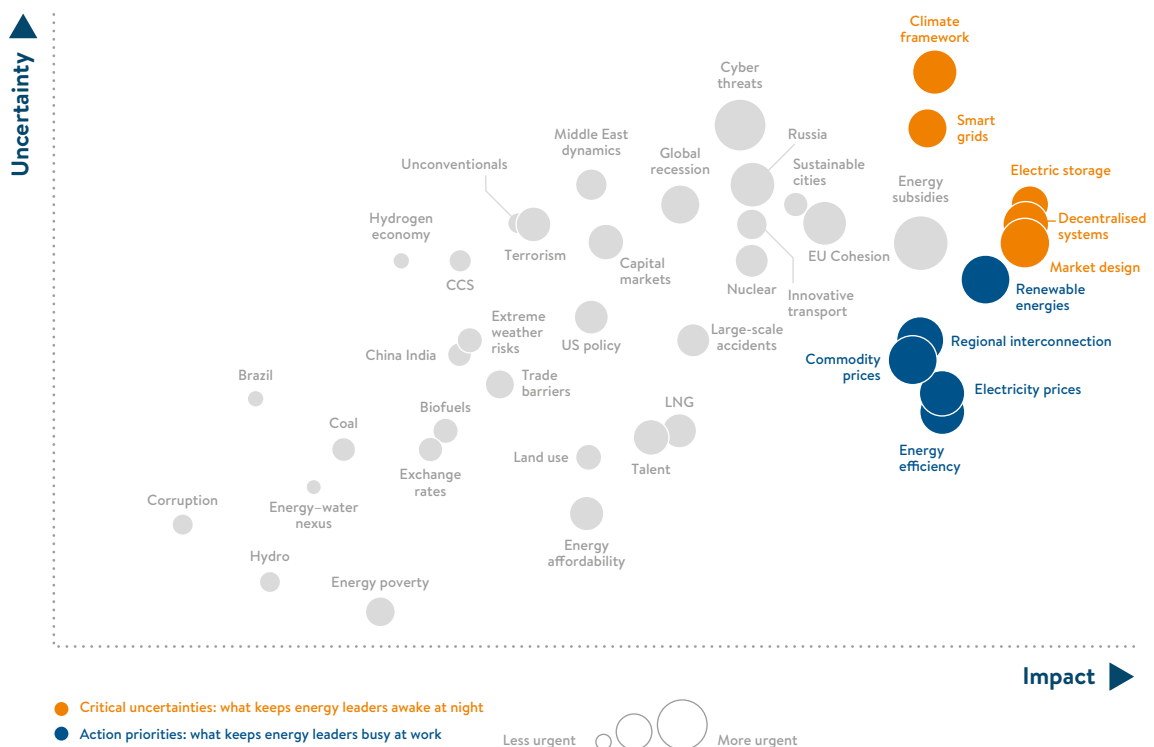
We see an overall agreement concerning issues like the ability to afford energy, further development of renewable energies also in connection with the future design of conveying systems as well as questions of energy efficiency. Uncertainties caused by Russia are specific for Europe/Austria and they can be explained by the dependence of Russian gas imports.

There is also a consensus concerning the need for consistent and coherent EU Energy Politics. In addition, problematic areas like renewable energies, energy efficiency, subventions for renewable energies and uncertainties caused by Russia

are seen similarly. Compared to last year’s investigation, there’s much more emphasis on the necessity for consistent and coherent EU-Energy Politics.

The need for ambitious climate targets which should apply equally for all the countries in the world, the need for a new electricity market design and uncertainties caused by being energy dependent on Russia are perceived with the same importance as last year.

BELGIUM



For Belgium, much of the context is still dominated by European circumstances. Major concerns are the continued economic downturn and a ‘hesitating’ financial sector. Also, important influencing factors are the regulatory uncertainty especially on the future **market designs** and the energy policy. It is realised that system-integration aspects were forgotten, leading to unanticipated effects. Examples are the absence of a current CO₂-cost signal through the ETS and the uncertainty for the future (for example, by changing the rules for the ETS), the over-subsidising of renewables leading to a too rapid growth of zero-marginal cost investments and the changes in subsidy policy. Furthermore, the on/off decisions on nuclear energy in Belgium and court cases introduced by certain groups, the decreasing wholesale electricity prices in North-Western Europe so that the crucially needed balancing

thermal gas-fired units are no longer competitive and are mothballed have all also contributed to this effect. In contrast, the end-user **electricity prices** are increasing, especially because of the increasing distribution costs, strongly affected by the passing on of the costs for **renewables** support. Recent actions by the authorities try to make the price setting more cost-reflective for electricity grid-related costs. The VAT for electricity of end consumers has been restored to 21% (from the temporary level of 6%) thereby better incentivising **energy efficiency** actions, the backlog of green certificates bought by the grid operators is being ‘resolved’ via a levy, and a so-called ‘prosumer tariff’, whereby effectively a capacity-based grid-connection tariff for rooftop PV owners, has been introduced.

On the gas side, US shale-gas prices are still much lower than European gas prices, albeit that European gas prices also have decreased recently, partly because of falling oil prices. Indirectly, the US shale-gas prices imply low world-market steam-coal prices, which combined with the low CO₂-cost in Europe gives priority to coal-fired electricity generation over gas-fired CCGTs also in Europe. The geopolitical issues related to Russia and Iran do not affect Belgium too much. Although Belgium has no gas resources, supply diversity has always been the rule in Belgium. Its gas-contract portfolio is not very sensitive to the sort of political tensions, at least not in the short run. However, with a currently scheduled **nuclear** phase out by 2025 and a mono-fuel electricity generation mix based on gas, it is important to remain vigilant for a balanced gas portfolio.

As to security of supply of electricity, 2014 was characterised also by the shutting down of two 1 GW nuclear units which have been reconnected to the grid in December 2015. The return of these units and the permission by the government for continued operation of the nuclear units Doel 1&2 together with a probabilistic adequacy assessment by the TSO have shown that no major security of supply issues are to be expected for the next two winters.

The results of the Belgian issues map reflect more or less the above concerns.

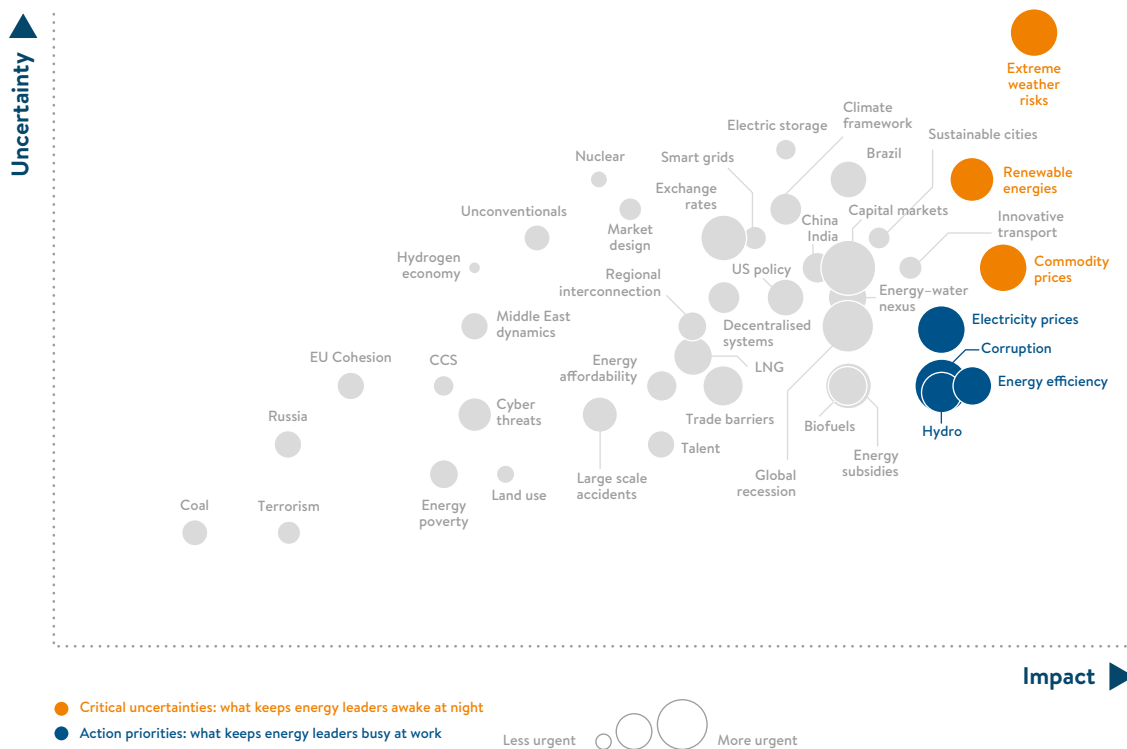
The critical uncertainties are the **climate framework, electrical storage, decentralised systems** and **market design**. ‘Decentralised systems’, ‘market design’, and ‘electrical storage’ reflect the fact that current challenges caused by decentralization may be assisted or not by the regulations for market design and by technologies such as electric storage.

The most important needs for action (the issues that keep the leaders busy at work) are renewable energies, energy efficiency, **electricity** and **commodity prices** and **regional interconnections**, although issues like **EU cohesion** and **energy subsidies** also require full attention.

Compared to the issues map of 2015, the biggest shifts are the role of **India & China** and **US policy**, which have now moved much more to the left, and are now estimated to have less impact. **Electricity prices** are still very important as to impact, but are perceived to be less uncertain. The role of **coal** is now less of an issue, whilst **innovative transport** is receiving much more attention.

We mention some important differences with the European issue map. **Russia** keeps European leaders more awake than the Belgian ones. **EU Cohesion** is higher on the European action list than on the Belgian one. Belgian energy leaders, in contrast, expect a lot from **electricity storage** and are more concerned about a **global climate framework**. **Energy subsidies** and **renewables** are roughly equally important for Belgians and Europeans.

BRAZIL



In 2016, the critical uncertainties at the top of the agenda for energy leaders in Brazil include **extreme weather risks, renewable energies** as well as **commodity prices** and associated volatility. With a perceived lower uncertainty; those issues considered as action priorities for the energy sector to address are **large scale hydro, energy efficiency, corruption** and **electricity prices**.

The top positioning of **extreme weather risks** for energy leaders in Brazil is closely linked to the country recently facing its worst drought in 40 years. As a result, hydropower consumption in Brazil fell by seven% in 2013 and an additional 5.5% in 2014. While El Nino was expected to increase the amount of rainfall for key points in Brazil, changing weather patterns shifted its path resulting in the need for more costly thermoelectric plants and additional energy imports. This reinforces

the perception of extreme uncertainty and impact for the issue. Consequently, a continued focus on energy supply diversification has become a key strategy for resilience in the country, especially with increasing investments in renewable energies including wind power.

Installed capacity in Brazil for generating electric power reached 140.9 GW in December, representing a 6.9 GW increase over 2014. This capacity increase occurred largely in eolic generation, due to an increase of 2.7 GW in the past year. This is equivalent to an increase of over 56% in relation to the capacity recorded the year before. In hydraulic generation the increase amounted to 2.3 GW. This is closely linked to the importance attributed to both **renewable energies** and the role of **large scale hydro** within the national monitor of Brazil.

Overall, domestic energy supply declined two% compared to the 2014 figure. Non-renewable sources saw a four% decline while the drop of six% in petroleum stands out. In contrast, for renewables there was growth of one% due to an increase in eolic energy.

Domestic supply of electric power dropped a total of two%, of which 2.7% in hydraulic supply, compensated in part by an increase in eolic generation (increase of 80%) and biomass (increase of 12.1%).

The year 2015 closed with a drop of 2.1% in electric power consumption over 2014, totalling 464.7 TWh. This decline was caused principally by the fall in industrial consumption (-5.3%) due to an unfavourable scenario throughout the year (a -3.5% estimate for the 2015 GDP). Residential consumption also diminished in 2015, by 0.7%, totalling 131,315 GWh, influenced by higher rates. This retraction was the greatest since 2004. This is emphasised in the latest findings by energy leaders with a very high perceived impact attributed to the issue of **electricity prices**.

Only the commercial segment showed a positive result last year with an increase of 0.6%, totalling 90,383 GWh. However, this result was significantly below performance levels during the last five years. In December, residential consumption dropped for the first time since the rationing in 2001, a retraction of 0.3%. This result is due to a combination of aspects, including the unfavourable economic situation and continued impact from the **global recession**. Additionally, the rise in the average rate of electricity charged to the consumer was caused as by a readjustment index above 40% by some Brazilian distributors and by the introduction of a 'red flag' in electricity accounts.

Together with the increase in electric power prices during the past year, a system of rate 'flags' were implemented in order to protect the poorer consumers. If the flag is green, the consumer does not pay an additional tax; if it is yellow, R\$2.50 is charged for every 100 kWh of power consumed; if red, the tax increases to R\$5.50 for each 100 kWh. This range of options is reflected by the central positioning of the issue of **energy affordability** in the latest issues monitor, suggesting a moderate degree of uncertainty with a limited perception of impact for business leaders.

Industry suffered a loss of 8.4% during the last month of the year as compared to December 2014, and commerce closed the month with a drop of 0.2% in a similar comparison.

Reflecting trends set out across the global energy agenda, the issue of commodity prices and associated volatility is also one of the most important areas to address for energy leaders in Brazil. Total production of petroleum and natural gas in Brazil in December, 2015, totalled 3,164 million boe/d.

Production of petroleum and natural gas liquid (NLG) reached an average of 2,527,000 bbls per day. This production amounted to 7.7% above that of 2014, a new record for Brazil. The average annual production in the pre-salt area was also the largest in Brazil's history, reaching an average of 767,000 bbls/d and surpassing the previous year's production by 56%.

In December 2015, average production totalled 2,619,000 bbls/d, the second highest in history, only surpassed by the production in August when the figure amounted to 2,641,000 bbls/d. The December pre-salt production from 52 wells amounted to 875,000 bbls/ per day and to 34.3 million cubic metres per day (m³ /d) of natural gas, totalling 1.09 million boe/d, a 6.6% increase over the previous month.

On the natural gas side, production reached a record volume at the end of last year, totalling 100.4 million (m³ /d). This represented a 6.6% increase over the previous month and a 5.5% increase compared to the same month in 2014.

A further increase in the production of petroleum is expected for 2016, which may reach up to three%. This is due to the forecast that the platforms of the Maricá, Saquarema and Caraguatatuba will enter into operation, all of them in the pre-salt area.

From a consumption perspective, petroleum products had by November accumulated a loss of 5.8%, displaying the following negative rates: -7.6% for gasoline and -3.3% for diesel oil. Consumption of natural gas retracted 0.8% by November, having been 0.1% positive until October. Natural gas sales for electric power generation retracted 11.3% that month.

Petrobras refineries attained a major record in total production of diesel oil S-10 in 2015, to the order of 11.686 million m³. The volume achieved at that period amounts to a 40% increase compared with the previous year's result when 8.329 million m³ of this derivative was produced. This production growth contributed also to a 49% reduction in importations of S-10 diesel oil, dropping from 9.3 million m³ in 2014 to 4.7 million m³ in 2015.

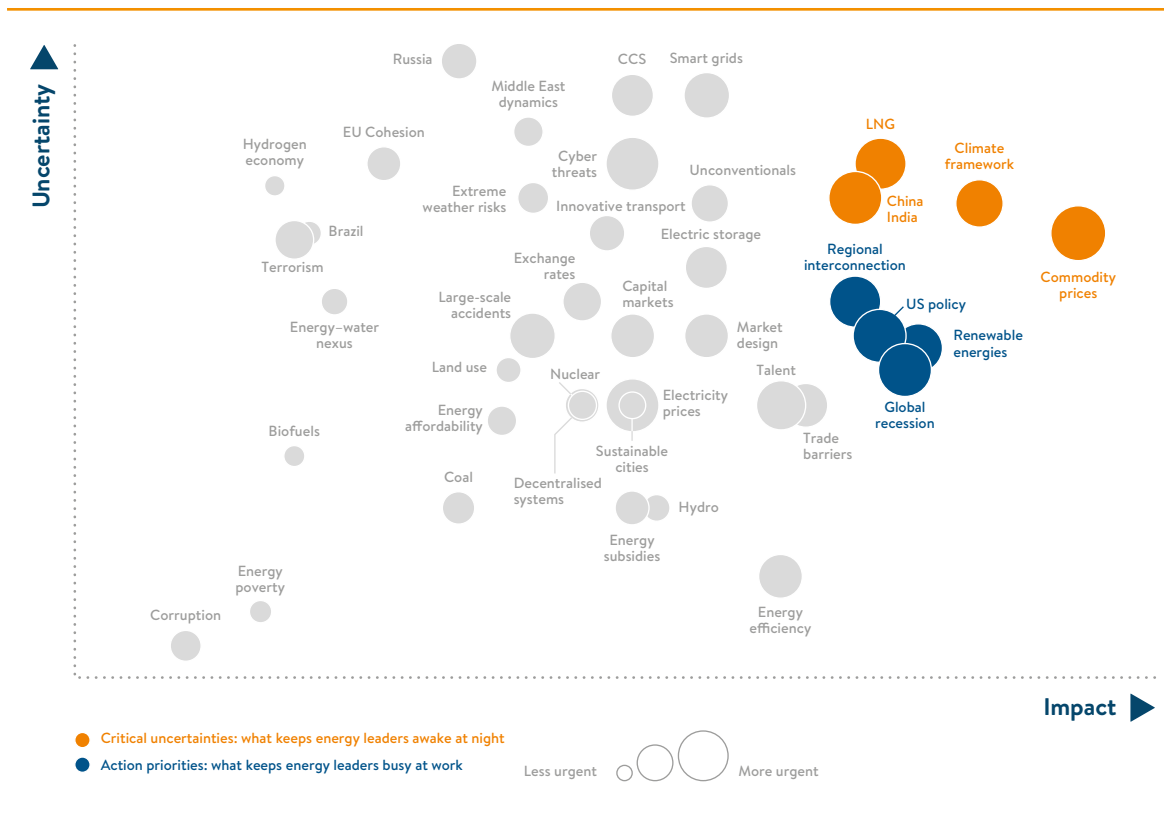
Diesel S-10, with its low content of sulphur, allowed the introduction in Brazil of vehicles with modern technologies for treating emissions that, among other important advantages, reduce emissions of particulate material by up to 80% and emissions of oxides and nitrogen by up to 98%. It offers other benefits as well, such as an improvement in cold start, larger intervals between lubricant changes, better performance, and a longer useful life of the motor. This reflects the recognition for action around the issue of **climate framework**, through industry action and comparative advantages that energy leaders in Brazil can leverage.

In short, despite the financial crisis of Petrobras which revised its production goals for 2020 from 4.2 to 2.8 million bbls/d, in 2015 there was an increase in the

production of both petroleum and natural gas. The production of diesel oil, the most consumed product in Brazil, increased also in the S-10 parcel which amounts to less dependence on imports to meet Brazilian demand.

Speaking of the energy sector in Brazil as a whole, despite the lesser consumption of electric power and the drop in the consumption of petroleum products and natural gas, Brazil increased its installed capacity of future electric power generation in renewable sources. It also increased the production of petroleum and of its products, as well as of natural gas, thereby cutting down on its dependence on imports to supply national demand.¹⁰

CANADA



In 2016, three issues continue to feature prominently among Canada’s energy considerations: carbon policy, energy trade, and energy commodity prices.

10. Sources: BP Statistical Review of World Energy, 2015; World Energy Council, ‘The road to resilience – managing and financing extreme weather risks’; EPE (Energy Research Company); ANP (National Petroleum, National Gas & Biofuel Agency); MME Ministry of Mines & Energy); Petrobras

Carbon: Policy uncertainty amidst a fossil-intensive energy mix and wide reaching energy sector

Climate Framework stands out as a significant critical uncertainty in 2016 for energy leader in Canada, as it did in the 2015 issues monitor. Canada is a member of the United Nation's Framework Convention on Climate Change. Previous Canadian governments have committed to reducing Canada's CO₂ emissions and in May 2015, the Canadian government pledged to reduce emissions by 17% from 2005 levels by 2020, and 30% by 2030.

Against this background of commitments, Canada's CO₂ emissions grew by 18% over the past twenty-five years and less than a fifth of the reductions targeted by 2020 have been achieved, despite being more than halfway through the target period.

Canadians elected a new federal government in October 2015. Post COP-21, the federal government has committed to meeting with all provinces and territories within 90 days to craft a pan-Canadian framework for tackling climate change. Climate commitments under the new government are expected to evolve and may feature more ambitious reduction targets along with more far-reaching supporting policies. While specifics of potentially revised targets are not yet fully known, stated supporting policies will include carbon pricing, clean technology investment, financial contributions to innovation strategies in the forestry, fisheries, mining, energy and agricultural sectors, direct federal investment in energy conservation, expansion of the list of technologies eligible for accelerated capital cost allowance (now to include electricity storage technologies and electrical car charging stations) and the creation of 'Green Bonds' to support large and community scale renewable energy projects.

Canadian progress to date in reducing carbon emissions has largely been driven by initiatives implemented by provincial governments across the country. Policies have already been implemented which include significant carbon pricing (carbon tax, cap and trade), regulation of emissions, and emissions reduction initiatives (off-coal, carbon capture, use and storage). Recent announcements include work towards a cap and trade regime in Ontario, Canada's largest province, and a carbon tax regime in Alberta.

Significant areas of uncertainty remain, including: the viability of achieving Canada's previously stated carbon reduction commitments; potential evolution of those commitments under a new government; and, implications for the Canadian energy sector. These are particularly salient considerations given the large role fossil fuels currently play in the Canadian energy mix (about 75% of Canadian final consumption) and in light of the sizeable contribution of the energy sector to the Canadian economy (Canada's gas, oil, mining and utilities sectors together comprise approximately 35% of the Gross Domestic Product of Canada's goods-producing industry).

Energy Trade: growth in Canada's large oil, bitumen and synthetic crude production; access to markets constrained by pipeline capacity; expansion proposals which face significant social, environmental and political challenges

The 2015 survey responses indicate that the impact of the issue of **Trade Barriers** has increased significantly compared to the 2014 responses. This is interpreted to arise from respondents' concerns around constraints in pipeline capacity to move Canadian oil production to international markets.

Canadian oil production grew by nearly 40% between 2005 and 2013, largely from growth in bitumen and upgraded synthetic crude production from Alberta's oil sands reserves. The oil sands now represent approximately 98% of Canada's oil reserves. It is expected that most of the future growth in Canada's liquids production will come from unconventional resources. Furthermore, Canada has the potential to become one of the largest sources of growth in world liquid fuel supply, both in the near-term and long-term. By 2030, Canadian oil production is projected to grow to over 6.4 million barrels per day.

As noted above, Canada's ability to trade liquid oil commodities and fuels with other countries is limited by pipeline constraints. Recent experiences with four prominent expansion proposals highlight some of the challenges Canada will face in growing its liquids industry.

First, the proposed Keystone XL pipeline project would involve the construction of new pipeline traversing six U. S states and supply up to 830,000 barrels per day to U.S. Gulf coast refineries. In November 2015, the U.S. President rejected the proposal.

Within Canada, the Energy East pipeline project would transport 1.1 million barrels per day to refineries and export ports in Eastern Canada. This proposal faces challenges before Canada's federal and provincial regulators and adjacent Canadian communities and has consequently seen delays. On November 5, 2015, TransCanada Corporation announced adjustments to the Energy East Pipeline Project to remove a port in Québec from the scope of the project. The company remains committed to ensuring a Canadian crude oil supply connection to refineries in Québec, to helping to minimise the pipeline's impact on the environment while continuing to focus on pipeline safety, and to maximizing the project's economic benefits for Canadians.

Third, the proposed Northern Gateway project is also not without its social and environmental complexity. This project would transport over 500,000 barrels of oil per day to the Canadian west coast and provide access to international markets, including around the Pacific Rim. While the Canadian government approved the project in 2014 subject to compliance with 209 terms and conditions, more recently reservations have been expressed regarding the project.

Fourth, The TransMountain Expansion Project is a proposal to expand the existing 1,150 km Trans Mountain pipeline system between Edmonton, Alberta, and Burnaby, British Columbia. It would include approximately 987 km of new pipeline, new and

modified facilities, such as pump stations and tanks, and the reactivation of 193 km of existing pipeline. The Westridge Marine Terminal would also be expanded. The proposed expansion, if approved, would create a twinned pipeline that would increase the nominal capacity of the system from 300,000 barrels per day, to 890,000 barrels per day. The proposed new line is intended to carry heavier oils with capability for transporting light crude oils. The regulatory panel convened by the National Energy Board heard oral summary argument from TransMountain Pipeline on December 17, 2015. The presentation highlighted the need for, and the benefits of, an expanded TransMountain Pipeline system and summarised the many years of technical and scientific evidence, design and engineering work and engagement undertaken by the company. The hearing panel will hear oral summary argument from intervenors in two phases in January and February 2016.

Energy Commodity Prices: low oil prices are leading to job losses, reduced energy sector investment and, if sustained, could discourage further oil sector investment and exploration

The 2015 responses show that the impact of low **Commodity Prices** tops the list of critical uncertainties. Oil prices saw marked declines over the past year as the market price of West Texas Intermediate declined from over US\$100 per barrel in 2014 to between approximately US\$40 and US\$60 per barrel in 2015 – a six-year low.

Low oil prices have had significant impacts on investment and employment in the Canadian oil sector. For example, it has been estimated that lower oil prices drove a 15% reduction in Canadian energy investments in 2015 and have been responsible for the lay-off of large numbers of energy sector workers. One analysis posited that approximately 35,000 job losses took place in Alberta's oil patch alone in 2015, about 70% of which took place in the oil services sector while the rest took place in the exploration and production sectors. It is expected that persistent low oil prices will significantly discourage further investment and exploration in the Canadian oil sector and will result in further reductions in oil industry jobs in 2015 and 2016.

Three additional critical issues

The responses for three other issues have shown significant changes this year, in comparison to the previous year's findings.

The impact of **Renewable Energies** has moved into the critical uncertainty category, possibly due to the potential impact of dramatic reductions in the cost of renewable technologies and expectations for increased penetration into the electricity generation sector.

The uncertainties related to prospects for **LNG** projects on Canada's west coast, and the significant impact that these projects will have on augmenting the potential for increased exports of natural gas to Asian markets, is reflected in the shift of the responses into the critical uncertainties quadrant.

Third, the responses indicate a significantly greater potential impact of technology

for Carbon Capture and Storage (**CCS**). This shift may be due to the launch of the successful project at the Boundary Dam electricity generation plant in Saskatchewan. This project incorporates CO₂ capture facilities at a coal-fired generator, transportation of the CO₂ by pipeline to enhance production at an adjacent heavy oil field, and permanent storage of the remaining CO₂ in a deep-seated reservoir.

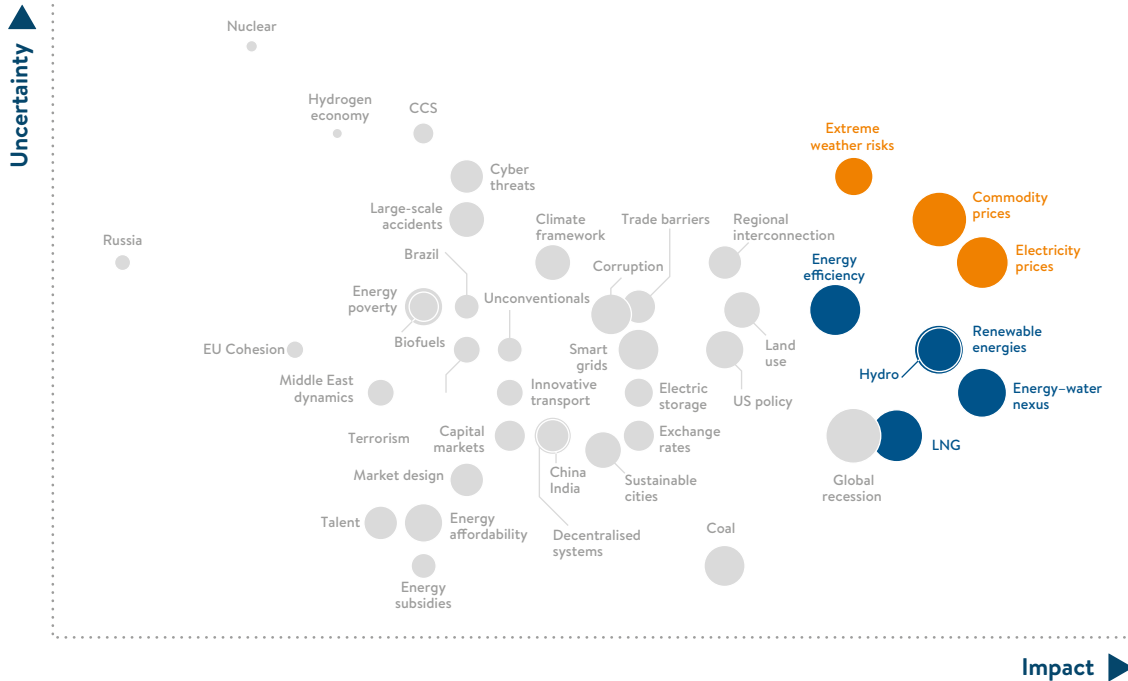
Comparison to previous years: Plus ça change ...

Broadly, the areas of priority identified in the 2016 Canadian National Issues Map are comparable to those identified in 2015 and are indicative of the enduring importance of climate policy, international trade and energy commodity prices to the Canadian energy sector and to the Canadian society as a whole. While uncertainty related to climate policy and international trade may subside somewhat in the coming year as intentions and priorities of the newly elected Canadian government are clarified, these issues are expected to retain their prominence among the factors that will shape the Canadian energy landscape for years to come. Likewise, although uncertainties about the direction of oil prices may subside over time as projections converge, the effects of energy commodity prices on employment, investment and productivity in the Canadian energy sector will continue to be far-reaching.

Comparison of Canada's priorities to those of responses from North America and the world in general: remarkably consistent

In general, key issues identified in the 2016 Canadian National Issues map echo those reported from respondents in North America and elsewhere in the world. Considerations of environment and economy tend to dominate those quadrants of highest impact and/or uncertainty. Concerns related to trade barriers and to LNG show perhaps greater growth in prominence in the Canadian national issues map, and as noted above, are likely influenced by recent developments in Canada's efforts to expand international markets for its liquid fuels and other energy sources.

CHILE



Based on the 2016 national issues monitor for Chile, energy leaders and experts cite hydrology as the main internal determining factor in the national electric power sector. Following five years of drought that reduced the contribution of hydroelectricity for electricity generation to below 30%, as of September 2015, the contribution of hydroelectric generation has been growing and now represents 60% of the generation in the system.

This is reflected by the positioning of large scale **hydro** as an action priority with a perceived high impact and low uncertainty. The relevance of this issue in particular, for the energy sector, is due to the strong role of hydroelectricity in the energy matrix in Chile, which reaches approximately 40% of the installed capacity of the system.

As a consequence, it follows that in times of drought the hydroelectric power must be replaced mostly using generation from fossil fuels; resources that Chile imports in almost its entirety due to the fact that non-conventional renewable energies account for only around 5% of the installed power.

The context outlined above reflects a clear logic for energy leaders in the country, where critical uncertainties identified include **extreme weather risks, electricity prices** and **commodity prices**.

Extreme weather risks: Between 2010 and 2015 the deficit of rainfall has been classified at “mega drought” levels. This is linked to seven individual regions, some

of which, from Coquimbo to Araucanía, had rainfall deficits bordering 30%. This drought, at least for some of this timeframe, has included significant anomalies with prolonged deficits in the Araucania Region. Whilst it has not been the most severe on record in terms of intensity, it is the most extensive and prolonged.

Electricity prices: The cost of energy for the past year closed at the lowest level in a decade. According to data of the CDEC-SIC, the agency that coordinates the operation of the electricity, the marginal cost ended at around USD 89/MWh, due mainly to significant increases in rainfall and the decline of the international oil price. This decrease in the price of energy represents an annual decline of approximately 31%, in comparison to 2014 when it was USD 130/MWh.

Commodity prices: Chile imports 96% of its oil consumption, which exposes the country to the volatility of international commodity prices and the supply constraints that occur because of political, climatic or market phenomena. This is reflected in the national monitor by the level of uncertainty attributed to the issue, in line with the price volatility over the past 18 months.

In May 2014 the Ministry of Energy presented the Agenda for energy, whose most important objectives include the topics that are highlighted in the latest issues monitor as the most important action priorities.

Renewable energies: are priorities to address in order to lift the existing barriers to non-conventional renewable energies in the country, by committing for 45% of the electricity generation capacity that will be installed in the country between the years 2014 and 2025 to come from these types of sources. This will help to fulfil the goal of a 20% of NCREs injection in the electrical system for the year 2025, according to the law N° 20.698 in force in Chile. As a specific example, the north of Chile has an estimated potential of 1.750 – 2.136 GW in solar energy, approximately 10 times the current installed capacity in South America.

Energy efficiency: A key objective is to promote the efficient use of energy as an energy resource, establishing a savings goal of 20% by 2025, while considering the expected growth in the consumption of energy in the country to this date. The implementation of the Agenda for energy efficiency (EE) would, by 2025, save a total of 20 TWh/year – the equivalent of an installed capacity of 2,000 MW coal.

Hydro: The hydro agenda, reflected in the level of impact for the issue, is dominated by the draft amending the Water Code, which is in the current legislature. The main aspects referred to in the bill are the following, which will dramatically shape the future of hydropower within the national energy agenda: (i) water is declared national good for public use (unlike the present in which is considered a private good); (ii) the State through the Directorate General of water may limit the use of the waters and establish measures to ensure the quantity, the quality of the waters and their opportunity to use; (iii) The concessions expire if the water is not used in a reasonable period of time or if it is used for other purposes; (iv) establishes a prioritization in the use of water; (v) strengthens the participation of citizenship, social organizations and users of water; (vi) not be given ownership of the waters but rights of use and

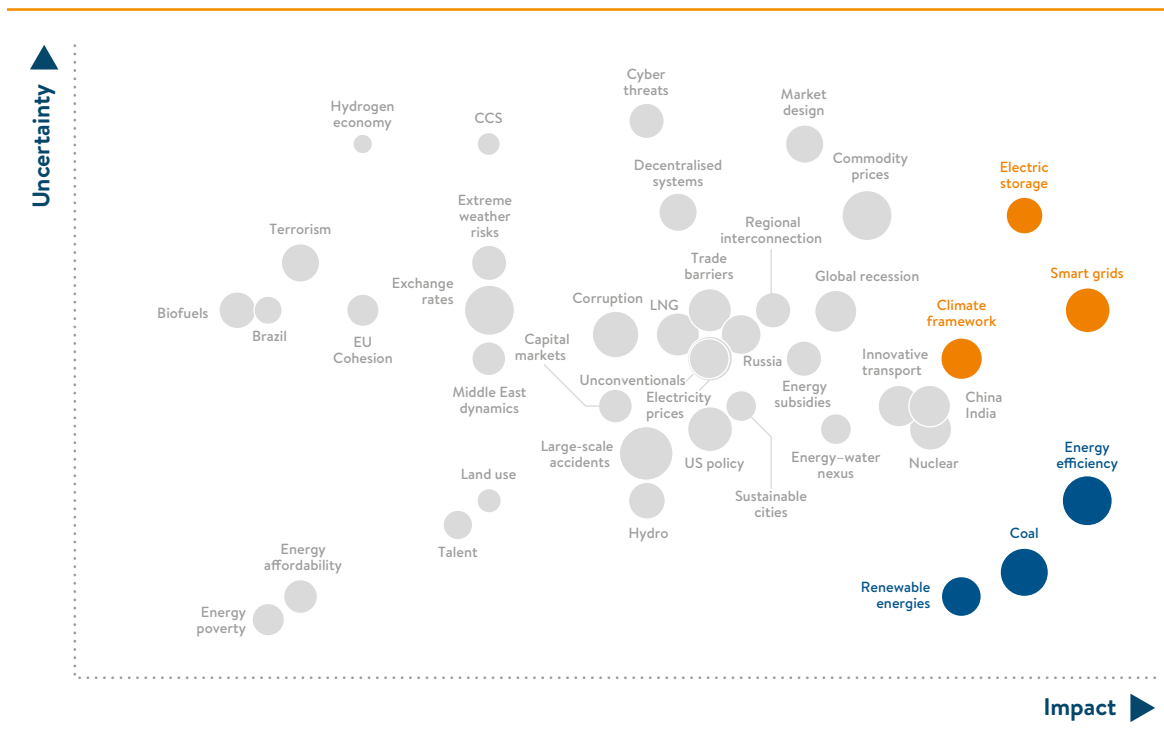
enjoyment in a concession model by between 20 and 30 years, and is renewed automatically if they are still used; vii), as of year 2020, the non-consumptive rights already granted would begin to expire, and that to that date they will have not been used for more than 14 years; (viii) the new non-consumptive rights will expire for non-use after eight years.

LNG: Chile imports LNG through the two regasification terminals in Quintero and Mejillones. The current importance of this source of natural gas is demonstrated by the capacity of LNG Quintero of 310,000 m³ and 9.6 mm m³/day for tanks and shipping, respectively. This combines with a capacity of LNG Mejillones, in the Region of Antofagasta, of 187,000 m³ for tanks and a shipping capacity of 5.6 mm m³/day. The importance of action around this issues is demonstrated by the current promotion by ENAP (State Company) for the construction of a third LNG terminal in the center-south.

The remaining uncertainty around the issues of gas market dynamics within Chile relate back to the exposure to the volatility of international prices and the supply constraints that occur by political, climatic or market phenomena.

Looking to the agenda for the year ahead; in mid-May, 2016, once the completion of technical tests have been made, Chile will begin to export LNG to Argentina. It is anticipated that export volumes will be 5.5 million cubic meters per day of LNG to Argentina and will account for approximately 20% of what this country currently imports via the terminals of Bahía Blanca and Escobar.

CHINA



There are two overarching themes that influence the way the energy landscape is reflected in the Chinese Issues Monitor of 2016. The first is the development of the 13th five-year plan, which will be formally adopted during China's National People's Congress in March 2016 and will set the tone for China's development strategy to 2020. The second is China's commitment to climate targets in the context of the climate negotiations of the 21st Conference of Parties in Paris (COP21), which took place in December 2015.

The climate targets include the following points, many of which are already addressed in the initial suggestions of the 13th five-year plan:

- A peaking of CO₂ emissions by 2030 at the latest.
- A lowering of the carbon intensity of the GDP by 60% to 65% below 2005 levels by 2030.
- An increase of the share of non-fossil energy of the total primary energy supply to around 20%.
- An increase of the country's forest stock volume by 4.5 billion cubic metres, compared to 2005 levels.

Currently, non-fossil energy sources make up approximately 10% of the total energy consumption.¹¹ Increasing the share of non-fossil energy sources to 20% by 2030 is therefore an ambitious target. Consequently, it is not surprising that matters such as **renewable energies, energy efficiency and coal** are perceived to be action priorities of energy leaders in China.

The expansion of **renewables** is a key aspect in the target to increase the share of non-fossil energy sources. Following suggestions for the 13th five year plan, much attention will be given to the development of wind, solar, biomass and hydro. Over the past couple of years China already accounted for 40% of the world's growth in renewable capacity.¹² This is likely to increase if China's plans are successfully implemented over the next five years. Increasing the share of intermittent energy sources will require backup and storage facilities to ensure a secure and steady supply of energy.

At the same time power networks are also faced with the challenge of unbalanced regional development due to uneven distribution of renewables capacity and increased urbanisation. The National New-type Urbanisation Plan (2014–2020) suggests that the share of urban population will increase to 60% (up from approximately 54% in 2014), which highlights the extent of the challenges faced by unbalanced regional development.

Investments into the power infrastructure and grid will therefore be necessary at a large scale. The five year plan suggestions reinforce this by suggesting that efforts should be made to strengthen China's energy storage and smart grid capacity.

11. www.eia.gov/beta/international/analysis.cfm?iso=CHN

12. www.iea.org/Textbase/npsum/MTrenew2015sum.pdf

At present it remains unclear how these plans will be implemented, which may explain why the Chinese Issues Monitor displays that **energy storage** and **smart grids** are matters which are perceived to be very important yet uncertain by Chinese energy leaders.

As outlined by the “Guidelines on the promotion of smart grid development” published by the NDRC in July 2015, China will have to study and assess various implementation strategies such as flexible pricing mechanisms to address the unknowns resulting from the energy storage and smart grid plans.

The successful implementation of smart grid and energy storage plans will also depend on the progress on technological and scientific research and the availability of finance. Therefore it will be necessary to further promote the support for investments; for example, by encouraging financial institutions to expand their financing for smart grid developments and by encouraging financial services to support smart grid related businesses through corporate bond issuances.¹³

The 13th five year plan further sets out aims to increase the rate of **energy efficiency** and energy savings in the country, which will be a necessary step to ensure that the climate targets China has committed to are met. The government has laid out a number of different approaches to promote energy efficiency in the 13th five year plan such as increasing energy efficiency standards in buildings, energy savings in the transport sector through the new energy automobile promotion plan and by moving the economy away from energy intensive industry to a more service oriented economy.

China’s demand for energy has already started to slow down, with a full-year electricity demand estimate of 1% growth in 2015. By comparison, electricity demand growth in 2011 was estimated to be approximately 12%.¹⁴ This reduction in electricity demand is however largely driven by the slowdown in the Chinese economy and energy efficiency measures will still be necessary to reduce the energy intensity of the country.

The Ministry of Housing and Urban-Rural Development and the NDRC developed a Green Building Action Plan in January 2013 with short-term targets, mostly to be achieved by 2015.¹⁵ Given the expiry of the targets, further work will be required to develop a new action plan to implement the building energy efficiency requirements set out in the 13th five year action plan.

The importance the new energy automobile plans have on the energy sector in China is evident in the Chinese Issues Map, which shows **innovative transport** to be a relatively impactful subject.

13. www.sdpc.gov.cn/gzdt/201507/t20150706_736625.html

14. <http://blogs.wsj.com/chinarealtime/2015/10/20/powering-down-chinese-electricity-demand-stalls-amid-slown-growth/>

15. www.pnnl.gov/main/publications/external/technical_reports/PNNL-22761.pdf

Under the 12th five year plan, the promotion of new energy vehicles was strongly supported by the government through subsidies. As a result the industry has resulted in a dependence on government support. The innovative transport industry is thus faced with the challenge of ensuring a sustainable growth, also in the absence of energy subsidies.

Moving China's energy intensive manufacturing industry towards a more service oriented economy may not only contribute towards saving energy in China but is also a key part of the plan to develop the country into a "moderately affluent" society, as stipulated in the 13th five year plan suggestions. Such an adjustment of the economy is also essential to achieve the targets set out for coal consumption in the 13th five year plan.

In 2012, **coal** was China's largest energy source, accounting for 66% of total energy consumed and responsible for 80% of CO₂ emissions from the energy sector.¹⁶ This is planned to reduce to less than 57.4% by 2020 with the implementation of the coal caps.¹⁷ Coal cap targets will be allocated to the various sectors including power generation, manufacturing and building sector with the ultimate aim to design a sectoral coal cap plan.¹⁸ It is therefore not surprising that **coal** is perceived to be an action priority by Chinese energy leaders.

By contrast, **CCS** is viewed to have a low impact on the energy sector in China, even though China is viewed to be a leader in this field with nine pilot projects in operation already. In fact, CCS is in a similar position in Asia and the World more generally, which may reflect the challenges this technology faces in China and the rest of the world.

With the ambitious climate targets that China has signed up to, it will be important for the country to develop a clean, low carbon energy system. This is also acknowledged in the 13th five year plan suggestions which states that the innovation of energy technology shall be accelerated and that the clean and efficient use of fossil fuels such as coal shall be promoted.

While this plan does not specifically refer to CCS or CCUS technology, China has already started to advance its engagement in this area. One action taken was to strengthen the partnership between the Asian Development Bank and the People's Republic of China which was announced at a side event during the COP21 negotiations in 2015 in Paris.

As part of this partnership a roadmap to mainstream the use of CCS in China was launched. This roadmap recommends a dual approach: (1) to demonstrate low-cost CCS in coal-chemical plants and (2) to undertake research to overcome its barriers

16. www.nrdc.cn/coalcap/console/Public/Uploads/2015/11/30/13FYP_EN4.pdf
www.eia.gov/beta/international/analysis.cfm?iso=CHN

17. www.nrdc.cn/coalcap/console/Public/Uploads/2015/11/30/13FYP_EN4.pdf

18. www.nrdc.cn/coalcap/console/Public/Uploads/2015/11/30/13FYP_EN4.pdf

such as the high costs.^{19,20} Therefore, it is expected that CCS matters will increase in impact over the coming years.

Nuclear is another issue that is perceived to have a relatively high impact on the energy sector in China. As a non-fossil energy source, nuclear will play a significant role in China's energy future with plans to build five to six nuclear reactors a year over the next five years.²¹ By 2030, China is planning to have more than 100 nuclear reactors online, making it one of the largest nuclear users in the world.

Right behind nuclear, in terms of impact, is the **energy-water nexus**. China's government is faced by the challenge to manage the competing demands on China's water sources while still ensuring a secure and affordable, clean supply of energy. The government has already blocked a number of industrial projects such as coal gasification plants due to their high water requirements and pollution²² and policies have been introduced to promote the sustainable use of water in energy generation.²³

This first Chinese Issues Monitor reflects the agenda of Chinese energy leaders in the context of the country's recent commitments to new climate targets. The Chinese Issues Monitor also echoes the direction the 13th five year plan is taking, which is a reflection of the current context of the energy sector in China. It will be interesting to see how the priorities of energy leaders in China will develop as concrete actions, policies and regulations are introduced to implement the 13th five year plan over the next five years.

19. www.adb.org/news/adb-prc-partnership-can-help-advance-co2-emission-reduction-targets

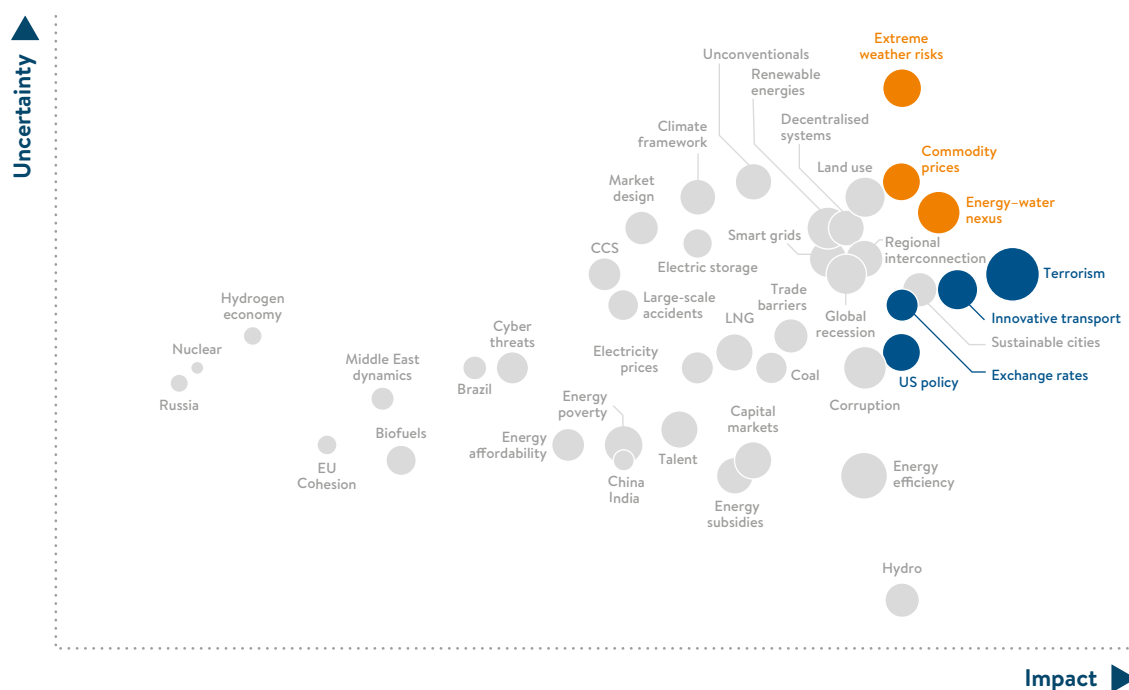
20. www.adb.org/sites/default/files/publication/175347/roadmap-ccs-prc.pdf

21. http://english.gov.cn/news/top_news/2016/01/25/content_281475278230014.htm

22. www.chinadialogue.net/blog/7854-China-unveils-landmark-plan-to-curb-water-pollution/en

23. www.gov.cn/zhengce/content/2015-04/16/content_9613.htm

COLOMBIA



The latest issues map of Colombia shows that energy leaders in the country have been influenced by the process of COP 21, where negotiations are seen as a focal point for the decisions which will impact on the national management of climate issues. Consequently, this has created more uncertainty around associated issues including extreme weather risks, renewable energies and the energy-water nexus.

Additionally, the strongest El Niño in two decades affected Colombia in 2015 has further questioned the effectiveness of the current mechanism for securing energy supply in the long term during such adverse weather conditions.

Those issues perceived as action priorities include terrorism, US Policy and Innovative transport, each of which have a reduced level of uncertainty – implying uncertainty to become issues where they should put “hands-on” for the potential benefits offered for the energy sector.

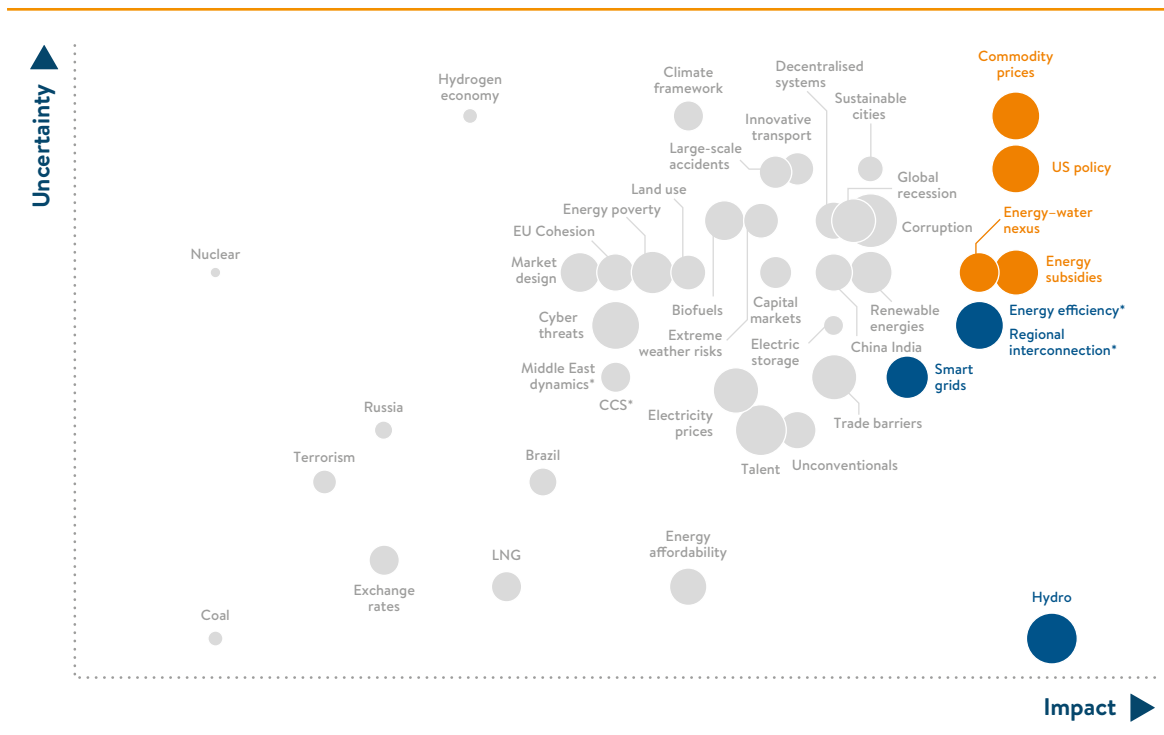
Among the issues with big changes highlighted, are exchange rates, which increased from one year to another, from the quadrant of weak signals to that of critical uncertainties, due to the sharp devaluation in Colombia and other countries by factors as the fall in oil prices.

The comparison between the issues maps of the world and Colombia, allows us to identify shared issues of great interest and importance, such as energy efficiency. In Colombia it is working on regulation and define the necessary normativity to promote the use and application of these practices of efficient and rational use of

energy. Large-scale Hydro in Colombia remains a topic for action, because of the potential and the strong participation that water has in our energy mix while the world sees it as an issue with less impact.

Colombia shares with LAC region the interest and importance on Hydro, because of the potential for the production of electrical energy and the current involvement that it has in the mix of the region. In this aspect the decisions of COP 21 in Paris and the consequent measures of adaptation and mitigation to be taken in the short and medium term to address the effects of climate change, clearly will determine the development of this energy source in the countries of the region.

ECUADOR



The results of the Issues Survey national deep-dive in Ecuador have shown four aspects that present important need for action for energy leaders and experts: **energy efficiency, regional interconnection, smart grids** and **hydroelectric** power plants. In this regard, Ecuador is working on several energy policies that put the main attention of the industry towards these four aspects.

The Ecuadorian Government has been pushing several initiatives towards the changing of the energy matrix. These approaches, from a long-term perspective, focus towards sustainable development of the Ecuadorian energy sector, including the electricity sector in its stages of generation, transmission and distribution. For this purpose, the Government is currently developing several challenging projects,

which include the minimisation of environmental impact via the construction of eight high-capacity hydroelectric power plants; the promotion of installing non-conventional renewable power plants; the change of gas-based cooking by efficient induction-based cooker appliances, among others. All of these projects are oriented not only to ensure the future energy availability (Energy Security), but also to promote less impact on the environment (Environmental Sustainability) while ensuring the access to low price electricity and oil-derived products to all the Ecuadorians (Energy Equity). The ambitious policies stated by the Government will ensure the future for Ecuadorian Energy Sustainability while promoting the improvement of each dimension of the World Energy Council's energy trilemma. Furthermore, Ecuador has pushed its initiatives in order to incorporate technology in the grid, making it more intelligent (smart grid), as well as to ensure a future regional interconnection. The twelve years of Electricity Interconnection between Ecuador and Colombia has shown that it is actually possible to interconnect power systems, even with different local markets, obtaining technical and economic benefits for each country. In this sense, the ambitious regional Andean interconnection (SINEA project) represents huge potential for being a successful opportunity to obtain economic and technical benefits for all the Andean countries.

Although the ambitious energy policies will actually benefit Ecuadorian energy sustainability, they are also related to the occurrence of four main critical uncertainties that have already been determined by the Issues Monitor. These critical uncertainties are the **commodity prices**, **US policy**, **energy subsidies** and **energy-water nexus**. Ecuador is an oil-exporting country; thus, extreme variations in this commodity price, as well as a change in the US policy, could modify the expectations of some projects related to energy sustainability. In addition, the energy production in Ecuador uses great amounts of water, distributed in: oil extraction; oil-derived products and refining; thermal-generation cooling; and mainly hydroelectric generation – which actually represents 2.346 MW of installed capacity that signifies near 70% of the peak power demand. Moreover, Ecuador's hydroelectric potential is more than 20,000 MW from feasibility studies, and it actually might reach 30,000 MW based on some estimations. This huge hydroelectric potential will be able to ensure meeting the growing energy demand for the upcoming 40 years, in the case that actual environmental conditions and water availability do not change. Under this context, the Energy-Water-Food nexus takes a fundamental role in the Ecuadorian economy and is one of the critical uncertainties for energy leaders. In this connection, the Ecuadorian energy sector, and Government have established some policies and regulations to preserve the hydrological resource. The main objective is to ensure a sustainable generation of electricity while keeping the balance of the sensitive relationship between energy, water and food. Moreover, the ambitious plan of changing our energy matrix to a more efficient one will allow Ecuador to improve its production matrix; offering a better and more competitive framework for industry growth as well as reducing the budget oriented to unnecessary energy subsidies.

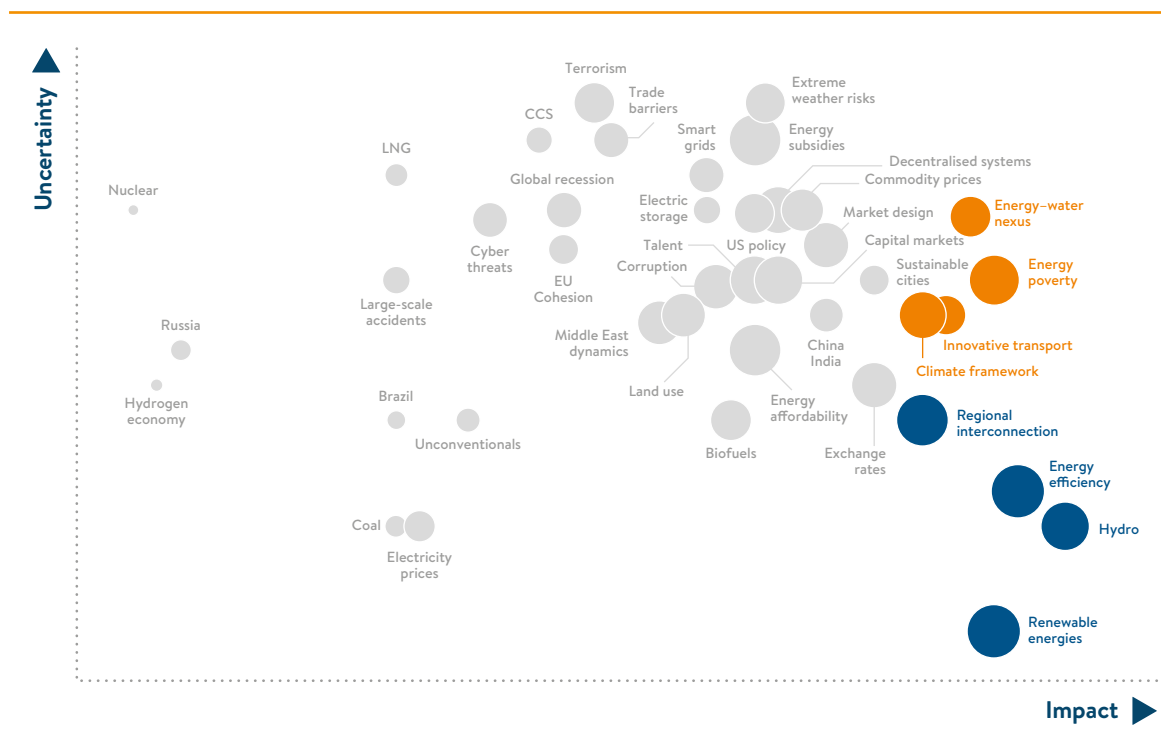
for **unconventionals**, Estonian companies have experience in using oil shale for more than a century and they are constantly working on improving their technologies. New facilities have lower environmental footprints and higher efficiency.

Looking at the Estonian Issue Map it can be seen that **market design** and **electricity prices** are thought to be a lot more uncertain than commodity prices. This is interesting to note, because it clearly suggests that some parts of the energy market have more regulatory problems than others. Market design could be higher on the agenda also because the European Commission is looking into developing new rules and regulations for the European electricity market. One more issue of interest could be the fact that **electric storage** has gained so much both in uncertainty and in potential for impact. Most probably the reasons for this are twofold, first Tesla’s forecast of competitive small scale storage solutions and secondly the advances of Estonian start-up company in the field up super-capacitors.

While electric storage and smart grids have moved up in the agenda, a number of issues have moved down as well. Two of the most notable decreases were those of **coal** and **nuclear**. Nuclear is moving off the chart because the costs are seen as too high and coal is just seen as an unpopular option right now.

Overall the Estonian issue map is quite similar to the European map, with the exception of unconvensionals.

ETHIOPIA



According to a World Bank report, the Ethiopian economy has registered robust growth in the last five years (July 2010 – June 2015), which can be attributed to the implementation of the Growth and Transformation Plan (GTP I) in Ethiopia. In this period annual average growth rate of the Gross Domestic Product was 10.1%. Agriculture, industry and service sectors have displayed average annual growth rates of 6.6%, 20.2%, and 10.8% respectively.

One of the major developments in the energy sector of the country in this year is the provision of sustainable energy supply to the recently launched light rail metro system in the capital and the cross border railway to the neighbor country Djibouti. Both of the systems are fueled by electric energy from renewables.

In relation to climate change the El Nino induced drought on Ethiopia. The drought has resulted in a shortage of rain in spring when much rain is expected and resulted in a delayed rainy season.

In this context the top issues of uncertainty on the agenda of Ethiopia's energy leaders include: **energy water nexus**, **energy poverty**, and **innovative transport and climate framework** as displayed in the Ethiopian Issues Map.

The inter linkage between the water, energy and food supply systems – the nexus – is a major consideration in the country's sustainable development strategies. Rapid economic growth, expanding populations and other socio- economic changes are driving up demand for energy, water and food. The ability of existing water, energy and food systems to meet this growing demand is constrained with various factors, including climate change impacts.

There are a number of issues associated with Ethiopia's energy consumption pattern. At a general level, energy consumption is a derived demand used to satisfy other needs such as consumption of products, services as well as production. The high dependence on traditional biomass fuels such as fuel wood, charcoal, crop residues and dung has implications for indoor air pollution and the associated health problems. Consumption of fuel wood and charcoal also have implications for deforestation and forest degradation to the extent that there is a net negative effect on forest cover due to such energy consumption pattern.

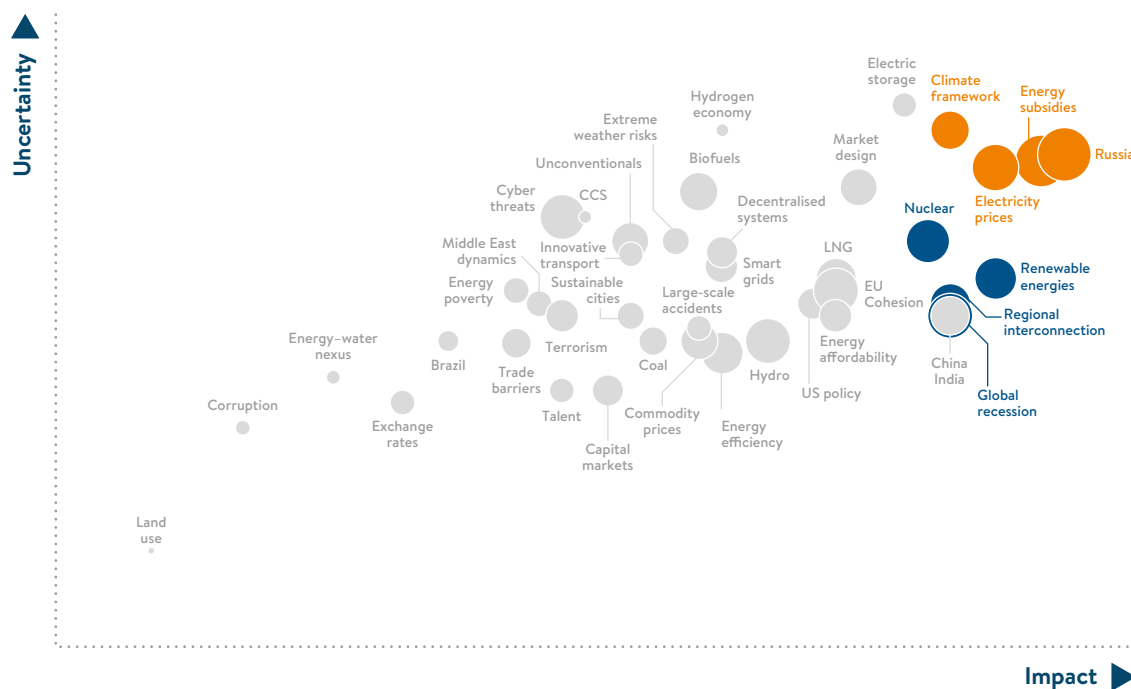
Business, industry, commerce, and public services, such as modern healthcare, education, and communication, are highly dependent on access to modern energy services. Therefore, in countries like Ethiopia where the availability of energy is very limited for most households or society, the long term commitment of the government to poverty eradication and broad based economic development could be seriously impaired, without the provision of sustainable energy to all sectors of the economy.

Climate change is a challenge to be addressed at both the national and the international level. It requires a collective response; it is essential that major players agree internationally on a common agenda and discuss core issues such as greenhouse gases reduction targets, diversification commitments and financial and technical assistance for developing countries. Such an agenda must be able to translate at the domestic level, to allow each country to develop a pathway towards a secure and equitable distribution of energy in a low-carbon world.

The development of **renewable energies** including hydro, **energy efficiency** and **regional interconnection** are dominant issues in the need-for action space. Ethiopia has substantial energy resources, which includes hydropower, wind, solar and other renewable energy sources. The country’s huge energy resource potential can play a major role for rapid economic growth and poverty eradication. Due to this fact, Ethiopia has given top priority to the development of its huge hydro power potentials, which are distributed in nine major river basins with their innumerable tributaries, to supply its alarming domestic modern energy demand as well as to use it as catalyst and entry point for regional integration and the formation of broader regional markets and industrialization. Accordingly, the strategic dimension and importance of hydropower other renewables generation in the context of Ethiopia is beyond doubt.

The development of **coal**, **electricity prices** and the realising the potenail of **Brazil** are in the ‘weak signal’ area. Given that abundance of renewable energy sources – hydro, wind, solar and geothermal and the country’s Climate Resilience Green Economy Strategy, it is not surprising that coal does not have as much impact in Ethiopia as it has in other regions. However, the position of electricity prices is rather unexpected because the current price of electricity is very low, making it more difficult to attract private investors in the power sector, as compared to other countries in the world.

FINLAND



The first ever Finnish deep dive provided some interesting and some self-evident results. As is the case with most of Europe, Finland has suffered severely from the economic downturn. In addition to the general slowdown, two major Finnish industries, mobile electronics and paper manufacturing have all collapsed in recent years pushing down domestic energy demand. Weaker demand has impacted the electricity price which is at record low level.

Moreover, the Nordic electricity system has also seen a major increase of subsidised power production (especially wind energy) which has also contributed to the downward trend of the wholesale prices of electricity denting the margins of major producers.

Historically low prices have led to some unprecedented actions by some utilities. For example Vattenfall announced that it would prematurely close down two nuclear units at the Ringhals site. Similarly Eon also announced that it would close down two units at the Oskarshamn nuclear site in Sweden. Therefore issues regarding the future of the market design are considered existential from the point of view of utilities.

While the subsidies have certainly impacted the market their predictability is also an issue in Finland. The new government announced that it would reduce the cap of wind projects that will be eligible for the subsidy scheme due to rising costs (the subsidies are paid directly from the state budget) further increasing uncertainty in the market.

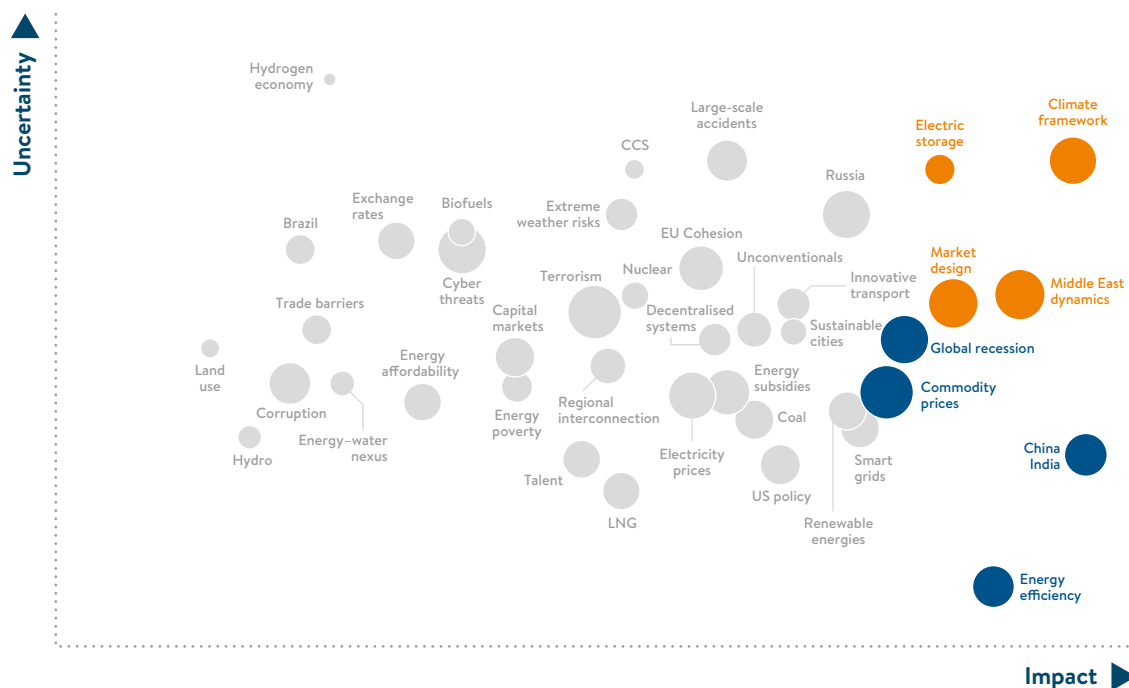
Another major element in the graph is the prominence of Russia – Finland shares a long border with Russia and imports most its energy products (oil, gas, coal and nuclear fuel) from Russia. There are alternative sources for almost all energy of our energy imports the uncertainty regarding Russia has probably more to do with the rising international tensions than energy as such. For example, Fennovoima, a new Finnish nuclear company with minority Russian ownership has had to secure over 60% EU ownership in order to apply for a construction license.

Climate framework is also considered a major issue because the Finnish economy is very dependent on exports and the industrial base is rather energy intensive. Therefore an international climate framework is seen as crucial for setting a level playing field especially for industries that are considered to belong to the ‘carbon leakage’-sectors.

While there are some uncertainties regarding nuclear power and renewable energies, both sectors enjoy fairly wide societal support and new projects are advancing. Global recession and the slowdown in China are also matters causing some concern but they are also facts that companies have to live with.

When comparing Finland to the rest of the world or Europe one can observe that nuclear energy, energy prices and Russia are clearly considered much more important issues than elsewhere. Lower commodity prices have been beneficial (Finland has no reserves of its own) their impact is considered perhaps surprisingly low compared to the rest of the world.

FRANCE



In the latest national issues monitor for France, the first observation is that the visual representation of these results is less easy to interpret than it was in previous years. A comparison of the issue positioning for 2014 and 2015 confirms this initial impression.

Whereas the key issues were generally stable between 2013 and 2014, the focus of issues moved slightly to the right for the latest findings – that is, the impacts of the various issues were felt to be more significant. The movement has also signified a lessening of uncertainty, while at the same time making the chart harder to read. Although it is not so easy to observe this on the chart, the average size of the bubbles has slightly increased between 2014 and 2015, which is a sign of some degree of growing urgency.

Throughout 2015, it was without question the **climate framework** issue that was still keeping French energy leaders and experts awake at night. The respondents were completing their questionnaires during the run-up to COP21, the Paris climate conference, and this undoubtedly contributed to the result. **Energy efficiency** can be found at the bottom right, which could signify that there is no longer any debate about policy issues in this area, and that it is now time for action as far as this major challenge is concerned. Towards the left of the chart, there is a small group of low-impact challenges including **land use**, which were introduced into the survey for the first time this year. These issues are perhaps perceived as being less significant globally than they are at a European level.

As we have just seen, climate remains the greatest cause of insomnia out of the macroeconomic issues. As the economic crisis seems to be receding, issues linked with economic growth have become less prominent.

The decrease in energy and **commodity prices** has certainly lowered preoccupations about their fluctuation or volatility. The evaluation of issues related to terrorism has changed very little. The survey was conducted after the Charlie Hebdo attacks, but before the Paris terrorist attacks of 13 November. Restrictions relating to land use and the **energy-water nexus** featured among the least important issues.

Turning to geopolitics, the major uncertainty here is linked to Russian foreign policy on energy. There seems to be little doubt about the importance of the major roles to be played by China and India on the international energy stage, and the continuing uncertainty around the fragile situation in the Middle East and North Africa will also maintain a major influence. A further source of uncertainty relates to European cohesion and the prospects for implementing coherent energy policies. This has made a moderate impact, which it will be interesting to confirm when the next survey is carried out. There is almost full certainty when it comes to American energy policy, and Brazil is not of significant concern among French stakeholders.

Under the energy policies category, issues are differentiated more by their impact and their degree of urgency than by the level of uncertainty surrounding them. The issues monitor highlights the importance of new regulations and **market designs**. These have major consequences, which must be addressed promptly. The effects of **energy subsidies** represent a further concern in need of a solution. In contrast, the question of trade barriers seems to have been relegated to the status of a minor, non-urgent issue. The implementation of decentralised solutions and the development of interconnections are not being treated as urgent matters, although they are being accorded slightly more importance than previously.

On the technologies front, energy storage appears to be the most critical question in terms of impact and level of uncertainty. As has already been emphasised, the issue of energy efficiency is no longer a subject marked by uncertainty and its importance is clearly confirmed. One group of overlapping issues reveals a high level of importance, moderate uncertainty and a sense of urgency regarding the medium term. These include **renewables**, **coal** and **unconventional** hydrocarbons, as well as innovative **transportation**, **sustainable cities** and **smart grids**. Carbon capture and storage (**CCS**) is still perceived as an uncertain, long-term technology, albeit less so than **hydrogen economy**.

Energy Leaders vs Experts

Although a similar level of caution is required here, considerable light can be shed by looking at the question of whether energy leaders and experts evaluate energy issues in the same way. To answer this, the French Council of Energy divided the survey questionnaires into two groups; Leaders and Experts – which turned out to be almost equal in size.

The first result is highly reassuring: no statistical divergence was established between the evaluations made by energy leaders and those given by energy experts. That overall statistic aside, however, one may observe that most of the gaps between evaluations are in the same direction: leaders judge 80% of the issues to be more significant than the experts do, as well as feeling that 60% of them carry more uncertainty and urgency.

By individual category as well as on average, the evaluations align most strongly on technologies, but least of all when it comes to macroeconomic variables. On average, the most pronounced divergence among respondents is on the level of uncertainty, as compared with their evaluations of impact and degree of urgency.

It is useful to identify the issues where the assessments of energy experts and leaders match up most closely according to the different aspects of impact, uncertainty and urgency as well as overall, and also to identify where the divergences are greatest, using the same criteria.

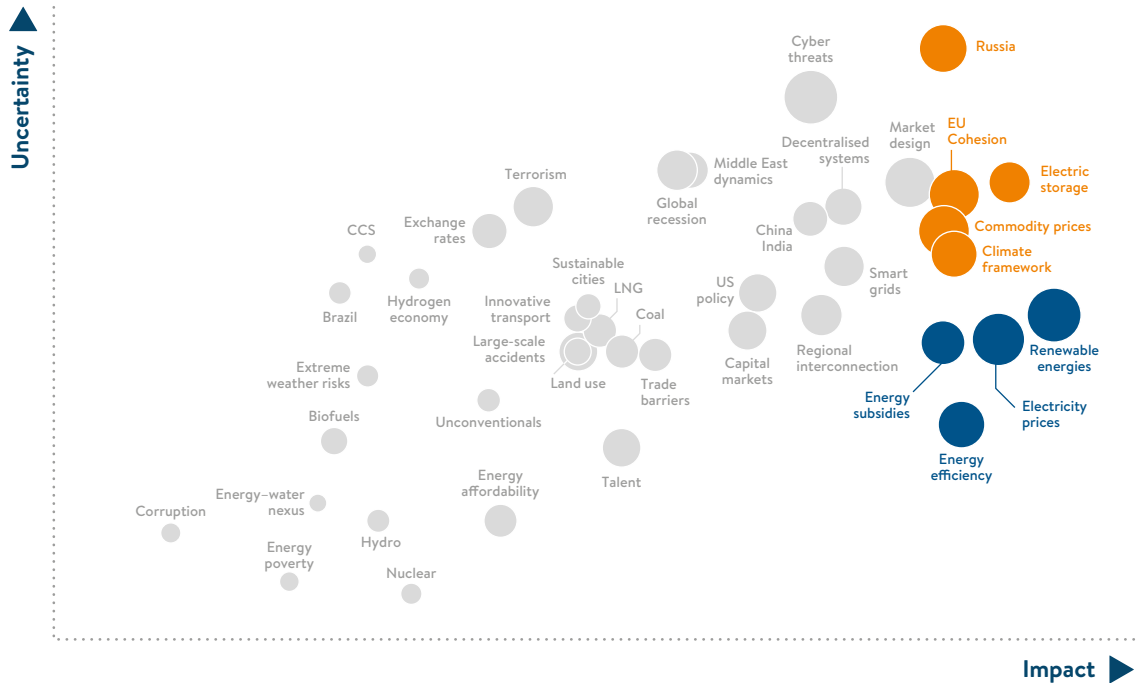
If we take the first of these dimensions, that of impact, the views of energy leaders and experts are closest regarding the influence of growth in China and India, whereas they diverge most strongly in their evaluations of the effect of energy subsidies on the energy mix. As for the second dimension, the level of uncertainty, the strongest consensus among respondents is on their evaluations of the importance of the price of electricity, whereas their evaluations of currency uncertainty reveal the greatest contrast. The degree of urgency, which is represented by the size of the bubbles, is the most difficult factor to understand visually. In this respect, the greatest consensus is found on the development of renewables, whereas the fight against corruption, which delays the implementation of effective policies, gives rise to the most divergence among evaluations.

Dynamics

When evaluating the shifts in the issues monitor results for France, between one year and the next, the data should be treated with extreme caution. Statistical tests are never based simply on the representativeness of those who responded to a questionnaire. Caution leads us to limit ourselves to measuring the distances between the 2013 and 2014 issues and those between the 2014 and 2015 issues for each topic so as to identify those issues whose evaluation has been stable and those where it has been dynamic. Over the whole period between 2013 and present, the three issues whose evaluation has been most stable are growth in China and India, nuclear energy and the effects of global recession. Similarly, we can use the same criterion to identify the three most dynamic issues: energy and commodity prices, unconventional, smart grids and big data.²⁴

24. All the charts arising from this year's survey (both general and issue-specific) are available at <http://wec-france.org/etudes.php>

GERMANY



In 2015, Germany found itself in the middle of several European crises; from continued conflict between Russia and the Ukraine, to the Greek debt crisis and an influx of refugees. In the energy world, 2015 was a year of both great anticipation and great uncertainty over the outcome of the COP 21 climate conference, which took place amid rock bottom prices for traditional fossil fuels, namely oil.

In 2015 politics, **Russia**, in particular, served as a primary source of uncertainty for German energy leaders. Against the backdrop of EU sanctions against Russia and the need for continued solidarity amongst member states, respondents also expressed rising concerns with **EU cohesion**. This increase in uncertainty as compared to last year is understandable given the brinkmanship over the Greek debt negotiations, the possibility of a ‘Brexit’, and the rising popularity of anti-EU political parties in many countries.

In Germany, **electric storage** and a potential **climate framework**, remained key sources of uncertainty, while **commodity prices** increased dramatically in both uncertainty and impact.

A breakthrough in storage capacity is critical for the success of Germany’s Energiewende, which has seen an increase in both renewable capacity and the challenges of integration. Storage would serve as an anecdote to problems plaguing the German electricity market, namely intermittency, capacity and transmission constraints, and complex re-dispatch measures to balance supply with demand and avoid congestion.

With respect to a **climate framework**, while an agreement was reached in Paris to limit warming below 2 degrees Celsius, this outcome was far from certain in the year preceding the COP 21 conference. Germany was particularly invested in reaching an agreement for both political and economic reasons, as many German firms hoped an international agreement could put them on more equal footing when competing internationally.

Meanwhile, **commodity prices** sank to new lows, surprising many who had predicted an increasingly tight oil market and expensive fossil fuels. This fluctuation resulted in uncertainty and in some instances fear low prices might derail political support for climate protection when it was most critical. Furthermore, the uncertainty of commodity prices, and the speed with which they sank, also upended a key assumption of the Energiewende—that traditional fossil fuels would continue to increase in price.

The action priorities of German energy leaders include **renewable energies, electricity prices, electricity subsidies, and energy efficiency**—all interconnected and evolving components of the Energiewende. 15 years after the Renewable Energy Act (EEG) was enacted, Germany's support scheme for green electricity is undergoing crucial reforms to ensure a more economical and affordable transition. Central to these reforms is the shift from and gradual abandonment of feed-in-tariffs set in advance by the government in favor of a bidding process for green power producers. Thus, electricity suppliers will compete for support in auctions by submitting their production costs rather than relying on fixed tariffs. Nevertheless, the question of how to contain costs will remain central.

The rising share of intermittent renewable electricity also puts more stress on the grid itself. The cost of measures to balance the grid has risen to several hundred million euros a year, while the costs of grid expansion both on- and offshore are also expected to amount to several billion euros annually. In particular, the government's decision to bury the planned north-south transmission cables to gain public acceptance, are expected to contribute to even higher electricity prices.

However, higher energy costs could facilitate investment in efficiency measures and spur progress in implementing the government's national efficiency action plan (NAPE). The plan includes standard setting and financial support mechanisms, and the government has encouraged the creation of a nationwide efficiency network among German Industry.

Another key action area, as well as a source of uncertainty is **market design**. This comes amid ongoing debate over the future of the German electricity market and the summer 2015 announcement to move forward with the energy only market design. The recommendation, referred to as Energy Market 2.0, was welcomed as more market-oriented and less costly than a capacity market, and is expected to be adopted in 2016.

In a surprising change over the last year, energy leaders in Germany are increasingly concerned with **cyber threats**. This heightened awareness is on the one hand

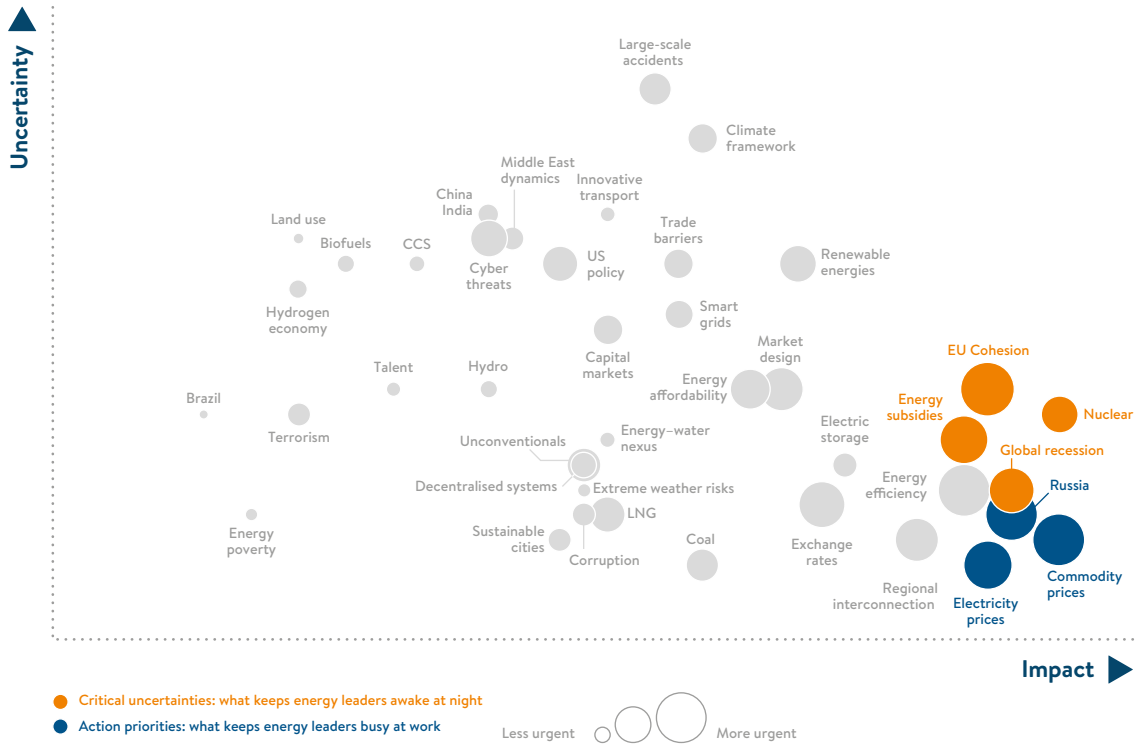
related to the debate over EU-wide regulations on cyber security in 2015. On the other hand it is linked to the design of the national wide plan for a smart meter roll out from 2017 on. As conversations about smart grid technologies in Germany intensify, cyber is likely to be increasingly perceived as a critical issue.

German conceptions are largely synonymous with those across Europe, particularly when it comes to **regional interconnection**, a positive trend for the inaugural year of the Energy Union project. However, **nuclear** power is a point of divergence. While nuclear fell in importance and uncertainty in Germany as it moves toward the nuclear exit, many countries in Europe still plan to produce nuclear power.

In both Germany and Europe, **trade barriers** and **capital markets** rose in both uncertainty and impact. While attention to capital markets may be a combination of the ongoing legacy of the financial crisis and the still present reality of the Euro crisis, the source of uncertainty over trade barriers could be due in part to the recently concluded free trade agreement with Canada, and the increasing attention to ongoing negotiations over the Transatlantic Trade and Investment Partnership (TTIP) with the United States. Furthermore, increasing trade with China has fed concerns over trade barriers in the energy sector, namely with respect to solar. In late 2015, a cooperative of German solar utilities signed a statement for a solar market with no barriers.

Ultimately, Germany experienced continued uncertainty over many issues at the heart of its domestic energy transition, as well as increased uncertainty over geopolitical issues in Europe and beyond. In the year of COP 21, it is perhaps unsurprising that climate framework, renewable energy, and energy prices remain top action priorities for German energy leaders, but in a slightly unexpected twist cyber threats also emerged as a top source of uncertainty.

HUNGARY



The 2016 Issues Monitor perfectly visualises the most important challenges the Hungarian energy industry is facing with in the recent (and probably upcoming) years. The sector’s top priorities are concentrated around the management of **commodity prices** as it is necessary if the country wants to keep its current economic competitiveness. The other relevant issues came from the experience in 2009 when the Russian gas flow to Hungary was reduced to zero for a few days. It is obvious that diversification and security of primary energy resources are also necessary for long-term stability.

As a result of its historical and geographical situation, Hungary is highly dependent from Russian natural gas, and the cancellation of gas pipeline developments (Nabucco and South Stream) in 2014 shows that Russia will keep its impact on the regional gas market. Other gas interconnectors in Central & Eastern Europe could decrease the uncertainty of gas prices, however they cannot provide a 100% alternative of Siberian sources.

New power market conditions (especially the renewable energy and high ratio of import supply in the mix) have altered the market conditions of conventional power generation. New initiatives such as capacity market mechanisms are needed to guarantee the survival of the units and provide enough reserves for power market stability.

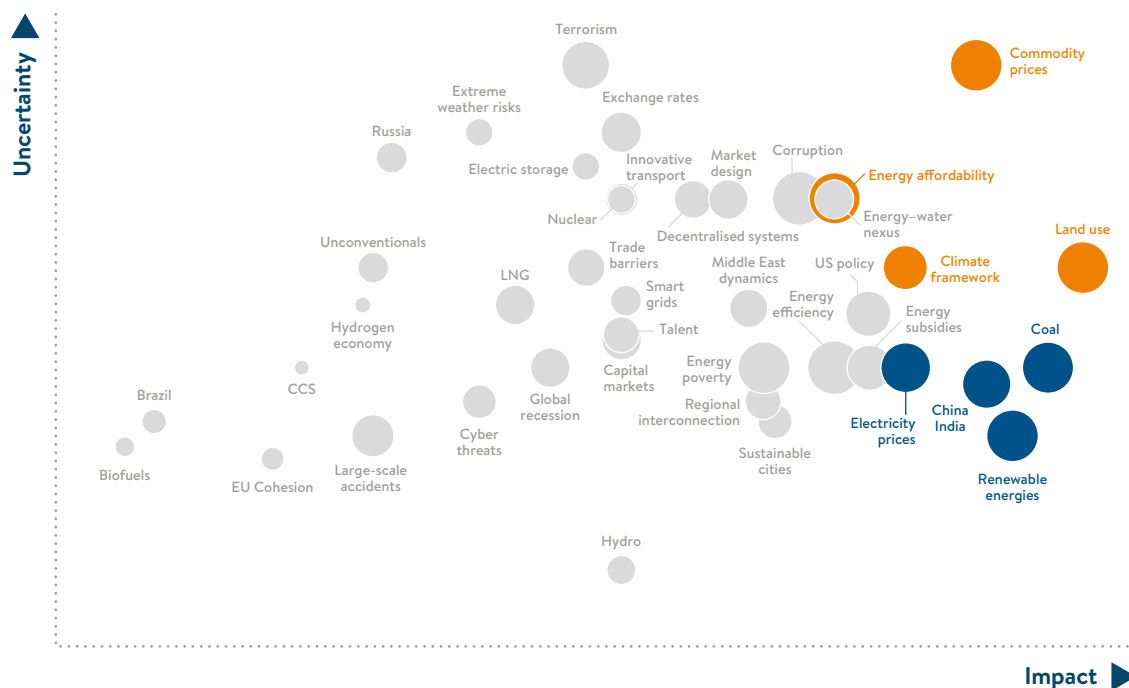
In the absence of private power plant developments, the state tries to support long-term power supply and stable power prices with state-owned new nuclear units, which are planned to be built in the late 2020's. The investment, which is based on the agreement between the Hungarian and Russian government, will keep the dominance of nuclear power production in the Hungarian generation mix, but also increase the Russian presence in the region.

To avoid the negative influences on household utility prices the Hungarian government keeps its energy policy by continuously strengthening its status in the field of energy, preparing for takeover of utility companies and has already established a state-owned utility holding. These movements together with regulated utility prices are going against the liberalization aims in the EU and threatens the cohesion.

Implementation of the three 2020 EU goals spread slowly: reduction of GHG emissions and energy efficiency improvements are in progress, however the development of renewable energy source requires modification in the current legislations: no wind power generation tenders have been announced in the past 5 years and investors are waiting for the upgrade of existing feed-in-tariff system.

However Hungary's geological structure provides excellent conditions for an extensive utilization of geothermic energy, it has mainly been used for thermal baths and for heating purposes, but the geothermal project developments have completely slowed down.

INDIA



The Issues in the Indian Issues Map can be largely grouped into two clusters, following an environmental theme with land use, energy water nexus, climate framework and renewables and an economic theme with commodity and electricity prices, coal and China/India.

Key uncertainties in the Indian Issues Map thereby include land use, commodity prices, energy water nexus, climate framework. Action priorities include coal, renewable energies, and China / India and electricity prices.

Coal is a major energy source for India, accounting for about 44% of energy demand (IEA 2015). It also accounts for about 61% of installed power generation capacity (March 2015). Due to the energy sectors' heavy reliance on coal, supply needs to be ensured and is definitely an action priority.

The Indian government set a target to roughly double India's coal production to 1 billion tonnes by 2020. Initiatives such as trebling exploration, and opening of new mines and better evacuation among others are expected help achieve the target.

While coal continues to be the main source, India's sustainability commitments are evident from the country's INDC at COP-21 which aims

- to reduce emission intensity of GDP by 33% to 35% from 2005 levels by 2030
- to achieve about 40% cumulative electric power installed capacity from non-fossil based energy resources by 2030.

- to create an additional carbon sink of 2.5-3 billion tonnes CO₂e through additional forest and tree cover by 2030

India's Government has already introduced a number of policies to increase the share of renewable energy in the energy mix in the coming years. A total of 175 GW of renewable energy capacity is envisaged by 2022 which has 100 GW of solar power and 60 GW of wind capacity, making **renewable energies** is a key action priority.

The ever increasing impact of India and China on the global energy scene is well recognised by the energy community as is indicated in the map.

Electricity prices are another action priority for energy leaders in India. UDAY (Ujwal Discom Assurance Yojana) is expected to bring about an operational and financial turnaround of distribution companies (DISCOMs) which also includes an increase in electricity prices.

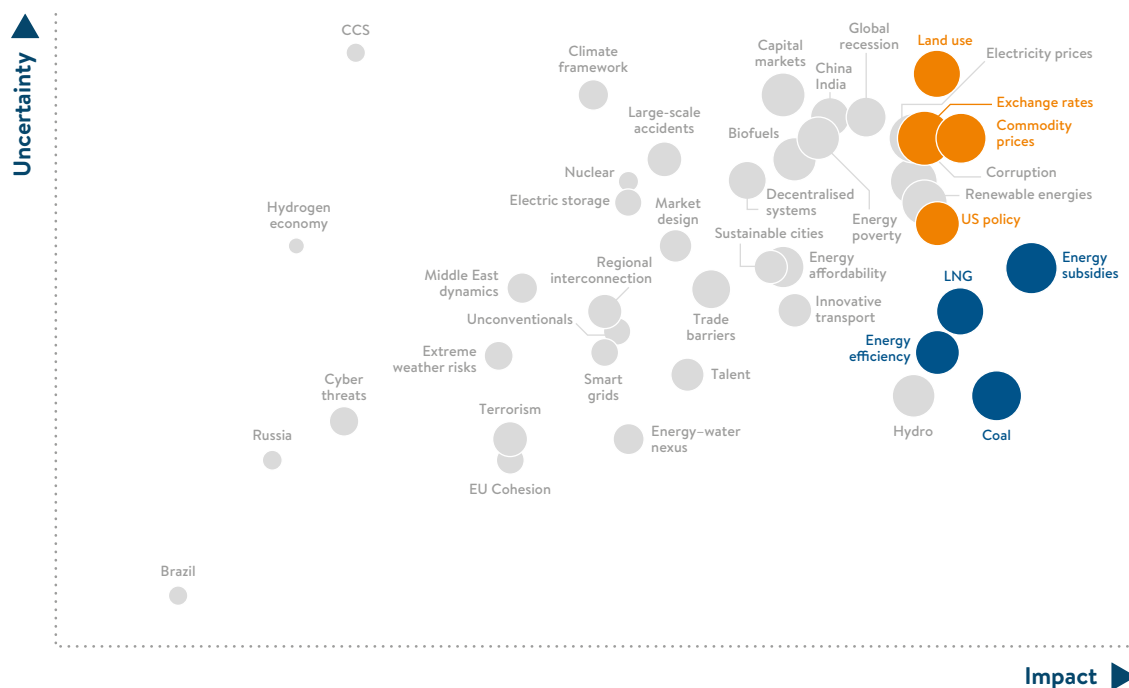
India's map features **land use** as a high impact area. Energy projects put a stress on land and clearance of land for projects face challenges due to its obvious linkages to existing use such as agriculture, forests and compensation and other acquisition issues. The national biofuels policy, by the Ministry of New & Renewable Energy, aims at mainstreaming bio fuels. An indicative target of 20% blending of bio-fuels by 2017 (bio ethanol and bio diesel) is proposed which envisages required support mechanisms. With increasing demand for land for urban and infrastructure development, food and biofuel production could potentially result in land use and water availability conflicts.

India is affected by severe water scarcity, with groundwater extraction exceeding recharge rate which is aggravated by vagaries of monsoon. Several measures are taken to reduce the water intensity of energy production. Besides China and New Zealand, India is the only country in the Asia region that perceives the **energy-water nexus** to be a highly impactful issue.

Energy policies in India aim to address the Energy Trilemma to balance the needs between energy security, energy equity and environmental sustainability. To address the energy equity aspect, the Government has a target to provide power 24 hours a day, seven days a week, for all by 2019. The direct cash transfer of subsidies for liquefied petroleum gas (PAHAL) is towards providing clean cooking fuel to the targeted beneficiaries.

Energy subsidies were already perceived to be an action priority in last year's issues monitor. The decision of the present Government to continue with the petroleum products subsidy reforms initiated through the previous government may explain the high impact associated with this issue.

INDONESIA



Particularly in developing countries, as the demand for energy grows, the energy sector will play a central role in supporting the country’s social and economic development. The energy sector will have to maintain an adequate level of energy security and energy independence by utilising the domestic energy sources and maintaining appropriate levels of national energy reserves.

As a common practice, one of the key drivers of energy policy at national level is the endowment of energy sources. This means the use of all locally availability energy sources need to be integrated and balanced to secure a sustainable energy future whilst minimising its environmental impacts. This can for example be achieved by enhancing the deployment and diffusion of low-carbon and zero-carbon energy technologies (including new and renewable energy), promoting the role of energy efficiency and conservation in up-stream to down-stream activities and by expanding a reliable and economic energy infrastructure. These actions are the key strategies in achieving a low-carbon development path in the energy sector. Managing the energy system, while ensuring a sustainable energy development, is one of the key roles of the government.

The Indonesian economy is supported by a large amount of energy consumption, heavily dominated by industrial and transportation sectors. Indonesia still depends on fossil fuels to maintain the balance between energy supply and demand. In order to move the national energy system towards a low-carbon energy system, and to

support the national environmental priorities in achieving the national emissions reduction target, low-carbon and zero-carbon energy technologies need to be embedded in the long-term national energy programs.

As described above critical uncertainties in the 2016 World Energy Issues Map for Indonesia include commodity prices, land use & availability, US trade & policy influencing global energy markets and exchange rates. Action priorities for the country include coal, energy subsidies, liquefied natural gas (LNG), renewable energies and energy efficiency. These issues emerge from the 2015 World Energy Issues Survey at national level.

Next to India, Indonesia is one of the few countries, which perceive land use to be a highly impactful issue, with this issue featuring as one of the key uncertainties in the Indonesian Issues Map of 2016. The high impact land use may have within the Indonesian context may relate to the conversion of forest and peat land to agricultural land for food and in particular palm oil production.

Indonesia is, next to Malaysia, one of the world's leading producers and exporters of palm oil, a product that can be used for human consumption and as a renewable energy such as biofuel and substitute for conventional diesel, POME to energy and etc. The large demand for agricultural land, particularly for palm oil production, may be driven by the newly introduced funding mechanism for biodiesel which are replacing biofuel subsidies in 2015. The Government of Indonesia established an Institution under the Ministry of Finance, namely the Indonesia Estate Crop Fund (IECF) for Palm Oil. The fund, with a yearly budget of US\$700 million a year will be a key driver for the country's biofuel development.²⁵ The objectives of the fund raising are to:

- Provide funds for the development of a sustainable plantation,
- Improve human resource capacity in plantations,
- Encourage the development of downstream industries of plantations,
- Improve the optimisation of the use of plantation for industrial raw materials, renewable energy (include biodiesel) and export,
- Improve and maintain the stability of the plantation business revenue by optimising prices amid fluctuations in world commodities prices,
- Support efforts to increase prosperity and sustainability

Coal and LNG are issues that consistently are top agenda items for energy leaders in Indonesia. Unlike last year, where LNG was perceived to be a critical uncertainty, both issues, coal and LNG, are perceived to be action priorities this year.

Coal has the potential to be a major future primary energy source in Indonesia due to its large resource base, ease and low cost of exploitation, good quality and existing infrastructure. Currently, Indonesian coal resources are reported to amount

25. www.themalaysianinsider.com/business/article/cimb-says-indonesias-rm3-billion-fund-to-support-malaysian-palm-oil-prices

to 120.53 billion tonnes of which 31.36 billion tonnes are classified as coal reserves (Directorate General of Mineral & Coal 2014; Geological Agency 2014). The coal reserves are roughly 0.6% of total proven global coal reserves ranking Indonesia 13th worldwide. Coal resources are located in Sumatera and Kalimantan islands. Regarding coal production and export, Indonesia is one of the world's largest producers and exporters of steam coal. In the last 10 years, coal exploitation in Indonesia rose sharply. In 2014, the coal production increased sharply to 458 million tonnes compared to only 217 million tonnes in 2007 (Indonesian Coal Mining Association – APBI).

Coal has shown its strategic role in development since it creates multiple effects at national as well as regional economies. From the standpoint of stability of energy supply and economics, coal also has an advantage, which is not to be subject to price fluctuations – unlike many alternative energy choices. As a result, coal – as one of the primary energy sources – is expected to continue to play an important role in maintaining the country's security and national economy.

The Government's energy diversification policy encourages using coal as a substitute for oil and gas for major domestic industries that, up to now, have been based largely on crude oil and natural gas. Domestic use of LRC is primarily for power generation, where it is used to produce steam and to drive turbines for electricity generation. To optimise the use of coal domestically, the Indonesian Government encourages technology providers to develop their technologies in the country, including coal gasification and coal liquefaction. In 2009, the Indonesian Government issued Law Number 4, Year 2009 on Mineral and Coal Mining ("Mining Law"). The holder of a mining business permit is obliged to increase the value added nature of the coal it supplies.

In October 2015, Indonesia's benchmark thermal coal reference price, Harga Batubara Acuan (HBA), was set at USD \$57.39 per metric ton (FOB), the lowest it has ever been since HBA's introduction in January 2009.²⁶

The global slump in coal demand is also affecting Indonesia's coal exports. These fell by 18% (y/y) to 186.8 million metric tons in the first half of 2015 compared to the same period in 2014.²⁷ This, in combination with globally low commodity prices is contributing to the country's first trade deficit in 11 months in November 2015.²⁸ In fact, from the 22 commodities that are monitored by the central statistics agency (BPS), the only two commodities that increased in price are cocoa and fish. With Indonesia's trade position, exchange rate uncertainty is increasingly becoming an important factor.

26. www.indonesia-investments.com/news/todays-headlines/indonesia-s-reference-thermal-coal-price-hits-all-time-low-in-september/item6032

27. www.indonesia-investments.com/news/todays-headlines/coal-update-indonesia-price-environment-health-batang-plant/item5915

28. www.indonesia-investments.com/news/todays-headlines/indonesia-posts-unexpected-trade-deficit-in-november-2015/item6290

In the 1990s, Indonesia accounted for approximately 33% of worldwide liquefied natural gas exports, which has reduced to approximately 7% today due to increasing national demand and reduced production capacity. Despite a drop in domestic energy demand in 2015, Indonesia needs to further manage its domestic demand for energy, in particularly LNG and build production capacity to compete in the international market.²⁹

A number of projects to increase production capacity are underway already including the Chevron Indonesia Deepwater Development, which is now expected to be finished in 2020,³⁰ and Indonesia's second land-based LNG receiving terminal development, which has a planned storage capacity up to 400,000 kiloliters, to come online in 2018.³¹ The delivery of these projects and other energy projects will be critical to Indonesia's energy landscape. Delays will mean not just a delay in government revenue stream, but also increasing exposure to imported energy.

With rising energy demand and reduced fossil fuel production capacity, the country is increasingly dependent on energy imports. Energy efficiency and renewable energies therefore play an increasingly important role with regards to the country's energy security, access to energy and environmental targets, which is reflected by the high impact associated with the issues.

In 2014, the government of Indonesia had issued the Government Decree No. 79 on National Energy Policy to promote energy efficiency and increase the role of new and renewable energy. The Decree No. 79 stipulates an economy-wide target of a 1% per year reduction in final energy intensity up to 2025, and that the country's share of new and renewable energy in the energy mix should be at least 23% by 2025. There is thus a need for action to ensure that the targets are reached by 2025. Slow progress on increasing the role of new and renewable energy and energy efficiency enhancement means Indonesia is getting more dependent to energy imports, and thus Indonesia is increasingly more exposed to the global energy markets.

Some of the important instruments have been established to support the National Energy Policy, by issuing conducive regulations such as Feed-in Tariff, phasing out energy subsidy, simplifying permit procedure, biofuel blend regulations (B20) with starting year 2016, providing incentives such as free import duty and tax holidays. It also includes implementing programs such as constructing additional power plants (35 gigawatts) between 2015 and 2019 of which 25 % shall be renewable energy based power plants, and programmes to intensify rural energy based on renewable energy.

The historical plunge of oil price during 2015 in a way benefits Indonesia as a net oil importer from cheaper cost of importing oil and oil products. However, it also

29. www.eia.gov/todayinenergy/detail.cfm?id=15331

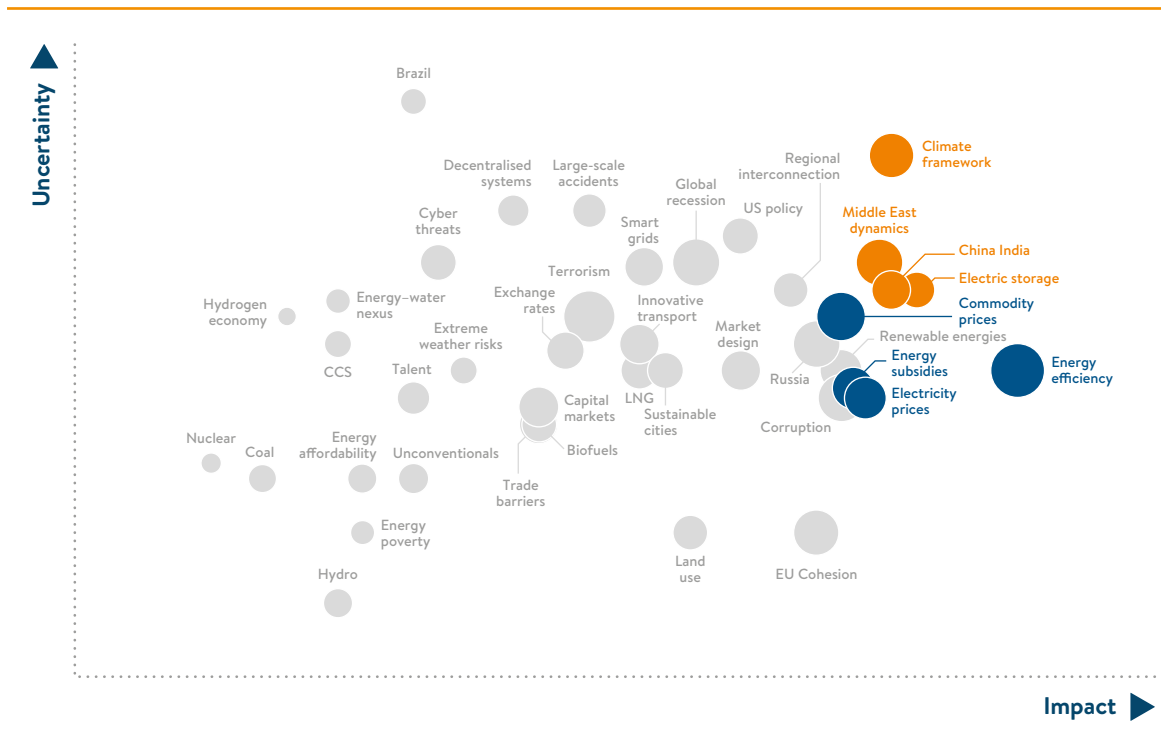
30. www.reuters.com/article/chevron-indonesia-gas-idUSL4N0SN4MD20141028

31. <http://asia.nikkei.com/Business/Deals/Tokyo-Gas-to-build-Indonesian-LNG-terminal-with-Pertamina>

hurts the government revenue from the oil it sells. In the long run, low oil prices will harm Indonesia more than it will benefit the country as it impedes investments in exploration and production of Indonesia’s hydrocarbon resources. Most of Indonesia’s untapped hydrocarbon reserves are located in deep waters at the remote eastern part of the country, which are expensive to develop. A prolonged low oil price environment will make Indonesia even more dependent on energy import as it fails to economically justify development of its native resources.

Other than oil price, Indonesia is also exposed to the global LNG market. Once the world leader in LNG export, it is now starting to import LNG. The Arun LNG facility’s conversion into an import terminal is a stark demonstration of the new reality. Although still a segregated market, the trend is clear that the global LNG market is getting more interconnected, with the United States being a key influencer. The United States trade policy, particularly its LNG export policy, will influence the global LNG market dynamics and pricing. With two mega trade deals the United States is working on, the Trans-Pacific Partnership (TPP) with some Asian countries, and the Transatlantic Trade and Investment Partnership (TTIP) with European Union, the market is yet to see the magnitude of US trade policy influence on the global energy dynamics.

ITALY



In 2015, after several years of crisis, Italy registered a growth in the demand for energy. In the first nine months of 2015 electricity consumption rose by 1.5% compared to the same period in 2014 and an overall increase in private energy consumptions of about 0.5% was expected over the whole year. This trend has been backed both by the growth of exports (for 2015 the increase was expected to be 3.7%) supported by the depreciation of the euro against the dollar, and a recovery in domestic demand which benefited from the fall in energy commodity prices.

However, energy prices remain a critical element for Italy. In particular, the electricity bill is significantly affected by the increase in “taxes/levies”, which in 2015 were estimated to be about 15 billion Euros, almost the double if compared to 2011. This is due to the increased components necessary to cover renewables incentives. On this specific matter stakeholders believe is necessary to act as a priority both for the country’s productivity competitiveness and for the improvement of the Italian family budgets.

While the reduction in energy costs charged to the national energy system is strategic for the Italian international competitiveness, on the other hand it is necessary that also end users undertake increased efficiency on final consumption.

Italian stakeholders pay special attention to **energy efficiency**. The recent difficult economic environment has also contributed to actors of the energy sector paying more attention to towards investments in efficiency of both energy production and consumption. In this context, the Directive on Energy Efficiency and the development of the Energy Efficiency Action Plan to 2020 provide an extensive and exhaustive framework in order to remove regulatory and policy barriers and to spread energy efficiency measures, both at the national and local level.

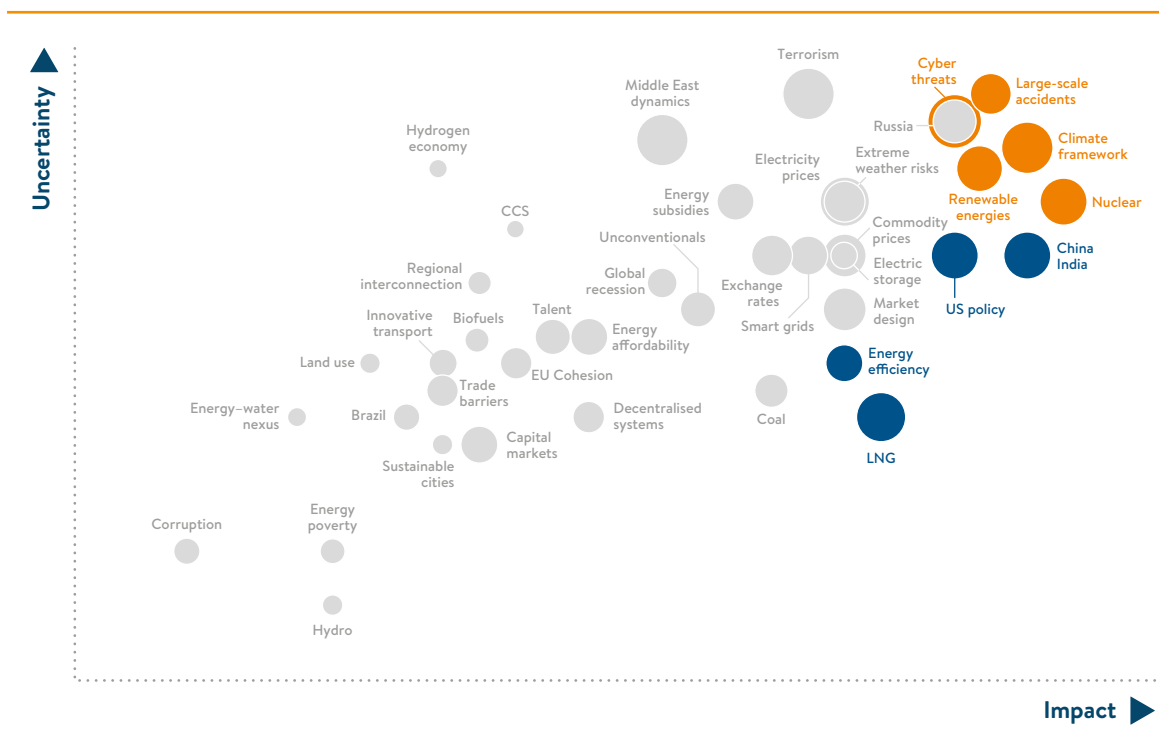
The Italian Issues Map shows that an international agreement on climate change (**climate framework**) is one of the issues that raises most uncertainty among the actors of the Italian energy sector. On the other hand, the **EU policy cohesion**, on which EU governments have already started a virtuous circle of collaboration, is considered as an area of priority action, in order to recover the competitiveness of the European industry as well as the Italian one.

The most important news in the 2015 Italian energy agenda concerns the stakeholders growing interest on **electric storage** technologies. The increasing share of renewables in the national electricity mix is a driver for increased efforts in the study electric storage solutions by network operators and energy companies that have made their first investments, although on small projects. There are still legal and regulatory uncertainties associated with this issue and the development and costs of technology are still holding back investments in the industry.

The most significant difference between the World-European energy agendas and the Italian one is the marginality of the coal and nuclear issues in the energy debate of Italy. This is mainly due to the peculiarity of the Italian electric mix, characterised by an increasing use of renewable sources (which have reached a share of 40% in the national electricity production). The renewable energy sector continues to attract

investments, even if at a slower pace than in the past years. This issue therefore receives much attention of energy leaders in Italy compared to the rest of the world. Natural gas is also gradually replacing oil as a fuel in thermal power plants, reaching a 40% share in the Italian electricity mix.

JAPAN



In April 2013, the Cabinet decided the ‘Policy on Electricity System Reform’ to realise three objectives in Japan’s market:

1. Securing a stable supply of electricity
2. Suppressing electricity rates to the maximum extent possible
3. Expanding choices for consumers and business opportunities

These objectives would be implemented in a three-step approach:

1. In April 2015, the Organization for Cross-regional Coordination of Transmission Operators (OCCTO) was established
2. In April 2016, retail competition to the residential sector will be expanded by opening a new market
3. In 2020, the transmission/distribution sectors of big EPCOs will be unbundled by regal unbundling style

Thus, the electricity retail market will be fully liberalised in April of this year and preparations for competition have already begun among EPCOs.

As of April 2014 the Abe administration raised the consumption tax, which is also imposed on energy, from 5% to 8%, resulting in a negative effect to economic growth. The administration has decided to raise the consumption tax again to 10%, from April 2017, which gives rise to potential further negative impacts on the economy in the future.

In July 2015, the government finalised the 2030 energy mix which determines the supply ratio of electric power (RE: 22~24%; Nuclear:22~20%; LNG: 27%; Coal: 26%; Oil: 3%) and submitted its INDC aiming at a 2030 GHG reduction target of 26% from 2013 levels, along with measures which form the basis of the bottom-up calculation of the target. On the nuclear side; Sendai No. 1 reactor restarted power generation in August 2015 and Sendai No. 2 reactor also restarted in October 2015. However, there is still uncertainty around when and how many additional units could follow these two preceding units. Additionally, there are other uncertainties about extending the life time of aged plants from 40 years to 60 years and the possibility of constructing new plants. For having further restarts of nuclear reactors, both the clearance of the New Regulatory Requirements and a more favourable public opinion to nuclear will be required.

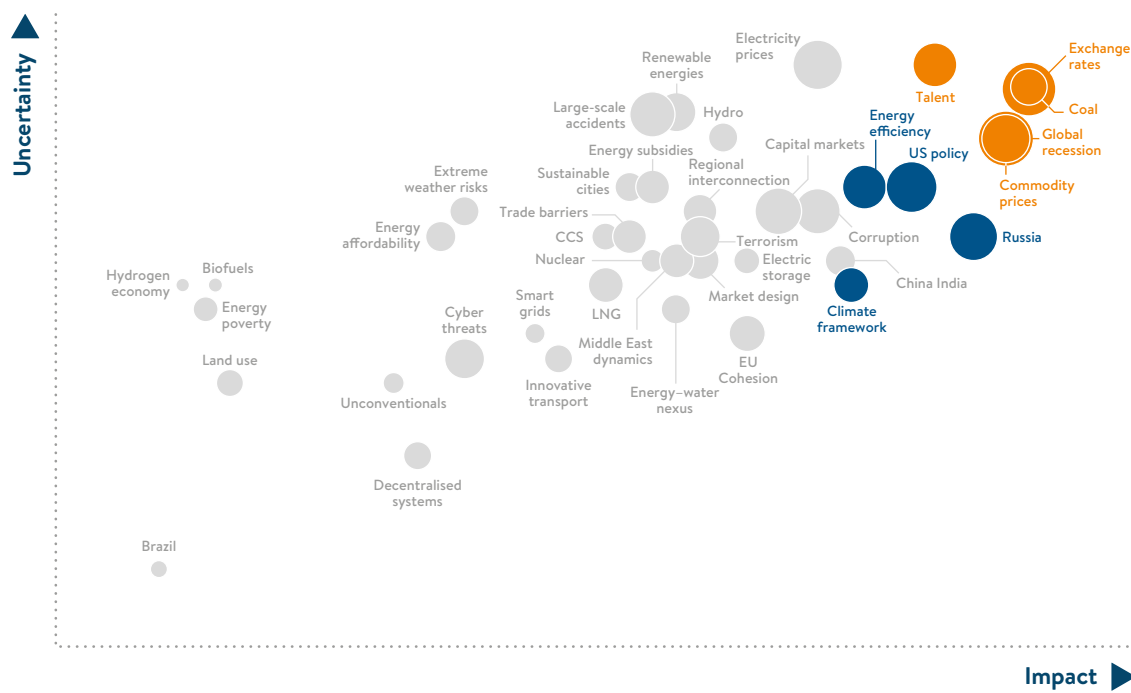
This is reflected in the national issues monitor for Japan; where the critical uncertainties for energy leaders and experts include **large scale accidents, climate framework, cyber threats, nuclear** and **renewable energies**. Large-scale accidents reflect the anxiety in society, caused by the huge damage of the Great East Japan Earthquake followed by the Fukushima accident. The expectation and uncertainty around COP21 might also have kept energy sector leaders awake at night, and the adoption of the Paris agreement has thrown them into tough challenges. Cyber threats are also of high concern, because in the present digital information society the possibility of a severe crisis that cyber-attacks might cause on important social infrastructure is growing. Japan introduced a Feed-in-Tariff (FIT) in 2012 and an unexpected volume of PV has already applied. As the levy of the existing PV application amount has increased more than three folds from 2012 to 2.7 trillion yen in 2014, the burden on consumers will be huge hence the reform of FIT is in progress.

China India and **US policy** are positioned as urgent need for action issues. Japan can be expected to assist two major energy consuming countries; China and India, to improve energy efficiency. US is expected to start exporting shale gas this year, which could be of some help for Japan to enhance its energy security and hopefully secure the safety of intensified relations in the Middle East, which acts as the current life line area for importing energy to Japan.

The highest downward changing issues are **market design** and **energy affordability**. Electricity and gas market reform in Japan is about to realise fully liberalised retail markets and the energy price has gone down substantially due to the drastically decreased price of imported crude oil and LNG.

In comparison with the world map, what is unique in Japan are **large scale accidents** and **nuclear** as top priority need for action issues. To the contrary, **energy efficiency** and **regional interconnection** are not hot issues. Japan has already achieved the world highest energy efficiency both in supply side and demand side. However, further efforts for efficiency improvement, such as building insulation or air-tightening, are still underway. More specifically, under the Energy Saving Act, the number of product items to be covered by the Top Runner Program has been increased, and conforming to new energy conservation standards will be mandatory for all new buildings, including houses in 2020. As Japan is an island country, at the moment, it has no concrete regional integration projects with neighbouring countries.

KAZAKHSTAN



For energy leaders in Kazakhstan in 2016, there are three critical uncertainties at the top of the agenda: global recession; coal and exchange rates.

Global recession

Given current geopolitical and economic changes one of the main challenges of the energy sector is a sharp increase in competition among countries – suppliers of energy, both for markets and for foreign investment. In order to compete, countries will have to adapt by showing some flexibility in fiscal terms and local content requirement. In Kazakhstan, certain levels of diversification of the economy has

been achieved in the years since gaining independence (in 1991); however hydrocarbons and other energy resources will continue to hold strong positions for the foreseeable future.

Coal

The country is ranked eighth in the world in terms of proven coal reserves (about 4% of world reserves). Kazakhstan remains among the top ten countries in terms of production (109 million tons in 2014). However, most of the existing stocks of coal have a high moisture content, sulfur and ash. These indicators, coupled with high levels of methane in most fields, mean that the production and consumption of coal in Kazakhstan are less environmentally friendly than in other countries, despite the fact that some of the fields in which coal is mined by open method, are highly competitive because of extremely low production costs.

Official energy strategy announced (The Concept of Kazakhstan's Transition to a Green Economy – 2013) sets of ambitious targets for the substantial shift in electricity production towards renewable energy as well as a gradual reduction in the share of coal in the long term. Some of the options include using large reserves of natural gas as a stage in the transition from coal-fired generation to alternative (renewable and nuclear) energy sources. In accordance with a decree signed by the President of the Republic of Kazakhstan May 30, 2013, renewable and alternative energy sources by 2050 should provide 50% of the country's electricity. Modernization and diversification of the coal-dependent economy is at core of the initiatives set out by policymakers.

Recommendations for the coal industry are as follows. **1.** Continue to explore potential alternative use of coal: including coal methane and production of synthetic liquid fuel, coal slurries, and others as a promising way of expanding the use of cheap coal in the country's economy. **2.** Continue to study ways to make more eco-friendly and efficient use of coal, especially in power generation such as the reduction of emissions through clean chimneys and improving the efficiency of combustion.

Exchange rates

In 2014 overall growth slowed down due to a number of factors, including a drop in oil prices in the second half of the year and the overall slowdown in the Russian economy (main trading partner), partly because of international sanctions. These difficulties have led to the devaluation of Kazakhstan's national currency; Tenge, in February 2014 and August 2015. Overall, the sharp fall in oil prices in the international markets will have a significant impact on the economic performance of oil exporting countries given the policy of OPEC and decisions of non-OPEC producers.

Action priorities for the energy sector focus around US policy; energy efficiency and climate framework.

US policy

Major US oil companies are continuing to rethink their CAPEX budgets due to price fluctuations by re-evaluating current and future projects, especially in the upstream. At the same time there is a pressure for all parties in the energy market to advance operational and financial indicators. Timely and efficient completion of the commenced projects in the framework and their increasing costs as well as issues arising from low oil prices and its effect on national budgets are challenges for the energy sector in the long-term.

Energy efficiency

The power industry accounts for about one-third of primary energy consumed in Kazakhstan, and, accordingly, the potential savings from increased efficiency are huge. Given the predominance of coal in the power sector, measures to reduce energy consumption in this sector may get more support and encouragement, as part of the policy to reduce greenhouse gas emissions through the introduction of ETS, as well as by increasing the share of natural gas and renewable sources energy in the new structure of the power generating capacity of the country. Smart grid and energy storage technologies are on the agenda (high level of losses in transmission/distribution due to vast territory (2.7 million sq. km) and sharply continental climate).

Nevertheless, the existence of huge energy reserves in Kazakhstan and the relative cheapness of the domestic market make it difficult to implement initiatives in energy efficiency – the resulting economic benefits will be relatively small. In this regard, an important role will be played by incentives provided by the government that encourages participation in energy efficiency programs and investment in energy-saving technologies.

Climate framework

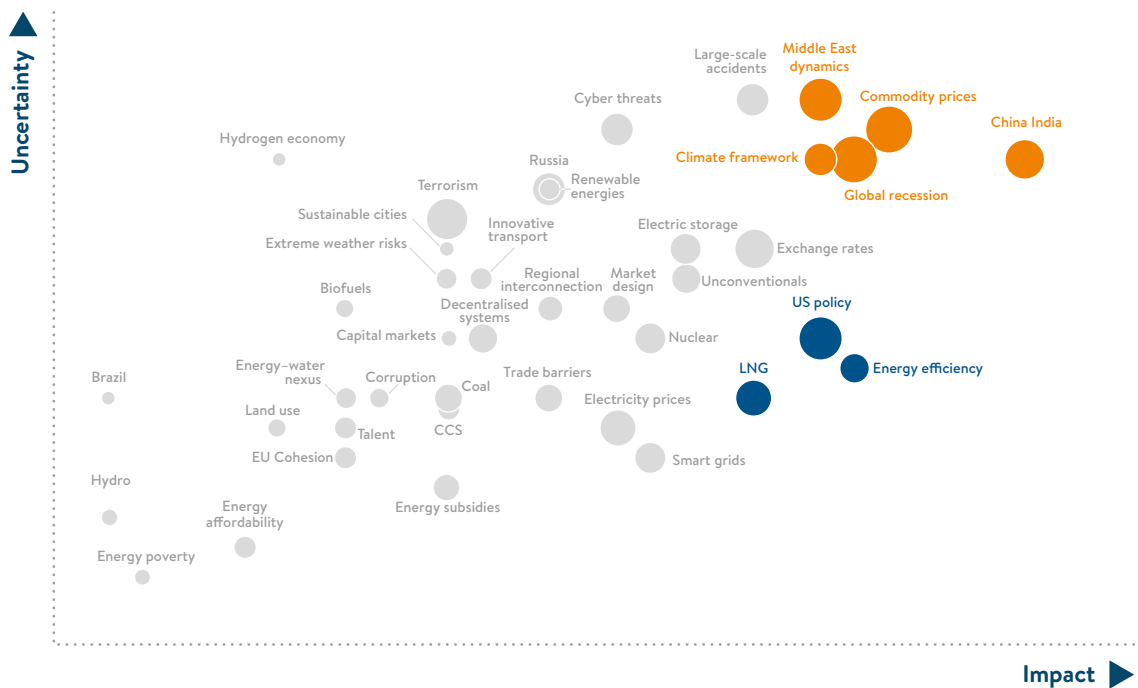
The Republic of Kazakhstan is fully committed to the negotiation process of the UNFCCC with a view to adopting a legally binding global agreement applicable to all parties to the Paris Conference. The country's INDC indicate a commitment to reduce greenhouse gas emissions by 15–25% by 2030 compared to 1990. It is important, however, to align commitments at COP with historical development trajectory of major players in the energy world without damaging pressure on entities in the field.

Macroeconomic risks and vulnerabilities such as global recession and exchange rates are in the zone of uncertainties which are more or less common for World, Asian and the Kazakhstan economy. Specificity of Kazakhstan's industrial structure dictate the need to tackle issues related to coal as a main vulnerability for the sector in terms of high environmental risks, but also as an opportunity to develop new export markets and energy vision.

Climate framework is placed somewhere between uncertainty and need for action in the world picture, whereas for Kazakhstan it is clearly a tipping point for when we have to start dealing with environmental footprint issues given historical heritage of being a country rich in mineral resources. Energy efficiency positioning in the monitor is common for all regions as one of the main prerequisites for tackling climate change.

Energy geopolitics (US policy) is being marked as a critical uncertainty (common to the rest of the world due to the falling oil prices, increase of US shale oil production despite falling world demand, OPEC decision not to reduce volumes of oil produced in order to retain market share).

KOREA (REP.)



In the result of Korea energy issues map for 2016, critically uncertain issues with high impact are shown at the top-right side of the chart. **China/India**, which is found at the top-rightmost corner, is identified as an issue with high degree of uncertainty with the largest impact among the energy leaders of Korea. China in particular is linked closely to Korea not just through energy market but through the whole economy. The country is the biggest trade partner of Korea based on geographical proximity. Annual trade between two countries has increased from 118 billion dollars to 227 billion dollars over the last 10 years. More critically saying, as Free Trade Agreement between Korea and China has gone into full effect from December 20th, 2015, it demonstrates a strong South Korea-China trade picture. Under the FTA, the two sides will eliminate tariffs as much as 90% of trade goods within 20 years of the pact’s operation and can be expected to increase volume of bilateral trade even further.

Besides China/India, a level of impact is slightly lower but still critically uncertain issues are **commodity prices**, **Middle East dynamics**, **global recession** and **climate change**, found at the top-right corner of the chart closely aligned together.

Uncertainties associated with **Middle East dynamics** could be explained by Korea's degree of dependence on imported oil. The country is heavily reliant on crude oil from Middle East over 86%, so very vulnerable to oil shock. In this regards, Middle East Dynamics is positioned more on top right side of the critical uncertainties quadrant of Korean map than that in the Global and Asia regional maps.

In the same context, **global recession** which is closely followed by the ongoing drop in oil prices have caused difficulties in projecting the future energy price and situation and therefore perceived to be another key uncertainty. In the past, low oil prices were beneficial for the Korean economy because people could increase consumption and businesses could save expenditure on production costs. However, the ongoing drop in oil price is now resulted in weak demand due to global economic slump, causing revenue loss in most industries that exports products by using crude oil as a raw material. Particularly for oil industry, petrochemical and shipbuilding industries are suffering from cheap oil prices.

In addition to the aforementioned Energy geopolitics and regional issues, the **climate framework** has emerged as critical uncertainty with high impact in Korea. The government set an ambitious carbon mitigation target of 37% below BAU by 2030 and implemented various measures for achieving the goal. For example, the government has implemented The Energy Greenhouse Gas (GHG) Target Management System (TMS) in 2010 and has launched the national Emission Trading System in 2015 for the first time in Asia. Amid of the government's effort on climate change, encouraging support of the private sector remains as a key challenge.

Along with the above mentioned critical uncertainties, a key issue that call for action among Korean energy leaders is **energy efficiency**, found in bottom-rightmost corner in the chart. Energy efficiency is a crucial player in Korea's future to achieve climate target and creating new energy market. Particularly, new energy sector developed by cutting-edge technologies which include energy efficient system, smart grid, ESS, e-vehicle are highlighted as future growth engine of Korea.

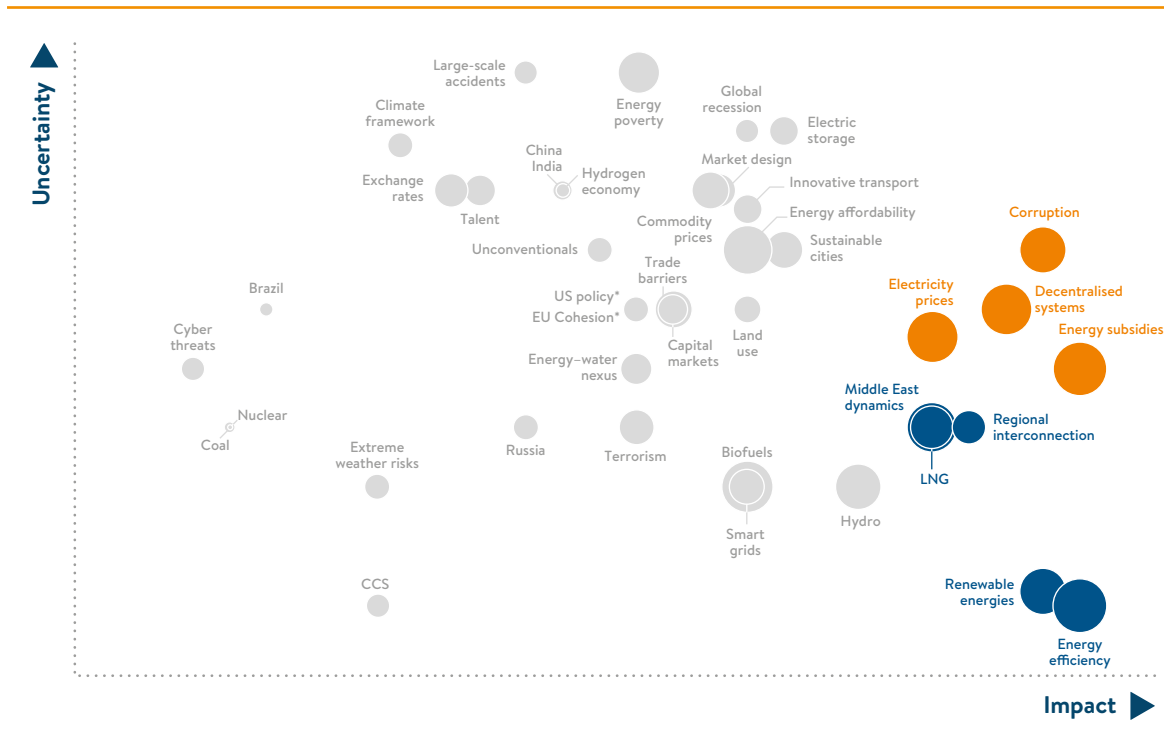
In this light, the country has announced a plan for fostering the growth of energy efficiency area. For example, 40,000 energy-efficient smart plants will be built by 2030 and all new large buildings need to be certified as zero energy buildings starting from 2025. In addition to this, the government will spend over one billion dollars to foster the growth of the new energy sector such as energy-efficient smart plants, smart grid and ESS in 2016.

The private sector also has a plan to invest about 15.8 billion dollars in the new energy sector over the next 5 years. At the same time, various measures will be taken to make the transition to a new energy society. For example, business-friendly deregulation that allows individuals to sell and buy electricity will take place starting from 2016 and new business models such as "energy-independent islands" will be introduced. With an implementation of this plan, Korea's market for new energy industries is expected to reach 83.3 billion dollars with 500,000 new jobs created and help reduce the country's greenhouse gas emissions by 55 million tons by 2030.

LNG, which is found slightly below the energy efficiency, is another issue that has kept Korean energy entrepreneurs busy in 2015. Thanks to the shale gas revolution and a strong commitment to a sustainable growth, LNG is considered to play a vital role as a bridge fuel to clean energy future. In particular, Korea, as the second largest LNG importer, is keen on unconventional energy for diversification of its import sources. US shale gas doesn't mean only increased supplies but also trigger a new market mechanism such as free destination, new pricing structure etc. In addition, the government has established 'the strategy for development of LNG as new energy industry'. The main purpose of this plan is to create a new LNG market and business opportunities such as FLNG, LNG bunkering based on high technology and competitiveness in automobile and shipbuilding.

It is noteworthy that **smart grid** is appeared in action priority quadrant, reflecting that Korea's effort on developing smart grid is well on track. Korea is one of the leading countries in innovative smart grid technologies. The government and private companies will launch a new business for expanding the smart grid infrastructure in 2016. This roadmap aims at establishing 13 hubs for smart grid system by 2018 and spreading toward nationwide by 2025. Korea is expecting its clear and constructed plan for developing smart grid to be one of a key instrument to clean energy future of the country.

LEBANON



Key contextual observations which have affected the energy sector in Lebanon over the last year focus around the political, geopolitical and economic situation for energy leaders in the country.

Lebanon has been without a president for more than a year. There was a presidential election in May 2014 however no candidate gained the required majority.

The country is affected by the military unrest in Syria. In November 2015 there were bomb attacks in the capital, Beirut, which killed more than 40 people. The country is also affected by rising immigration from Syria, with more than 1 million Syrian refugees seeking shelter in Lebanon, a country with approximately 4.5 million inhabitants.³²

The country is still suffering from the economic downturn. The economic growth for 2015 is expected to be between 0%–1%, the lowest it has been since 2011.³³

Critical uncertainties for Lebanon include corruption, energy subsidies, electricity prices and decentralised systems.

Energy subsidies, mostly going to the country's electricity sector provider, Electricite du Liban (EDL), present the government's largest spending posting, amounting to 4.5% of GDP. This is adding to the national debt of Lebanon, which is already a country with one of the largest debt to GDP ratios. There was an expectation that the energy subsidies were going to decline in line with increasing electricity capacities under the National Energy Efficiency Action Plan (NEEAP). There is however great uncertainty with regards to the further development of the NEEAP without a stable government in place – given that the country has been without a President for over one year now.

With regards to **electricity prices**, Lebanese households spent on average \$1,300 on electricity in 2013, two thirds on generators, in a country where the gross national income per capita is \$9,800, according to the latest World Bank estimates.³⁴ At the same time illegal tapping of gas and electricity supplies is increasing with an estimated 45% of electricity generated by EDL not being billed, which in turn is driving the need for subsidies to sustain power generation.³⁵

In last year's issues map, **corruption** took a relatively central position. This year it is one of most critical uncertainties in the country. The uncertainty associated with this issue goes hand in hand with the uncertainty associated with the political situation in the country, driven by the inability by the politicians to reach consensus.³⁶

Key action priorities in Lebanon include energy efficiency, renewable energies, Middle East dynamics and regional interconnection.

32. <http://www.bloomberg.com/news/articles/2015-08-24/lebanon-plans-stimulus-as-salameh-sees-risk-of-zero-gdp-growth>

33. <http://www.bloomberg.com/news/articles/2015-08-24/lebanon-plans-stimulus-as-salameh-sees-risk-of-zero-gdp-growth>

34. <http://www.reuters.com/article/us-lebanon-electricity-idUSKCN0SK1LH20151026>

35. https://www.meforum.org/meib/articles/0308_l1.htm

36. <http://www.reuters.com/article/us-lebanon-protests-crisis-insight-idUSKCN0R70GO20150907>

Middle East dynamics, a critical uncertainty in Lebanon in 2015, is now perceived to be an action priority. In 2010, 90% of the energy consumed in the country was imported, mostly from the Middle East.

In particular the Eight Country Interconnection Project poses a risk to energy security in the country with persisting instability in the region. The project integrates the electricity grids of Lebanon, Egypt, Iraq, Jordan, Libya and Palestinian territories. However due to recent conflicts, a number of countries have been excluded from the network, which may present a risk to the country's electricity supply.

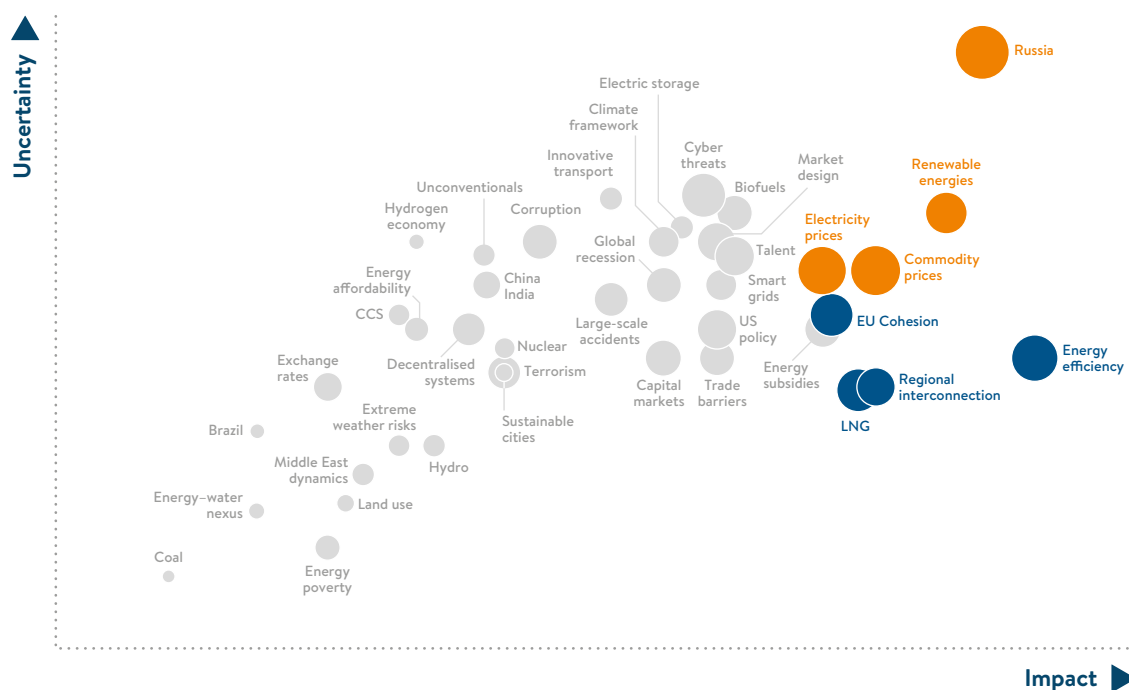
Energy efficiency and **renewable energies** are recurring action priorities in the country. Energy efficiency measures and the scaling up of renewables are essential to address Lebanon's increased need for energy and with that to secure its consistent supply and to reduce the need for government subsidies in the energy sector.³⁷

Given the low importance that is associated with the climate framework issue, it becomes evident that it is the energy security aspect rather than the environmental aspect that is driving the need for energy efficiency and renewable energies in the country.

Lebanon has set out a comprehensive energy efficiency action plan (NEEAP) to 2015. Action is required to secure new commitments going forward. The NEEAP comprises of 14 national initiatives to achieve a 12% renewable energy share by 2020. It moreover outlines initiatives to promote energy efficiency standards in households and commercial buildings, whereby a 5% reduction in the electricity consumption growth rate should be achieved by 2020. In order to achieve the goals the planned measures need to be implemented, which explains the need for action with regards to renewable energies and energy efficiency.

37. <http://climatechange.moe.gov.lb/viewfile.aspx?id=205>

LITHUANIA



The highest degree of uncertainty in the Lithuanian Issues Map is related with **Russia** due to its geopolitical threat created after annexation of Crimea and military invasion in the Ukrainian area Donetsk.

Consequently it is not surprising that the impact this issue has on the Lithuanian energy sector is reflected throughout the whole range of issues captured in the Issues Map for Lithuania. **Renewables**, energy **efficiency** and **regional interconnection** are for example top priority issues for Lithuania as they present means to mitigate the country's energy dependence on Russia.

Unlike in the Global or European Issues Maps, **renewable energies** are perceived to be a critical uncertainty (rather than an action priority) in the Lithuanian Issues Map. The high level of uncertainty associated with this issue can be attributed to the pending decision on support mechanisms for solar and wind energy. The use of biofuels, biomass and waste is further viewed as an opportunity for energy diversification and plays a particularly important role in the context of energy for heating purposes.

Using biofuels for heat generation can also help address **energy price** uncertainties (commodities and electricity), particularly when considering the need for heating during the winter season. At the same time declining oil prices are pushing the government to postpone a tender for shale hydrocarbon exploration in Lithuania, which highlights the impacts of uncertain energy price developments on the energy sector of the country.

Energy efficiency is an action priority in Lithuania and following the EU energy efficiency policy, Lithuania is in the process of implementing a state program on multifamily house renovation but improvements of internal building systems are still necessary.

Regional interconnection is also a top action priority for the country as indicated by the Lithuanian Issues Map. The launch of **power interconnectors** with Poland and Sweden in December 2015 make Lithuania a connection point for the Nordel, UCTE and IPS/UPS power systems.

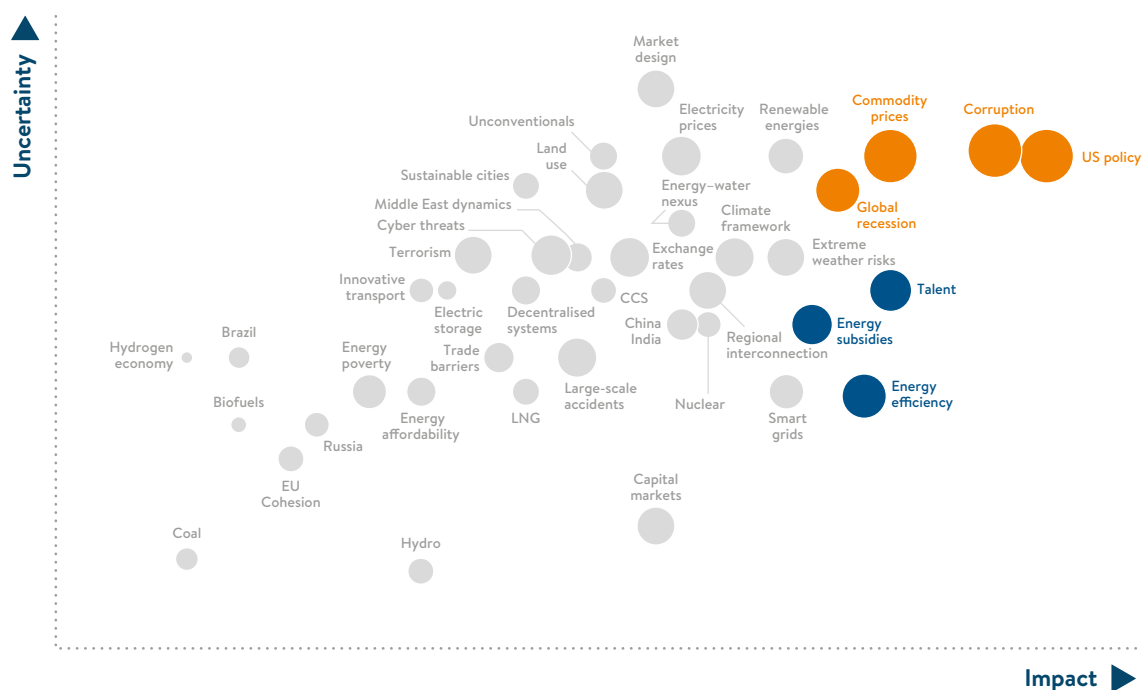
The EU Cohesion Policy is furthermore one of the priority tasks for the government of Lithuania. The aim is to reduce Lithuania's energy dependence on a single supplier and secure PMES by developing an energy infrastructure consisting of LNG terminal, gas and electrical interconnectors. This is directly linked to the provision of affordable energy to residents and industry.

Lithuania is to become a regional gas-trading hub after the launch of the LNG floating terminal. The country will strengthen the gas interconnection with Latvia and is also planning to build a gas interconnector with Poland. Funds are allocated for the implementation of above mentioned priority actions in line with EU Cohesion policy.

Surprisingly, new technologies such as **smart grids** are rising to the top of the agenda of energy leaders. During the last year talent scarcity, biofuels and decentralised systems improved their positions in issue map.

The issues reflected in the Lithuanian Issues Map show that for the Baltic region collaboration on strategic energy issues is increasingly becoming important. Further development of renewables will thereby play an important role.

MEXICO



The 2016 energy agenda in Mexico continues the theme set out by national leaders and experts last year, whereby Mexico is carrying on with two simultaneous transitions in relation to its energy sector; one short term and one medium to long term. The short term priority is the transition from a state monopoly structure of the energy sector with two national companies managing the oil and gas and electricity subsectors. Looking to the medium and long term transition, the issue is related to the national de-carbonization of the economy in order to reduce the emission of greenhouse gases. It is within this framework that different actions have been taken in both the legal and production areas.

The main critical uncertainties that were identified by the energy leaders that answered the questionnaire are **US policy**, **corruption**, **commodity prices** and **global recession**. Three of these are related to external events while one is a local issue. Since the Mexican economy's main driving force is the export sector and with more than 80% of exports going to the US, it is of great importance what public policies are adopted in the US, as it will affect the internal energy supply-demand structure. As the present US administration is close to the end of its second term, the electoral process has created important uncertainties as related to public policies for the energy sector. The uncertainty due to the volatility of **commodity prices** and the last remainders of the **global recession** are of concern because they both have a financial impact on the Mexican energy industry and the fiscal income of the government, the

importance of which has been demonstrated, for example, by the external economic balance of the oil and oil products subsector going into deficit at the beginning of this year.

In relation to the **corruption** issue, which is closely associated to the extended impunity present in México, the public pressure on the political sector has increased to such a degree that finally both chambers of Congress are discussing an important proposal to create a legal framework that should penalise such detrimental practices. The uncertainty now lies in how far the political sector will dare to legislate in order to create effective laws to reduce, if not eliminate, such practices.

The main issues that were indicated to require an immediate action are those of **human resources (talent)**, **energy efficiency** and **energy subsidies**. With respect to the first, an important program was created at the end of last year to reduce the deficit in human resources for the energy sector; a study has shown that in the rest of this administration there is a need of 135,000 specialists in areas of technical expertise, professional activities and research and development.

With respect to **energy efficiency**, in December Congress passed a new law on the energy sector transition (Ley de Transición Energética) in which a detailed framework is created for the National Commission for the Efficient Use of Energy to operate effectively. This should accelerate the pace in relation to energy efficiency and energy conservation. With regard to **energy subsidies**, the Treasury Secretariat has made important efforts for subsidy reductions, especially in petrol (gasoline and diesel) prices to the point that currently these tend to have some fluctuations depending on the international price of oil.

Two additional issues that stand out within the national issues monitor are **climate change framework** and the severe **weather risks**. Mexico presented at the COP 21 in Paris its Intended National Determined Contributions where it proposes to reduce GHG emissions by 25% for 2030 voluntarily. Part of the actions required to achieve this goal are included in the new PRODESEN (Programa de Desarrollo del Sector Eléctrico Nacional) published at the end of last year. It indicates that by 2024, 35% of the electricity generation will be carried out with clean energies (non- or low-emitters of GHG) and by 2030, it will reach of the order of 40%.

On the issue of extreme **weather risks**, the hurricane Patricia which hit the Pacific coast of México last year, a few hours before hitting land, had NOAA measurements which showed the highest ever recorded wind velocities in any of this type of phenomena due to temperatures of the surface sea water of over 30°C. Fortunately, just before landing, it lost some of its intensity and the damage was not as severe originally expected. In 2014, in the southern part of the peninsula of Baja California, the hurricane ODILE destroyed most of the electrical T&D system that served one of the important tourist resort areas of México, causing estimated damages of over one billion USD. Because of the high exposure of México to this type of climatic events, the government has created very detailed climatic vulnerability maps for each of the 2438 counties in the 32 states that conform the country of México.

When looking at how issues of importance for energy leaders in Mexico have transformed over time, there are a number of interesting trends.

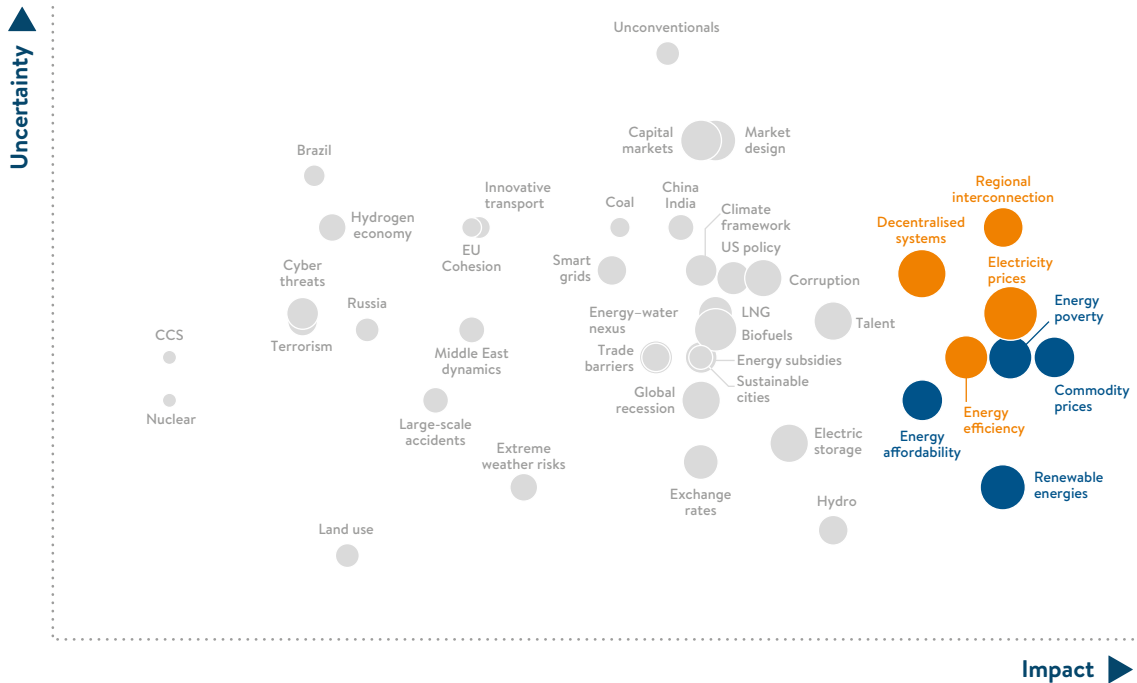
US policy has moved from low to high uncertainty in the last three years – potentially linked to the way the electoral field of one of the two main US political parties has evolved during this time; its importance has been described above.

The **Energy-water nexus** issue has increased its uncertainty due to the perception that this is probably the single most important long term problem for Mexico, and whilst it will directly affect the energy sector, little attention is being given to it at present.

Corruption is an issue that in the last three years has increased its perceived impact due to a series of scandals that have come to light. There is a perceived phenomenon that civil organizations are becoming much more active with respect to this issue and the social networks have been very active in making public whatever hints of corruption are discovered.

The **nuclear** issue has dropped in uncertainty, moving from a critical issue for energy leaders in the country to one of need for action. This is directly linked to the PRODESEN planning mentioned above and the three new nuclear units which are programmed to enter into operation in 2026, 2027 and 2028. Furthermore, the issue of **smart grids**, which has also moved to the action priority space, is linked to the new law of the energy transition mentioned above. In this regard, great emphasis is made with respect to the transition of the actual electricity system to a modern system which it states should be based on a smart grid concept with certain directives included to assure that this happens.

NAMIBIA



Top critical uncertainties in Namibia include energy prices, commodity prices, electric storage and renewable energies.

Commodity prices was amongst the top critical uncertainties in Namibia during 2015 and features again as a critical uncertainty in 2016, right behind energy prices. In 2014/2015 Namibia imported 58% of its electricity requirements. During that period, the average tariff of imports was higher than the Namibian local bulk generation tariff. This implies that the generation tariff is substantially determined by imports which the industry has little influence over. In addition to the cost of imported electricity, local tariffs are driven by the following factors:

- governments decision for the national utility tariffs to remain cost reflective;
- the need for additional investments in the generation sector;
- increases in the prices of commodities and primary energy sources such as oil and coal; and

Volatilities in commodity prices can therefore have a detrimental impact on the local economy and government budget, which explains the high uncertainty and impact associated with the issues.

Electric storage and **renewable energies** are perceived to have a high impact and uncertainty in Namibia. As storage technologies continue to make inroads in large commercial entities, Namibian entities are considering solar PV/diesel hybrid systems as storage solutions which are bound to become more of a common feature in the Namibian Energy Sector. Supporting policy-making will further encourage developments to advance the energy sector.

Namibia is endowed with a vast amount of renewable energy resources, and as a country it stands to benefit as the world-wide boom, in particular the solar power market, where there is a rapidly increasing scale of international manufacturing and uptake of solar technology throughout the world.

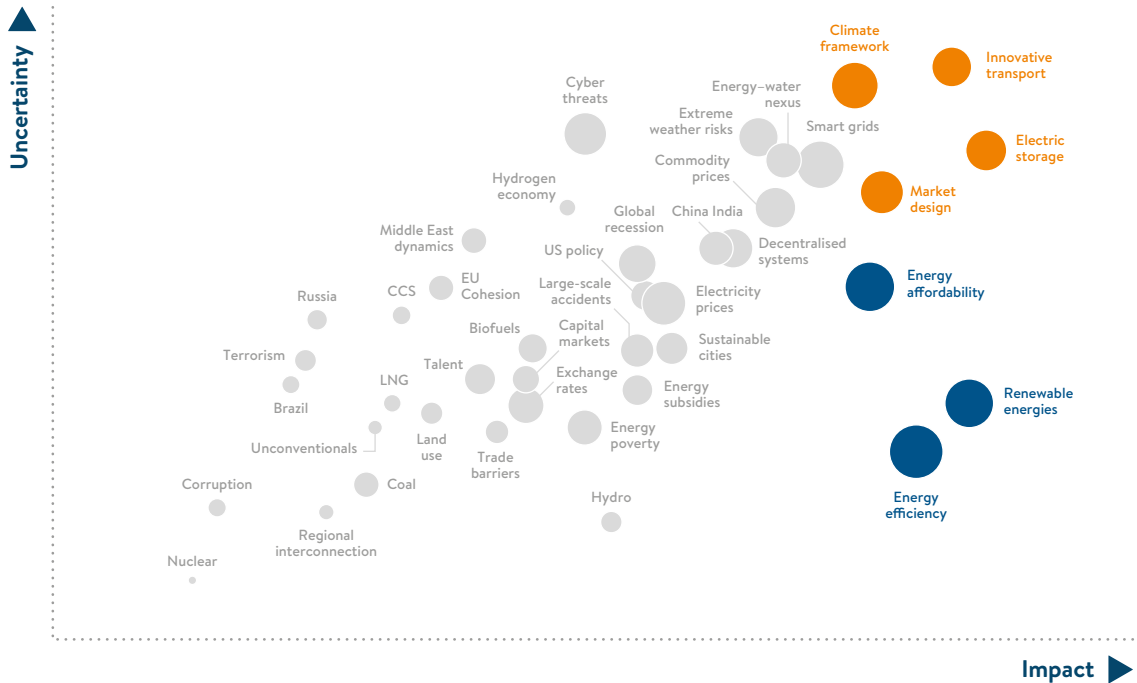
It is noticeable that in the Namibian map, ‘eco-issues’ such as renewables, energy storage, energy efficiency and smart cities feature in the high impact area of the map, while climate frameworks are perceived to be a weak signal. This differs from other regions featured in the Issues Monitor including Europe, Asia, North America and Latin America, where the ‘eco-issues’ feature together with **climate framework**. This confirms that in Namibia, ‘eco-issues’ may be driven primarily by energy security and affordability concerns rather than environmental concerns.

Regional interconnection and **Talent** feature as top need for action issues for Namibia, because domestic electricity production does not meet domestic demand. Rising electricity demands in neighbouring countries supplying Namibia is detrimental to regional electricity trade. The development of specific skills and competence is amongst Namibia’s top priorities to take further advantage of the resource abundance in the energy sector.

Large-scale accidents and **decentralised systems** are high change issues, having moved from the high impact half of the map to weak signals from 2014 to 2015. This movement is relevant for Namibia as uranium exports are a main contributor to the economy, whereby the country is amongst the top 5 uranium producers globally. With the renewed interest in nuclear as a power source after the Fukushima incident, the country may feel more optimistic with regards to its uranium export potential, resulting in a lower degree of impact associated with the issues.

The Namibian government continues to show commitment to electrifying more remote populations with decentralised solar power plants, which in turn lightens the burden placed on the national grid. This will provide rural Namibians with access to a more stable and cheaper electricity supply. Greater uptake for decentralised solar power plants will be realised as Namibia pursues the avenue for smaller scale solar power plants for more rural, remote areas.

NEW ZEALAND



Still with one of the largest response rates by all World Energy Council member committees, the 2016 New Zealand energy issues monitor reflects a future energy system that promises change and captures the current and future challenges and opportunities faced by the energy sector. While this could describe any other energy issues monitor, New Zealand increasingly charts its own course from the rest of the world.

In a world and region dominated by concerns about commodity prices, subsidies, the on-going global economic fragility and the uncertain geo-political dynamics of regional integration, New Zealand’s energy executives stand out as being kept awake at night by energy market V2.0. What creates the uncertainties in the minds of New Zealand energy executives is not threat-based, but rather more opportunity-based. The **climate framework** and **market design** (previously innovative regulation) have this year been joined by **innovative transport** (previously electric vehicles) and **electric storage** as critical uncertainties. **Smart grids**, **extreme weather risks** and the **energy-water nexus** complete the complement of issues that are keeping New Zealand energy executives awake at night. This clustering combined with its companion signal of urgency is unique amongst its World Energy Council peers. Opportunities, albeit uncertain, dominate the New Zealand map.

As a new-technology taker, New Zealand energy executives are apparently in an increasingly reflective mode – how does the growing global energy sector complexity and the increasing pace of change occurring in the sector, play out in the

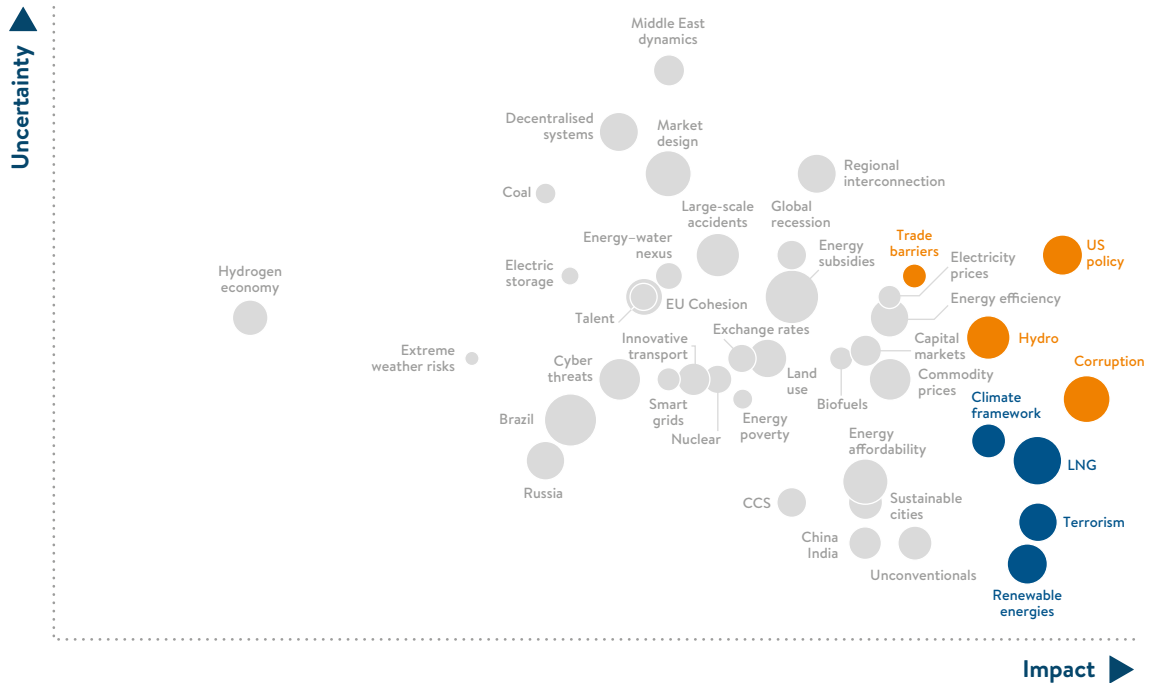
New Zealand context? One thing is clear – energy sector resilience – the challenges it creates and the new and innovative policy, finance, and consumer responses to achieve it are weighing on the minds of New Zealand energy executives. The map sends a clear signal to policy makers to keep up with unfolding technological developments and the rise of the prosumer in order to allow existing business models to adapt and compete, to ensure prices reflect costs.

With the passage of time since the last general election in 2014, concerns about energy prices and affordability have waned, but have not disappeared. Rather they have matured into an issue, alongside the perennials of **energy efficiency** and **renewable energies** that are keeping New Zealand energy executives busy during the day. Consistent with the recently released BEC2050 Energy Scenarios, energy executives are eyeing a plausible future for the sector that moves it from already being around 80% renewable, towards 90% plus, and the trade-offs and choices that would require to make this shift while retaining affordable energy.

Whether the current high levels of uncertainty around the **climate framework** will also begin to abate in light of the Paris Agreement and migrate into an issue that is more operational in focus, remains to be seen. But the early signals are there – **LNG**, **coal** and **unconventionals** have all commenced their passage to the bottom left hand corner of the map –the zone of irrelevance.- New Zealand energy executives seem to believe that a future of new innovative market, technological and regulatory models, combined with a future of renewable energies will define the future of the national energy sector.

This is an exciting future indeed. We hope that the quality of the conversations between business, policy-makers and researchers matches the challenges we face.

NIGERIA



Critical uncertainties for energy leaders in Nigeria include hydropower, corruption, US policy and trade barriers. With regards to action priorities, climate framework, LNG, terrorism and renewable energy are keeping energy leaders in Nigeria busy at work.

Nigeria has a huge **hydropower** potential, most of which still remains untapped and its further development is a part of Nigeria’s Renewable Energy Master Plan (REMP). One of the projects, the 700 MW Zungaru Project, once finished, will become the country’s largest hydropower project. Building works started in 2013 but legal challenges have been slowing its progress for a number of years, which may be contributing towards the uncertainty associated with this issue.

US policy is an issue that is continuously perceived with a high impact in the country. While it was an action priority for Nigeria in 2015, the issue is moving towards being a critical uncertainty in the country in 2016. The uncertain position associated with this issue could be related to the position of the newly elected President, Mr Muhammadu Buhari, on international relations with the US. Hopes are that the relations between the US and Nigeria can be improved under the tenure of the new president.³⁸

38. https://www.washingtonpost.com/opinions/hopeful-signs-from-nigeria/2015/07/23/07278892-3086-11e5-97ae-30a30cca95d7_story.html

President Buhari has also received a reputation on cracking down on corruption, another critical uncertainty in the country. A number of high powered individuals are currently being prosecuted and it is expected that the issue will consequently lose importance and become an increasingly weak signal in the coming years.

While **trade barriers** is perceived to be a critical uncertainty, it is interesting to note that **exchange rates** is positioned in a relatively central location – that is a neutral position in the Nigerian Issues Map. The Naira has been on a downward trend with foreign reserves down by more than 30% by the end of 2015 compared to January 2014. The continued low oil price environment is thereby posing a challenge to the country with approximately 90% of foreign exchange income being linked to oil revenues.³⁹

Renewable energy is an action priority for the country as it is seen as a solution to tackle the power crisis in a sustainable manner. The country has huge renewable energy potential with solar PV topping the list with an estimated potential of 325 TWh if merely 1% of the available land is utilised.⁴⁰ To put this into perspective - the current electricity generation of the country as a whole amounts to 3,500 MW with an electrification rate of 55.6% in 2012. The government has already introduced a number of measures to further promote the deployment of renewable energy sources. The Electricity Regulatory Commission of Nigeria has, for example, introduced feed-in-tariffs in 2012 to promote the renewable energy deployment (small / large scale hydro, wind, solar and biomass), with the largest tariffs being allocated to solar projects.⁴¹

Climate framework is another action priority that keeps energy leaders busy at work in Nigeria. The northern part of Nigeria has been affected by desertification partly driven by increasing rates of deforestation. At the same time other parts of the country have been affected by flooding exacerbated by the El Nino, which highlights the vulnerability of the country to changes in weather patterns.⁴²

Over the past year, **terrorism** has developed to be an action priority with a high impact in the country, having moved from a neutral position in the center of the Issues Map to the right bottom left in 2016. The main drivers behind the perceived impact of the terrorism issue are the activities of the Boko Haram militants, which have staged a number of attacks, mainly in the northern part of the country.

Nigeria is the largest oil producer in Africa and in the world's top five with regards to liquefied natural gas (**LNG**) production. The expansion of the oil and gas sector is however limited due to the lack of infrastructure. Gas flaring for example has been

39. <http://www.theguardian.com/global-development/2016/jan/07/nigeria-naira-devaluation-central-bank-currency-crisis>

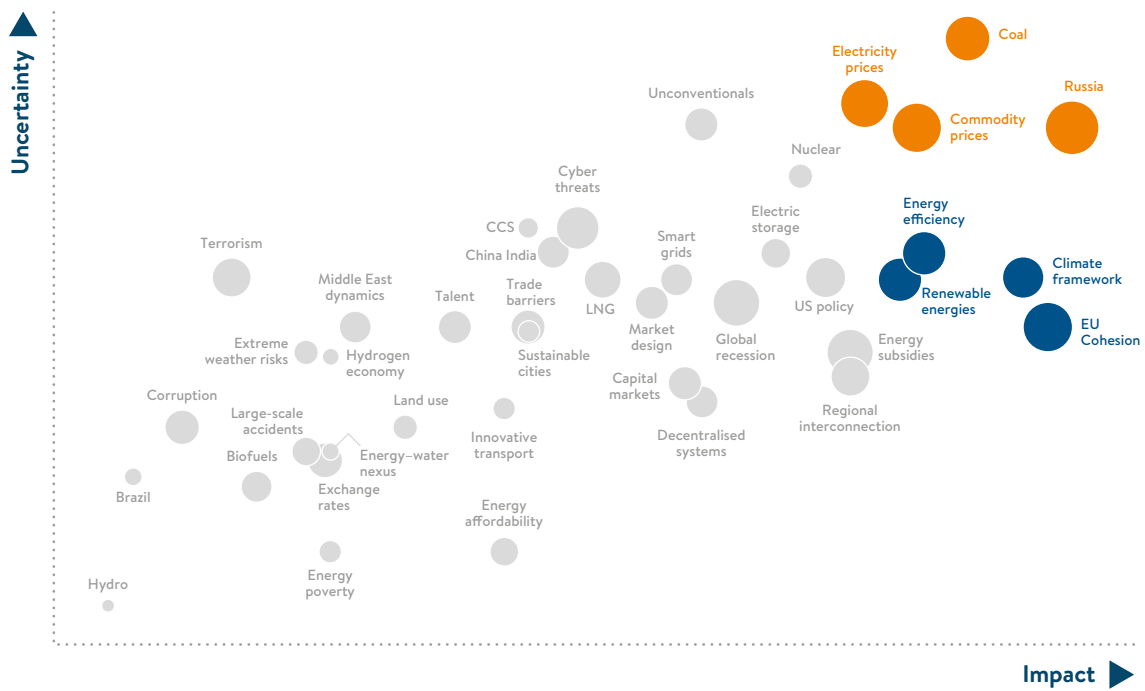
40. <http://community.irena.org/t5/The-Market/Renewable-Energy-Generation-Investor-Guide-Nigeria/td-p/455>

41. <http://community.irena.org/t5/The-Market/Renewable-Energy-Generation-Investor-Guide-Nigeria/td-p/455>

42. <http://allafrica.com/stories/201602222153.html>

estimated to have cost the Nigerian National Oil Corporation USD 869 million in 2014 alone. Action is required to further develop the oil and gas infrastructure in the country to ensure the competitiveness of the country as an exporter in the international market – particularly in a low-price environment for commodities.

POLAND



In 2015 the Polish energy sector was influenced by six main global, regional and national factors. The first global factor concerns the price slump on commodity markets – coal, oil and gas. The second international issue, which had a substantial impact on the sector, was the negotiations of climate frameworks on the COP21 in Paris.

At the regional level, the most influential fact was the adoption of the conclusions by the European Council concerning the new climate and energy policy framework and the new 2030 targets. The European Council endorsed: i) a binding EU target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990; ii) a binding EU target of at least 27% share of renewable energy consumed in the EU in 2030; iii) an indicative EU target of at least 27% of improving energy efficiency in 2030 compared to projections of future energy consumption based on the current criteria. Another issue of a regional reach was still unsolved the Ukrainian crisis and general geopolitical situation in Eastern Europe.

At the national level, two legislative oriented concerns were in the spotlight – the development of the Renewable Energy Sources Act (RESA) and new Polish Energy

Policy to 2050 (PEP2050). The RESA was finally adopted by the Polish Parliament and is to go into effect from the beginning of 2016. The PEP2050 is still under public consultation. All six developments are clearly reflected in the 2016 Issues Map for Poland.

Critical uncertainties in the Polish map include: **Russia, coal, commodity prices** and **electricity prices**. These issues are fully consistent with the context described above. **Russia** refers to the Ukrainian conflict and the risk in ensuring security of gas supply.

Coal is the issue that is associated with the highest value of uncertainty. The new endorsed EU's climate and energy 2030 targets combined with COP21 negotiations put pressure on the coal industry and raises uncertainties with regards to its future in Poland. More than 80% of installed capacity in Poland is based on coal and changes in the fuel mix may heavily affect the sector.

The global **commodity markets** more broadly (coal, oil and gas) are additionally under stress because of the decreasing prices and oversupply. While the slump in **commodity prices** may be positive for the consumers and the production industry, it negatively affects the energy sector. This is also another reason why the coal industry has been struggling with socio-economic difficulties.

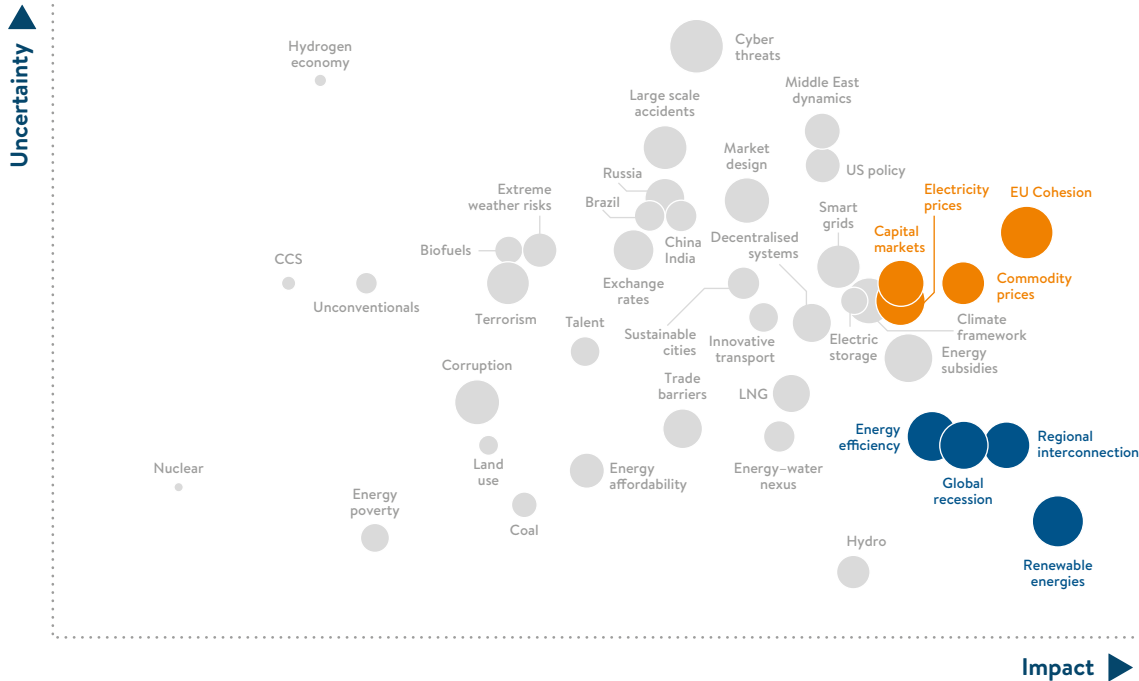
We can also observe decreasing trend for **electricity prices** on wholesale markets. The main reasons are cheaper primary energy sources (regardless of fuel type) and increasing shares of renewables with near zero short-term marginal energy production cost (wind, solar, etc.).

Four issues that keep energy leaders most busy at work are: **EU cohesion, climate framework, energy efficiency** and **renewable energies**. These issues are fully consistent with the context described above and are inextricably linked. The EU's newly adopted climate and energy 2030 targets, together with the passed RESA make these issues more certain, clear and ready for implementation.

The Polish map is very consistent with the regional (European) map. Seven of eight critical uncertainties and need for action issues are perceived exactly the same way in Poland and in Europe.

These are: Russia, commodity prices, electricity prices, EU cohesion, climate framework, energy efficiency and renewable energies. Coal is the only issue that is perceived with a substantial difference. This is an effect of coal resources and the strategic meaning of this fuel for Poland – both in the energy sector and the economy as a whole.

PORTUGAL



The Portuguese issues map reflects both the global, European environment and the domestic conditions, namely the commitments towards sustainability, financial stabilisation and economic recovery.

European Cohesion is the issue with greater impact in critical uncertainties, increasing in both impact and uncertainty compared to last year’s map. This is due to the financial crisis and socio-political stress that has affected the European economy throughout 2015.

Energy efficiency and **Renewable Energies** have a significant impact for energy leaders, but with reduced uncertainty in the latest issues monitor, which reinforces the fact that in Portugal more than 50% of generating capacity is from renewable sources. Both keep receiving political support, but further development requires the progress of other issues that remain in the critical uncertainties sector, such as **Smart Grids** and **Electricity Storage**, particularly required at the distribution level.

Market Design must be adapted, since increasing volumes of zero variable costs generation are not compatible with present marginal cost market pricing. **Regional Interconnections**, which are crucial for increasing renewable capacity, have less uncertainty in the latest findings, probably due to the European Commission’s commitment to support projects for stronger regional links between the Iberian Peninsula and France, as Portugal has been seeking for a long time (10% till 2020 and 15% in 2030).

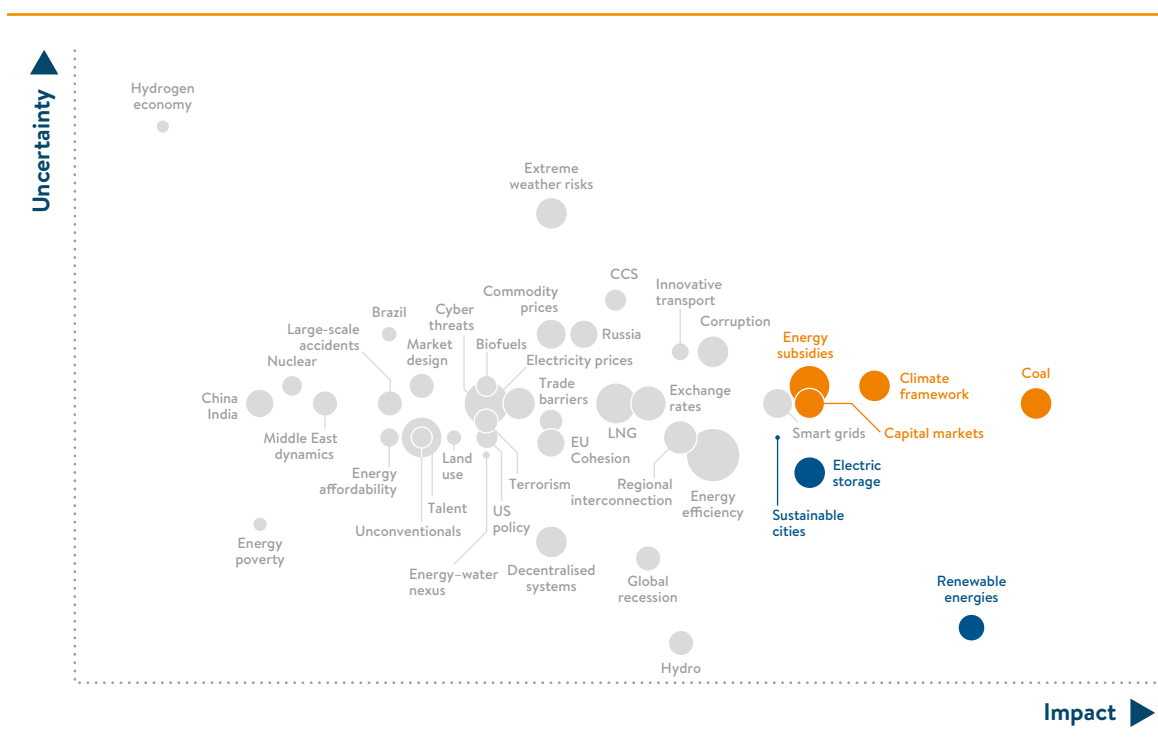
The approach of COP 21 increased confidence, as the setting of a new **Climate Framework** was felt this year as less uncertain than in previous years' publications. Also noticeable is the move to an area of much less relevance for **Unconventionals** and **Nuclear**, which almost became non-issues for the Portuguese energy leaders' perspective.

Energy affordability is now in the Weak Signals sector, a move that reflects economic recovery expectations. But **Market design** and **Smart grids** receive much more attention as well as **Electricity storage**, as a result of the high share of renewables in the electricity mix.

This share of renewables and the dependence on different supply sources explain why **Russia** and **Nuclear** issues have much less impact in Portugal than in the full European map; but **CCS** and **Hydrogen economy** are seen in both maps with high uncertainty and little impact, a finding that raises doubts for the contribution that these technologies may represent to carbon emissions' limitation.

In the World map, issues including **Renewable energies** and **Energy efficiency** receive high qualifications, similarly to what occurred in the Portuguese map, showing how they are globally important to the energy trilemma solution – to balance energy security, energy equity and environmental sustainability; but **CCS** in both maps is almost a non-issue, confirming the low expectations towards this technology.

SERBIA



Still in its long-lasting transition process, the economy of Serbia is suffering from the lack of investments in the energy sector, while energy consumption continues to rise.

Serbia's recent development in energy policy includes the new Serbian Energy Law which aims to ensure the transposition of the Third Energy Package of the EU, the opening of the energy market for competition and the restructuring of the power and gas sectors, which was completed in 2015.

In December 2015 the Parliament moreover adopted the new Energy Sector Development Strategy by 2025 with projections to 2030. This strategy incorporates the previously adopted national action plan for renewable energy sources to 2020. Serbia furthermore submitted its Intended Nationally Determined Contribution (INDC) to the UN. The INDCs declared reduction of the GHGs emissions by 9.8% until 2030 compared to base year 1990 emissions.

Changes are evident when this Map is compared with the earlier one for the year 2013, for example.

The Serbian energy sector is facing uncertainties concerning the recovery of the national economy to enable consumers to pay energy bills at prices that reflect the costs. These costs are expected to rise considerably to include both, the environmental protection measures and the subsidies to be paid for renewables. An effort by the Serbian energy sector to reduce its emission of GHGs puts additional pressure to the energy prices, thus further reducing affordability of consumers to pay their bills. Moreover, this may even put at risk the use of the domestic coal resources, thus increasing Serbia's import dependency on foreign suppliers.

Serbia is in need to increase security of gas supply by finding other means of gas import, after the "South Stream" gas pipeline project was abandoned. In the power generation sector, Serbia needs to refurbish its obsolete generation fleet based on coal, including new environmental protection systems to meet the EU environmental standards (in particular, Large Combustion Plants Directive and Industrial Plant Directive). Also, for the planned increase of the share of renewables in power generation adequate storage capacities will be necessary.

Low energy efficiency is one of the major challenges in the energy sector of Serbia, and is being ranked high in the priorities of its energy policy. The Law on the efficient use of energy is aimed to help establishing the fund to subsidise energy efficiency projects. While energy efficiency measures may contribute to reversing the trends in energy consumption to some extent, further deployment of renewables is expected to remain critical for action even if the current economic recession in Serbia eases. The existing feed-in tariffs for generation based on renewables and on efficient co-generation have proven to be attractive, but the regulatory framework has to be improved to ensure adequate return on investments.

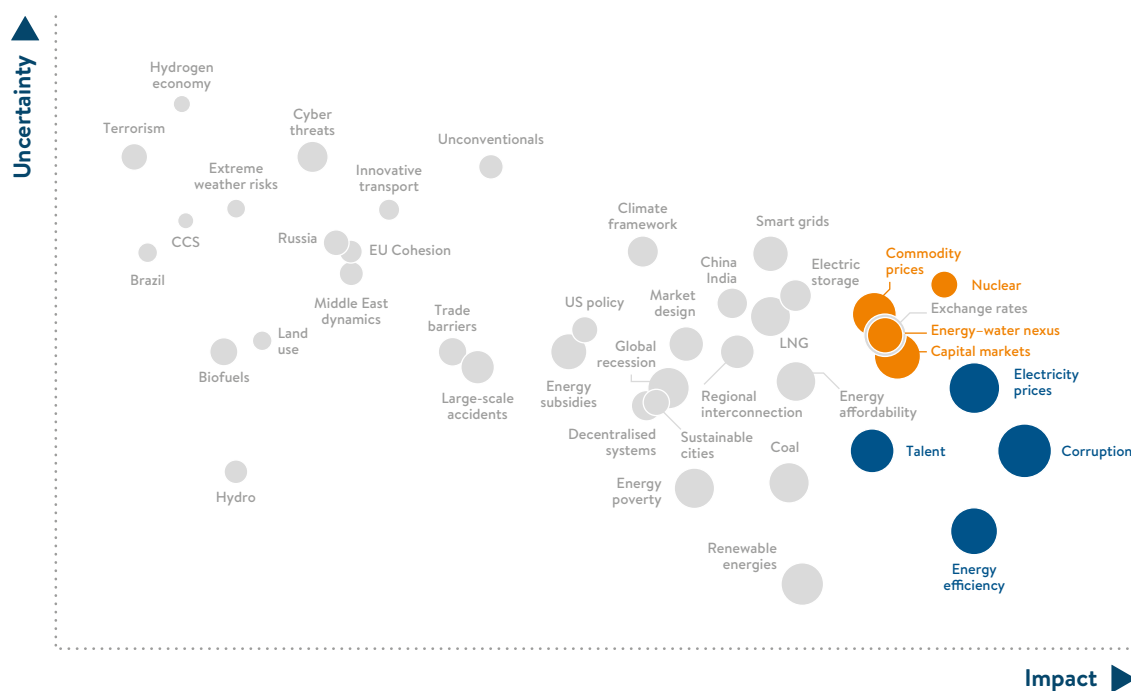
A comparison of the World Issues Map and the Serbian Issues Map does not show considerable discrepancy between major issues. The issue of coal seems to be an exception. The impact of the coal issue in Serbia is perceived high because of the environmental and climate concerns. If so in the Serbian Issues Map, the impact of

coal in the World Issues Map might be considered underestimated, bearing in mind the importance of coal in the future world energy mix. The same applies to the impact of the carbon capture and storage (ccs) technology.

Like in the World Issues Map, the impact of coal in the European Issues Map is well below that in the Serbian Issues Map. The same applies to the impacts of capital market, cyber threats, hydro, corruption, and some other important issues. Inversely, the impacts of market design, EU cohesion, Russia and some other important issues are ranked higher in the European Issues Map than in the Serbian Issues Map.

Serbia is 100% dependent on a single supply of natural gas via Ukraine, and is exposed to high risks of the current political crisis there. Even with its positive outcome, the risk remains because the contract on 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 about 70% of its electricity is generated by coal based thermal power stations. This issue is expected to be addressed during the accession negotiations recently opened between EU and Serbia.

SOUTH AFRICA



In 2015 three factors have had a major impact on electricity users in South Africa

- the high frequency of load shedding particularly in the first half of the year (load shedding is planned or controlled power outages in order to bring the demand into balance with the available supply)
- the proposal to increase the electricity price by over 25%
- the proposal to commit to building 9.6GW of nuclear power

Furthermore, given the reliance of the South African economy on commodities, the global collapse in commodity prices has resulted in a significant slowdown in the economy and growth prospects.

The concern around the electricity price, the possible nuclear power build programme and commodity prices have shown up in the Energy Issues survey – electricity prices in the action priorities and commodity prices and nuclear power in the critical uncertainties

Critical Uncertainties

The 4 issues arising as the major critical uncertainties are – **nuclear**, **capital markets**, **commodity prices** and the **energy-water nexus**. The first 3 issues are bound together. The South African Government has made it clear that it is intent on constructing 9.6GW of nuclear power as its next major electricity generation build programme. Whilst many agree that there is a need to build new base load capacity in order to replace aging base load coal fired power stations, there is a concern that the cost of the nuclear build programme may be something that the country cannot afford.

This concern is exacerbated when it is recognised that the state owned electricity generator has a weak balance sheet and will find it expensive to raise funding in the capital markets for any build programme. As a result one would then look to the South African Government for support and given that commodity prices have collapsed which reduces the tax revenues, the affordability of the nuclear programme has come into question.

It is interesting that the **energy-water nexus** is high in the critical uncertainties because it has not featured this prominently in previous surveys. The severe drought that South Africa has experienced may well have raised the focus on this issue.

Changes from last year

In the 2015 survey **climate framework** and **unconventionals** appeared high in the critical uncertainties. This year the perceived impact associated with the issues is perceived to be significantly lower. The reason for their slippage is mainly due to a shift in focus away from both issues in South Africa. The shift in the climate framework arises from the apparent lack of attention that this issue is receiving globally whilst for unconventionals the shift arises because the South African Government has put a hold on ‘fracking’ tests in the possible shale gas exploration areas for now. However,

all the environmental preparation work including the community consultation processes are allowed to proceed. The drop in oil prices has however caused many of the prospectors to slow down their activities in this sector.

Critical Action Issues

The 4 critical action issues for South Africa in 2016 are **corruption**, **electricity prices**, **energy efficiency** and **talent**. Corruption has become a major issue of concern in South Africa as it appears to become more pervasive. As explained in the context above, electricity prices and the concerns about punitive increases explain its positioning and energy efficiency has been on the list for actioning for many years now. Significant efforts have successfully reduced electricity demand but there is always scope to do more. Talent is new in the action list and this reflects the lack of suitably qualified and experienced people coming through into the South African energy industries particularly at the artisan and operator levels and the need to do something to improve the situation.

Changes from last year

The important change from last year is the decrease in attention on **energy poverty**. The reason for this shift is that in South Africa the focus has shifted to the broader issue of 'service delivery' with particular emphasis on water and sanitation. As a result energy poverty has been lost in the bigger picture. Currently for South Africa, the water and sanitation challenges are more pressing than access to modern forms of energy.

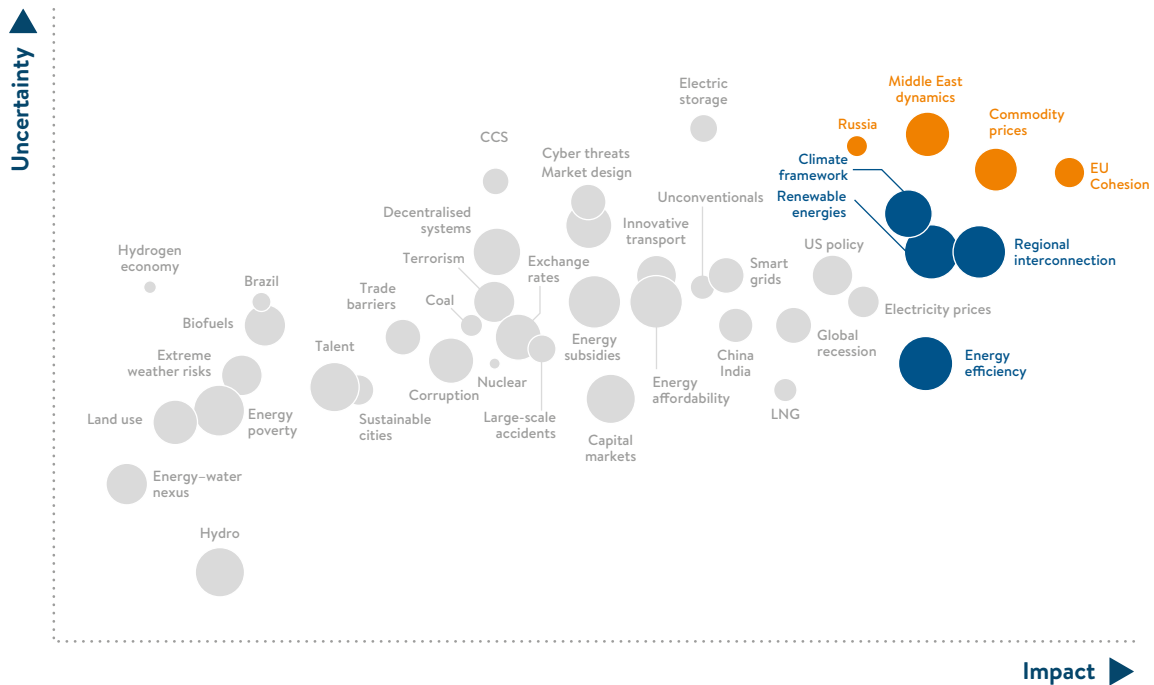
Comparison

When the South African uncertainties are compared with those identified for the World, the only common one is **commodity prices**. **Global recession**, **US policy** and **electric storage** do not have the same impact on life in South Africa. When the uncertainties in Africa are considered **corruption** and **talent** emerge as common issues although they are rather seen as action items for South Africa.

If the action items of the World are compared with those of SA then **energy efficiency** is the only common issue with **renewables**, **regional interconnection** and **energy subsidies** not seen as needing the same level of attention. For Africa the urgent action items are **energy efficiency**, **energy poverty**, **regional interconnection** and **renewable energy**. Again the only common issue is **energy efficiency**.

South Africa has had a very successful implementation programme for **renewables** which explains why this issue has a lower priority in South Africa. **Energy poverty** is a change from last year as discussed earlier and given the urgent need to sort out its local electricity generation shortage, South Africa is not paying too much attention to longer term regional interconnection.

SPAIN



The Spanish monitor reflects the influence of both global and local events which have been spotlighted in the national energy agenda.

Commodity prices has experienced an important growth in all the three dimensions this year: impact, uncertainty and urgency. The plunging oil price is one of the main drivers for this movement, triggered by (a) surging oil production from non-OPEC countries and (b) a weak demand in many countries. The weak oil demand can be associated with a smaller economic growth and a higher development of energy efficiency measures. In addition to this, the fact that the oil cartel OPEC is determined not to cut production must be considered.

This low price conjuncture could provide an opportunity for Spain to increase its industry’s competitiveness **EU Cohesion** has become the critical uncertainty with the highest impact this year (even higher than in the European Issues Monitor). The European Energy Union is observed as a key to ensure secure, affordable, competitive and climate-friendly energy, even though there is still significant uncertainty due to its early stage. The new 2030 EU Energy Package objectives are also seen to have a big effect in the Spanish national sector, which may be a further driver for the high impact associated with this issue.

Geopolitical tensions and regional conflicts have also defined the top critical uncertainties in the Spanish map. Although **Russia** shows a minor impact in comparison with last year’s monitor, it still remains as a hot spot in the Spanish energy

leader's agenda. **Middle East dynamics** has moved towards a higher impact/uncertainty area in this edition. The instability and conflict situation in the Middle East, being one of the main hydrocarbons production area, is a source of concern for the international community. The recent events in the Syrian Civil War, the emergence of the ISIS in Iraq or the agreement to a timeline for Iran's sanctions relief are clear examples of this reality.

The most important need-for-action issue in this edition is **Regional Interconnection**, keeping its high impact and reducing the level of uncertainty regarding last year's monitor. One of the main objectives of the European Energy Union project is the creation of a fully-integrated internal energy market, enhancing interconnectors which enable energy to flow freely across the EU, without any technical or regulatory barriers. Spain's electricity interconnection capacity remains very low at around 6% of installed capacity, in spite of the last 1.4 GW interconnection with France (the first new interconnection in almost three decades), considering UE's objective for 2020 of having at least a 10% interconnection of the installed power capacity.

In the case of natural gas, our physical interconnections with the North of Europe are also much lower than in other countries (e.g. it still remains at 5.2 bcm in both directions with France).

Climate framework keeps a prominent position as a need-for-action-issue, similar to the European and World's perception. The COP21 is expected to be a crucial milestone in order to search for a successor to the Kyoto Protocol. The Spanish energy leaders believe that any climate or energy policy must be coherent with the goal to increase industry's share of EU GDP to at least 20% by 2020. A stable and predictable energy and climate framework is essential to give European industries the necessary long-term security for making investment decisions.

Renewable energies and **energy efficiency** remain as top priorities in the national agenda, as well as in the European and Global monitors. The "National Energy Efficiency Plan 2014–2020" and the current transposition of the European Energy Efficiency Directive to the Spanish system, are some of the latest Spanish Government efforts to enhance energy efficiency measures. Moreover, the latest regulatory reform concerning renewable energies and the uncertainty about how the country will meet its renewables production target are having a big impact on these technologies.

Electricity prices and **US policy** are prime matters for the Spanish energy leaders too. The tariff deficit's containment makes this issue to reduce its uncertainty this year, although it is still one of the main subjects in the national agenda. Regarding the U.S. policy, the potential lift to the U.S. ban on exporting crude oil is a matter of crucial interest both for the Spanish and global industry.

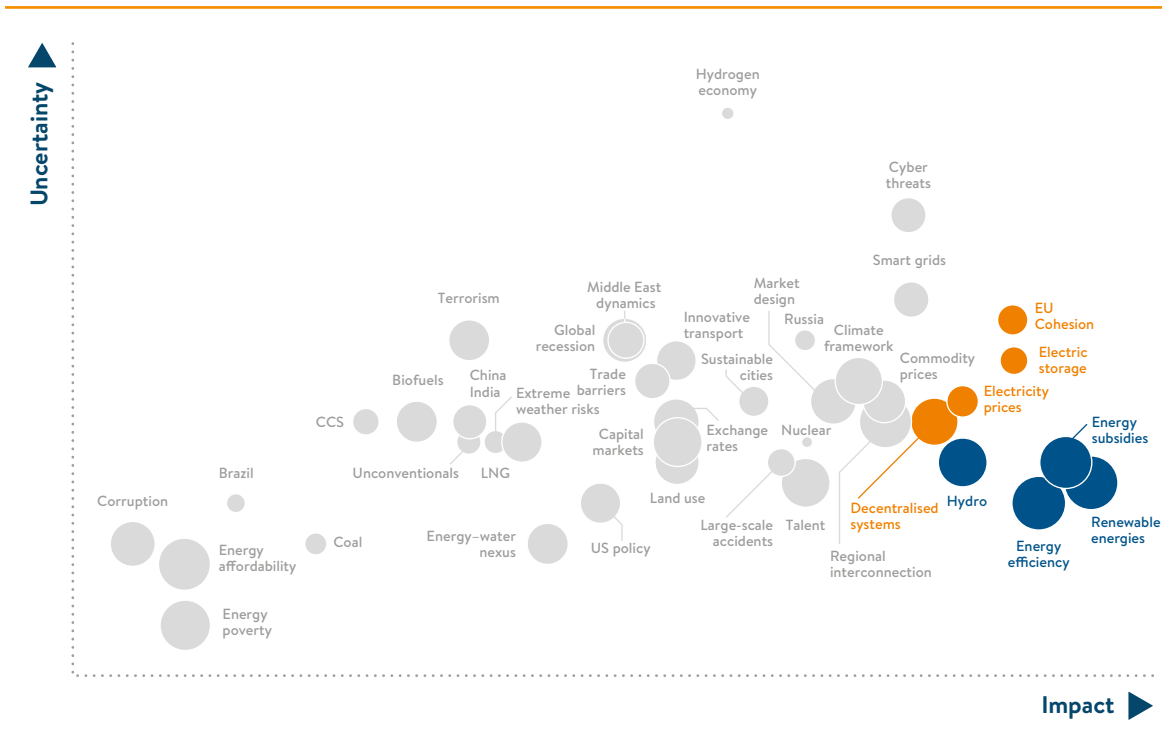
There have been certain issues moving towards a lower "uncertainty/need for action" area over the last period, such as **China/India**, **Biofuels** or **Nuclear**. The recent slowdown in China's energy consumption (its coal demand fell for the first time this

century, while crude oil slowed to its lowest level in a decade) might have brought about this movement. **LNG** has also reduced its impact level, despite the national interest on developing a Spanish gas hub and a potential LNG hub.

The comparison between the Spanish and European map shows multiple coincidences within the high uncertainty-high impact area. **EU Cohesion, Commodity prices, Climate framework** or **Regional Interconnection** are evidences of common priorities. On the other hand, there are certain issues which exhibit a higher degree of impact in the European monitor, such as **Energy subsidies** or **Decentralised systems**. Regarding the latter, it may reflect a higher interest from the European community to analyze the potential to use renewable energy sources available locally to cities, city districts or municipalities to satisfy their own power demand.

There is also certain parallelism on some issues when comparing it with the global monitor. **Energy efficiency, Renewable energies** or **Electricity prices** are placed on equivalent positions. It is highly interesting to remark that **Middle East dynamics** is perceived as much more critical in Spain than in Europe or the rest of the world

SWITZERLAND



In May 2011 – only two months after Fukushima – the Swiss Government drafted its ‘Energy Strategy 2050’. After consultation with all stakeholders, a final draft was presented to Parliament, which contains some changes in the sectors of transportation (European emission standards) and heating and cooling, but is still aimed at

a rapid change in electricity production. In December 2014 the proposal has been discussed by the first Chamber (National Council), in June 2015 by the second (Council of States). After the ongoing clarification of the differences between the two Chambers, the final proposal might be subject to a referendum, where Swiss citizens will accept or reject the strategy and its legal consequences. In the meantime, Switzerland has also introduced stronger levies on CO₂ emissions for heating, but not for the transport sector. By an early decision of Parliament in June 2013, the energy intensive companies can be relieved from feed-in tariff remuneration at cost.

The fact that the exchange rate issue appeared as a key issue in the Swiss Issues Map can be explained by the decision of the Swiss National Bank to discount the minimal exchange rate of the Swiss Franc and the connected strengthening of the currency.

Over the four years that Switzerland has been participating in the World Energy Issues Monitor national deep dive, it has become evident that Switzerland's critical agenda is quite stable.

Generally speaking, the petroleum and gas industries are concerned by the general trends towards a zero-emission society, which explains that the questions of **unconventional energies** and of a **climate framework** are important for them. Both topics are and have been subjects of high uncertainty and great impact. Both issues have however reduced in impact because of the low oil prices across the world markets.

Prior to COP21 the climate framework issue was of utmost importance to the electricity industry. The main reason for the importance assigned to this issue is the influence of feed-in tariff remuneration at cost in Germany on energy prices. State subsidy measures created an increasing distortion of final energy prices, with important impacts on neighbouring countries. As a consequence of heavy **subsidies**, the electricity market is a distorted one; a strong and functioning climate framework could be a means to partly reintroduce an undistorted market. This hope covers the equally important critical uncertainties with high impact as energy subsidies, energy prices and renewable energies. For the latter, it is remarkable that they are reaching more and more the need for action quadrant.

The gas industry increasingly views gas as a renewable energy source due to the increasing shares of biogas in the conventional gas supplies. It is however the energy storage aspect of gas that is increasingly being highlighted by the Swiss gas industry and which will increasingly play an important role in the gas network, particularly when considering the convergence of gas, electricity and heat networks. This also explains why hydrogen economy and sustainable cities have increased in importance over the last year.

Electric storage is a top priority and key uncertainty in Switzerland. The water stored in its reservoir lakes has played an important part in generating hydropower, but these are no longer profitable under the current circumstances. Even though **hydropower** is the most accessible renewable energy source in Switzerland, there is a risk that the potential is not harnessed, as it will be difficult for this energy source to compete against other highly subsidised energy sources. At the same time

Switzerland has to decide whether there is the public acceptance to enlarge the storage capacity of the existing reservoir lakes.

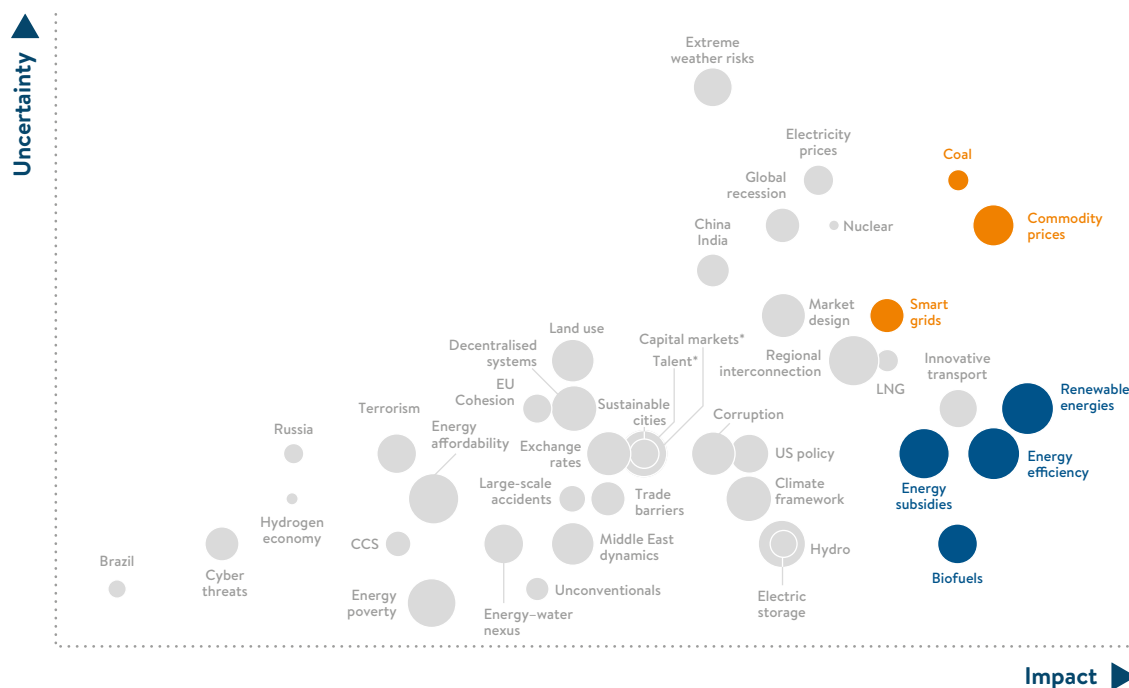
In this context it is interesting to note that while electric storage is a critical uncertainty in Europe and in Switzerland, large scale hydro only reaches the weak signals area in Europe, whereas it is a clear need for action topic for Switzerland. This discrepancy may be explained by the need to harness the large hydropower potential in Switzerland, whereas electric storage in Europe in general is viewed as a tool to develop the grid resiliency to intermittent power sources.

Nuclear has lost weight concerning critical uncertainty and impact over the years. The Swiss energy strategy does not propose closure of existing nuclear power plants, but has abandoned the construction of new ones based on today's technology (generation III). However, a first nuclear power plant (Mühleberg) will be shut down in 2019, based on a decision by its owners.

During three years, **smart grids** have developed a trend of reduced uncertainty towards becoming a need for action topic, whereas **decentralised systems** are still perceived as a critical uncertainty with a high impact. In the newest iteration of the Swiss Issues Map this relationship is however inversed. While smart grids are still perceived with a certain degree of uncertainty, the possible development of decentralised systems is increasingly becoming important.

Switzerland's energy leaders are positioning **energy efficiency** in the 'need for action' space, as the energy system is supposed to change from a producer-centred to a consumer-centred one. In the newest iteration of the Issues Monitor this issue is also considered a need for action issue at the European level.

THAILAND



Thailand has the Thailand Integrated Energy Blueprint (TIEB) which is aimed at developing a single energy blueprint, which incorporates all existing energy plans. These plans include those for capacity development, alternative energy, energy efficiency, and gas and oil projects. This is the first long term master plan for the energy sector. It sets the goals for Thailand’s energy policy over the next 21 years which will focus on energy security, fair energy pricing and eco technology.

The Integrated Energy Blueprint consists of 5 master plans that form the pillars of Thailand’s energy development strategy: 1) Energy Efficiency Plan, 2) Power Development Plan, 3) Alternative Energy Development Plan, 4) Gas Plan and 5) Oil Plan. These plans are in line with the goals of the Association of Southeast Asian Nations (ASEAN) and will support Thailand and the Asian region to fulfill the security, prosperity and sustainability objectives.

In line with Thailand’s long term energy plan set out in the Integrated Energy Blueprint, the Issues Map for Thailand shows that **energy efficiency**, **renewable energies** and **energy subsidies** are key topics of importance to the Thai energy leaders. Indeed, energy efficiency and energy subsidies are also important topics at the global and regional level while **renewable energies** are becoming increasingly important across all levels (national, regional and global).

With regards to **energy efficiency**, one of the top priorities of the Ministry of Energy is to reduce the energy intensity of the nation by 30% in 2036 compared to the base year 2010. This shall be achieved through subsidy removal, including diversion to direct subsidy, and enforcing mechanisms for more productive use of energy across

all domains. Greater energy efficiency also increases competitiveness, while helping to mitigate pollution and greenhouse gas (GHG) emissions responsible for climate change.

With regards to **renewable energies**, the target from the Alternative Energy Development Plan (AEDP) prioritises power generation from waste, biomass and biogas. The AEDP 2015 overall target is to increase the share of renewable energy to 30% of final energy consumption in 2036. This includes the utilization of renewable energy for electricity generation, heat generation and biofuels. AEDP is employing a new feed-in tariff (FIT) which replaces the former adder program that has been in place since several years. The FIT rates also favour smaller size systems (less than 1 MW) which is in line with the government direction to promote renewable energy uptake in communities.

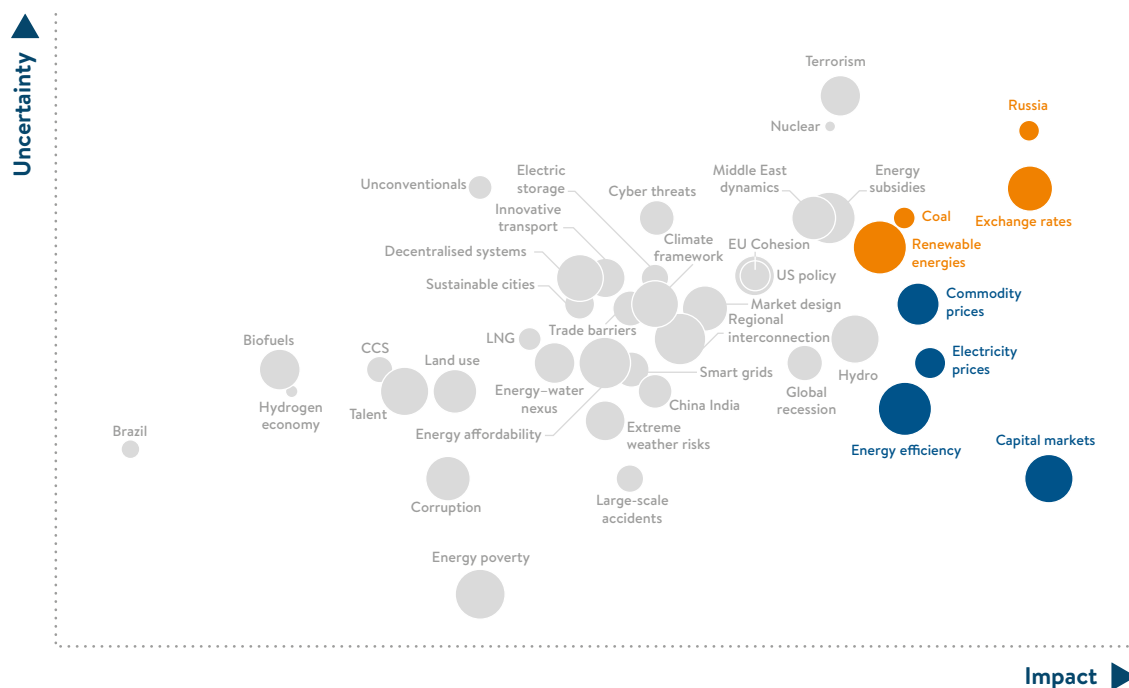
With regards to **energy subsidies**, Thailand has been gradually reducing fossil fuel subsidies in order to ensure that fossil fuel prices better reflect actual costs and do not distort the market mechanism which will ultimately encourage the efficient use of energy. Thailand has already removed liquefied petroleum gas (LPG) subsidies. However, to alleviate the impact of the increasing LPG prices for lower-income households and food hawkers and vendors, the government still allows them to pay at 18.13 Baht/kg. This is supported by Thailand's national oil company (PTT) and the total value of subsidies is about 50 million baht/month. As for other subsidies, Thailand still subsidises the prices of ethanol – blended gasoline (Gasohol E20 and E85) using the government Oil Fund mechanism and monitored by the Ministry of Energy in order to promote the use of renewable energy and to reduce oil import dependence.

'**Commodity prices**' is also one of the top critical uncertainties in the region and Thailand. The Government of Thailand tends to pursue national measures to solve the problem by liberalising the price of commodities. However, this issue must not place an excessive burden on the general public or affect the national income structure and energy fund unreasonably.

In addition, **liquefied natural gas (LNG)** is still a critical uncertainty for Thailand's energy leaders because LNG *imports* will help to offset the loss of natural gas from Myanmar whose gas *supply* contracts are expiring over the next 10 years. In Gas Plan, Thailand has set a target to increase import LNG by 71% in 2036 through LNG terminal.

A surprising observation is that China is more important to ASEAN countries compared to the rest of the world. China expanded its FDI to Southeast Asia after the global financial crisis in 2008, cooperation in this field developed to a new level, extending from energy trade to energy resource exploration and related infrastructure-building. The extent to which China's energy resource cooperation with Southeast Asian countries can develop securing energy or resource supply chains, increasing or diversifying their asset base, and enhancing their profits or market share. On the other hand, **Brazil** is a weak signal and a less important threat to Thailand as displayed in the Thailand Issues Map, the region and the world.

TURKEY



In Turkey, geopolitical thinking is a key determinant of how the energy landscape is perceived by energy leaders. The decision makers, investors and business owners of the country are still very much committed to keeping the country’s unique geography as the centre point of energy policy, and energy as the centre point of its foreign relations.

Consequently, much of the survey’s data mirrors the developments of the country’s neighbouring regions, most closely that of Europe, and the repercussions of the global economic conditions. In this respect, public opinion with regards to energy shares common concerns with Europe over Russia, commodity prices, and the need for action for renewable energy sources and energy efficiency.

The primary conclusion that can be rendered from the survey results is that Russia and the diplomatic relations with Russia are at the epicentre of the country’s energy concerns. Having limited domestic energy resources, $\frac{3}{4}$ of the country’s primary energy demand is dependent on imports. Turkey has to import 93% of its oil and 98% of its natural gas that it consumes. More than half of this gas is imported from one source, namely Russia, which puts Russia into a very crucial position for Turkey’s energy supply security. Turkey also relies on this imported gas to generate almost half of its electricity. Hence, Russia indirectly influences $\frac{1}{4}$ of the generated electricity. Within this perspective, the diplomatic crisis that has escalated between these two countries in 2015 has caused a wave of anxiety over the energy sector, rising

concerns such as potential energy cuts similar to those that Ukraine has experienced in the previous years.

The deterioration of diplomatic relations with Russia also spurred on further attempts to diversify energy sources and prioritise natural resources, most notable one of which is coal. As mentioned above more than half of Turkey's electricity is derived from imported gas, and although there are projects on hydro, coal remains the base for national energy production. However, despite having gained importance in energy policy-making in the previous decades, coal remains a critical uncertainty in the heads of sector leaders due to the lack of incentives despite the prominence given to it. So far there have been very few tangible attempts in encouraging investment in coal production. Still coal remains a centre point in Turkey's attempt to decrease dependence to foreign energy import. The aftermath of COP21 is another point of uncertainty as the investors are currently more or less in the dark about the measures that will be taken against CO₂ emissions, and consequently on coal production and coal based electricity generation.

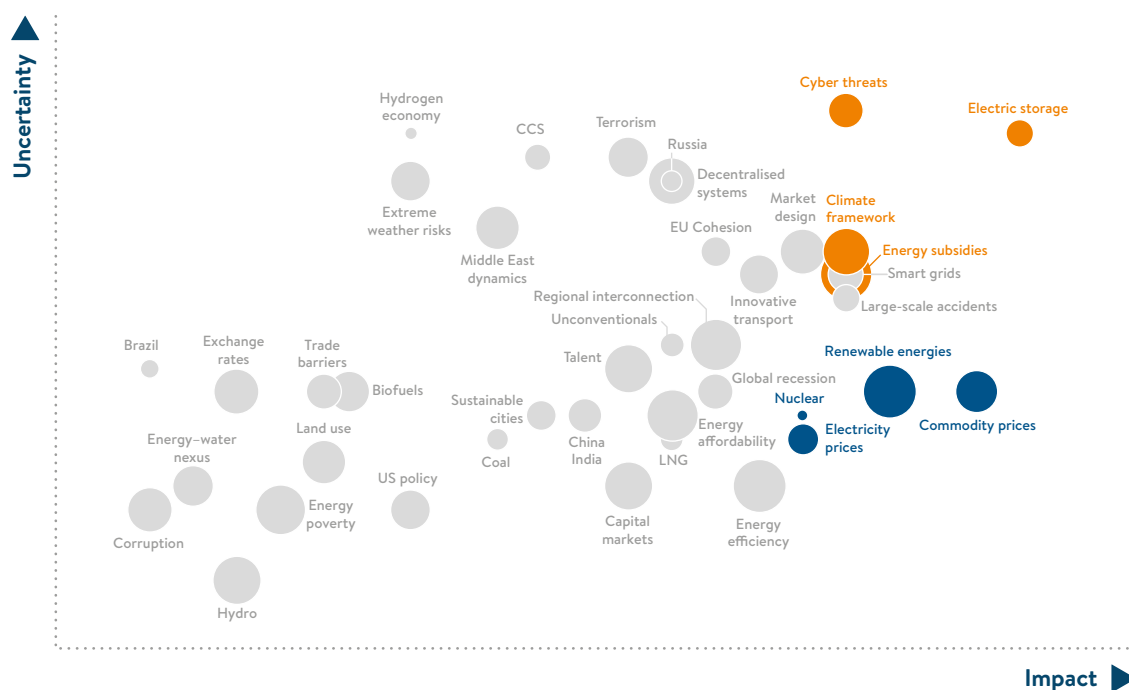
The survey also attests that renewable energies are another issue that remains uncertain within the energy sector, causing remarkable concern. Although the development of renewable energy in Turkey has been notable, a huge potential remains unutilised especially with regards to hydro, wind and solar. The industrial leaders expect more support from the government in terms of subsidies, feed-in tariffs and other support mechanisms. Fortunately attempts to solve this issue are underway. One of the first public comments received from the newly appointed Minister of Energy and Natural Resources' was that renewable energy will be given the utmost priority.

Volatile exchange rates are another critical issue that the energy investors are uncertain about. Generally, big energy projects in Turkey are financed through three channels: (1) equity transfers, (2) soft loans and (3) financial markets – and generally Turkish investors prefer international loans. The fluctuation of the major currencies of the world, especially against the Turkish Lira, presents a massive problem for investors since their investments and loans themselves fluctuate in value. This causes the investors to shy away from long term investments that are crucial for the energy sector. Consequently, there is an urgent need to answer the question of finding alternative means of financing investments.

With regards to the action priorities, energy efficiency remains a critical issue that demands urgent action according to energy leaders. Although large scale attempts to address this issue had been undertaken, they have simply fallen short on producing a remarkable difference – Turkey's primary energy intensity still lags behind the OECD countries. Thus the survey answers show that the decision makers believe there is still much to be done for improved energy efficiency – tangible actions that will have positive outcomes are required.

Also identified as a top action priority, is the capital markets issue. The energy industry anticipates a new approach from the government which prioritises

UNITED KINGDOM



For this 2016 edition of the Energy Issues Monitor, UK Energy Leaders have expressed a distinctive view on the key critical uncertainties in the energy landscape, diverging from the overall EU position.

Systemic uncertainty associated with the EU's relationship with **Russia**, and its possible impact on the security of gas supply to Europe, remains *the* critical issue in a European context, while political **cohesion of the European project** comes in a close second, but neither of these issues give significant concern from a UK perspective.

In the UK and Europe, changes in global economic activity, particularly reduced levels of growth in China, and the **fall in oil and gas** prices have resulted in a marked reduction in concern over **energy poverty** and **energy affordability** as **electricity and gas** prices decrease and cease to be at the forefront of political rhetoric and concurrent media interest as they were at the time of the May 2015 General Election. **Energy efficiency** remains a key concern in Europe and in the rest of the world, while in the UK there has been a notable decline in both the criticality and perceived need for action in this area, as the economic drivers for high cost efficiency measures fall away.

Post the General Election, the UK electrical **market reforms** continue to take effect and changes to the Government's energy policy with respect to reducing **subsidies** for **renewable energy** and its support for **nuclear power** is now clear. It is therefore interesting that **access to capital**, where a significant need for action was

perceived in 2015, is no longer viewed as a high priority, given the substantial levels of investment required in the UK energy market.

Fossil fuel prices have declined significantly, with continued anticipated abundant supply for the foreseeable future and, although there are clouds on the horizon of oil and gas geopolitics, fuel supply appears secure. The introduction of new electrical generation capacity to replace old nuclear and coal-fired plants needs to be managed in order to ensure security of generation capacity, and clarity and stability in government policy is required to enable the industry to do this. Since the last report, UK **energy security** has seen a marked refocusing on to non-industry-related external threats such as those from **terrorism** and **cyber attacks**, whether individual or state-sponsored.

Topping the list of critical issues from a national perspective is **electric storage**, which is connected to an anticipated expansion in the use of, and increasing dependency on, weather-dependent **renewable energy technologies** and, associated with this, a significantly increased level of interest in **decentralised systems**. These offer the possibility of a radically different model of locally generated energy supported by storage, interconnection and demand response assisted by smart metering and intelligent applications and appliances.

innovative solutions for the capital markets, solutions that would enable a more preferential investment environment. The unsettled and insufficient capital markets create concerns for the big energy projects and are the underlying reason behind delays experienced in the delivery of some of the projects. The falling electricity prices are additionally a factor that reduces the appetite of investors in the generation sector, which again calls for priority actions.

The recent upheaval with regards to commodity prices also stimulates unrest for the energy leaders in Turkey, though the solution lies at a more global level. As a matter of fact, Turkey benefits from the relatively low oil and gas prices. For example, most of the natural gas producing arrangements are linked with the oil prices and this causes additional relief for the government budget, trade deficit, and investors in Turkey. Yet, as the low oil prices undermine investments in the ongoing and planned exploration and development projects, Turkish energy leaders are anxious about the possible spikes in the near future.

During the last three decades the electricity demand in Turkey followed a very high average (at least twice the OECD average) and there had been a very close race between generation capacity increase and actual demand, which resulted in relatively higher electricity prices guaranteeing high profits and satisfying rate of returns. But due to concentrated huge investments and slowing demand increase, there had been a substantial spare capacity. This caused an inevitable drop in electricity prices. Coupled with the rapid loss of value in Turkish currency in 2015, these factors contributed towards the demand urgent action associated with the electricity price issue.

Although not as urgent as the above mentioned issues, Middle East dynamics result in additional concerns for energy leaders in Turkey. Being a neighbour of the Middle East, the turbulences and the diplomatic crises stemming from the region are negatively affecting the economy and investment climate, although Turkey is a relatively stable country. It can be argued that most energy news within the country is focused on terrorism's potential effect on energy, signalling a need for a rapid action to appease the energy sector.

by

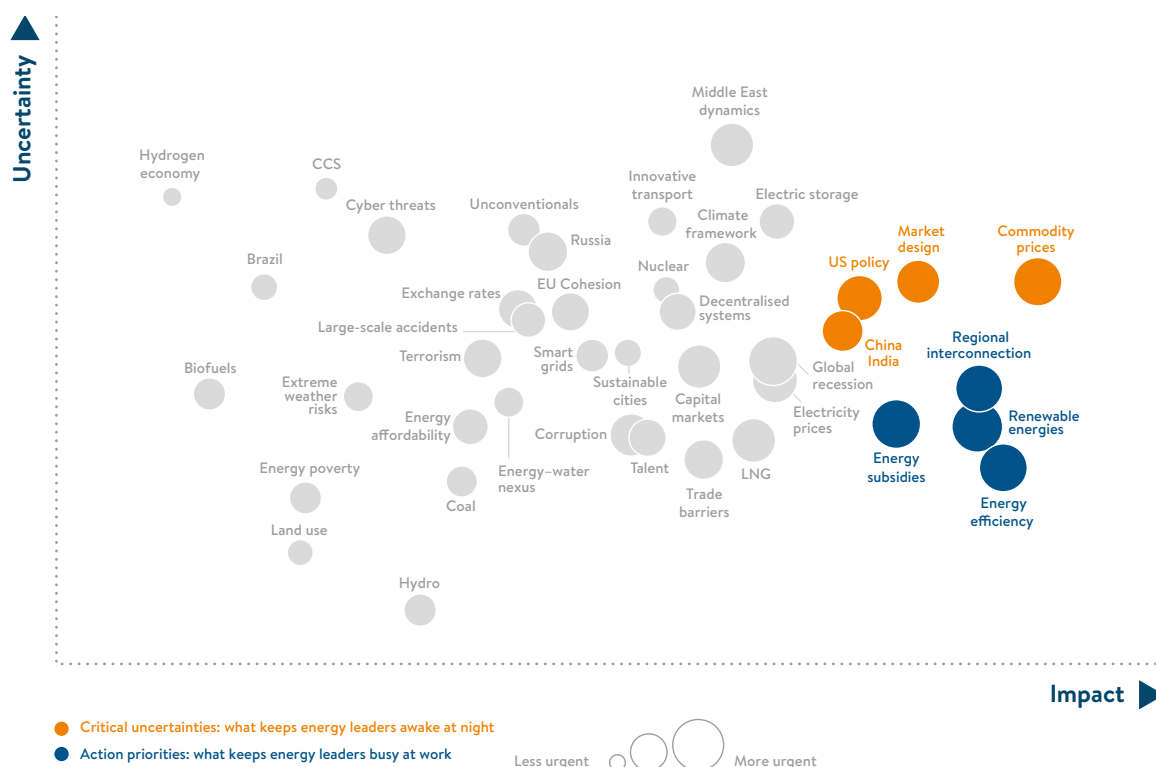
Chapter four

Assessing the Future Energy Leaders' agenda

FUTURE ENERGY LEADERS – 2016

The Council’s Future Energy Leaders - FEL-100 - are a global community of young professionals who share a commitment to shaping the global energy future. Made up of 100 carefully selected young professionals from diverse sectors, in over 40 different countries, the FEL-100 represent the future of energy leadership. They participate in network activities through a designated programme that enables them to further their experience, knowledge and skills in an energy-focused environment, contributing to the Council’s global dialogue and helping to shape energy solutions for tomorrow.

The World Energy Council looks at its community of next generation leaders to inform the energy debate through their fresh thinking, innovative ideas and new approaches to business.



The Future Energy Leaders’ (FEL) issues monitor reflects the influence of both global and local events which have been spotlighted in the international energy agenda. It may explain the great similarities with the global monitor.

The position of **commodity prices** is a clear example of this resemblance. It has experienced an important growth in all the three dimensions this year: impact,

uncertainty and urgency, becoming the monitor's top critical uncertainty. The oil price falling is one of the main drivers for this movement, triggered by a weak demand in many countries due to a lower economic growth and a higher development of energy efficiency measures, coupled with surging non-OPEC countries production. Additionally, it may reveal the oversupply and low price of coal as well as the enhancement of conventional energy resources in the electricity mix.

Renewable energies and **energy efficiency** remain as top need for action priorities in the FEL's agenda, as well as in the Global monitor. FEL's urge current energy leaders to reinforce the international commitment to move towards a low-carbon energy model and to boost energy efficiency as a key element to enhance growth, sustainability and decrease each country's energy dependence rate. **Energy subsidies** has moved towards a higher impact area over the last period, echoing the FEL's concern about phasing out inefficient fossil fuel subsidies in order to support the implementation of more sustainable measures and the development of renewable energies.

Market design and **electric storage** are still top priorities in this edition with a high uncertainty degree for the FEL Community. It might reflect the attention of the young professionals to innovative policies and further technology development which enable a higher renewable energy share.

There is a cluster of energy geopolitics and regional issues placed as critical uncertainties that reveal the FEL's concern for including them in the energy leader's agenda. **China/India** has increased its uncertainty and decreased on impact. The recent slowdown in China's energy consumption or the Indian government's announcement about increasing coal production and gradually decreasing its imports on this resource might help to understand this movement. Nevertheless, the huge energy consumption of both countries is definitely leading future forecasts and it will play an important role on commodity prices.

US Policy is also perceived as a critical uncertainty. The potential lift to the U.S. ban on exporting crude oil or the strengthening of the USD and its influence on changes in oil prices may be evidences of this viewpoint.

Regional Interconnection has emphasised its impact's perception over the period, aligned with its position on the world's monitor. International cooperation is understood to be absolutely required to ensure the security of supply under precarious conditions and to serve as the basis of a solid regional energy market.

Climate framework maintains a prominent position in terms of impact, similar to the World's awareness, having reduced the uncertainty's perception regarding last year's monitor. The COP21 was expected to be a crucial milestone in order to search for a successor to the Kyoto Protocol as a universal and legally binding climate agreement. A solution to the current global warming and the emission of greenhouse gases must be on the top of the list of current leader's agenda.

Other issues that have experienced a larger movement towards a higher impact area over the last period have been **corruption** and **talent**. Regarding this last one, its position on the FEL map reflects the international attention over the energy sector

to attract and retain both young and senior talent in order to fulfil the requirements of the energy trilemma.

In the weak signals area, the FEL's monitor shows several coincidences with the world one. **Biofuels** and **land use** are both placed in this zone. FELs understand that low oil prices decrease biofuels competitiveness, for example on the transportation sector, and it also has a certain nexus with land use in terms of agricultural services.

Chapter five

Methodology

The World Energy Issues Monitor is based on an annual survey, comprising 41 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 2016 monitor is based on insights from over 1200 energy leaders from 90 countries.

The data for the 2016 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. The resulting product is used as a report, an interactive monitor (www.worldenergy.org/data) for tailored results as well as for presentations in meetings and events.

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 John Bourne by emailing bourne@worldenergy.org.

THE INTERACTIVE ENERGY ISSUES MONITOR

OVERVIEW

Tailor monitors with the issues most important for you; explore the evolution of critical issues across years and in different regions; and download the results in the interactive issues monitor on www.worldenergy.org/data

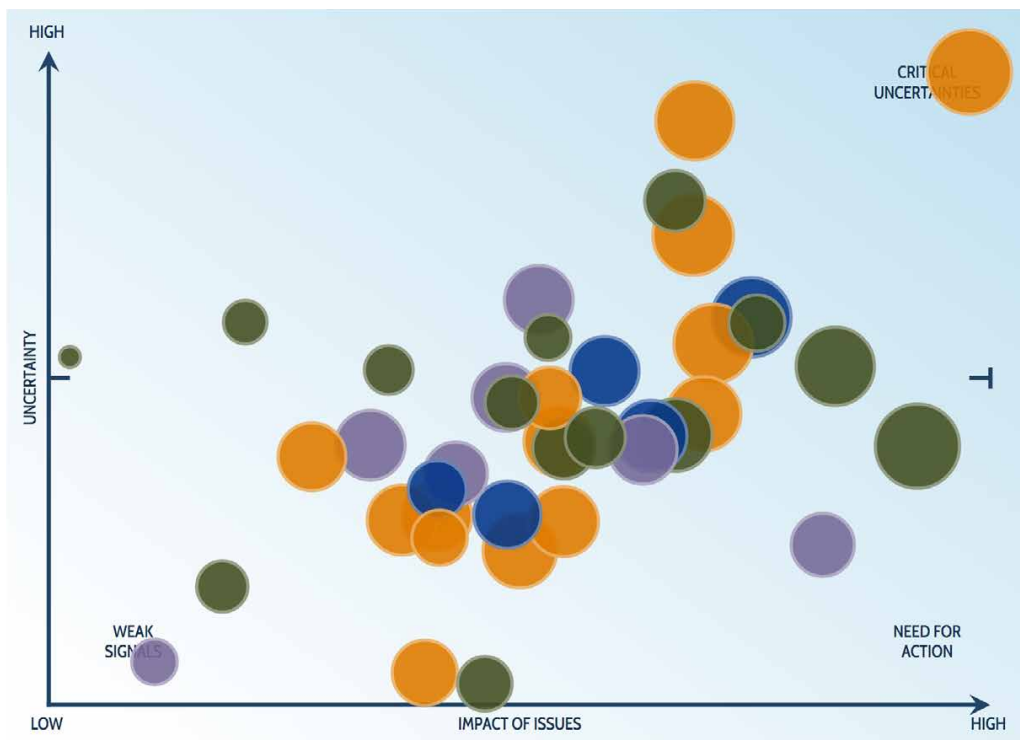


TABLE 1: THE WORLD ENERGY ISSUES

Macroeconomic Risks & Vulnerabilities	
Global climate framework agreement	Global climate negotiations and their outcomes (COP 21 and beyond).
Large-scale accidents	Past and potential large-scale accidents and resulting implications, such as the Fukushima nuclear disaster and the Deepwater Horizon oil spill.
Global recession	Ongoing effects of recession, including pressure on economic growth rates and macro-economic policies.
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/volatility – oil, coal, nat. gas	High volatility & inflationary/deflationary risk regarding energy and energy-related commodities including oil, coal, natural gas, metals and agriculture.
Electricity prices/volatility	High volatility & inflationary/deflationary risk regarding electricity prices.
Exchange rates	Exchange rate fluctuations and currency devaluation risks on energy operations and investments.
Energy-water nexus	Competition for water resources and water availability due to changing weather patterns and its effects on energy production and supply.
Land use & availability	Access to the required land for the supply, transport and distribution of energy and the social licence to operate value chain activities.
Talent scarcity	Shortage of skilled talent. Particularly from higher education STEM (Science, Technology, Engineering and Mathematics) subjects.
Energy poverty – access to energy	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/India	China and India affecting energy markets, technology and global governance.
Brazil realising its potential	Ability to realise its potential as a driver for regional energy markets and integration.
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 in the area including lasting effects of Arab Spring.
US trade and policy influencing global energy markets	US driven innovation and policy influencing global energy trade, market dynamics (gas, coal, oil) and relevant institutions (e.g. COP, IMF, OECD).
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 interconnection	Converging energy policy to overcome unequal distribution and ineffective allocation of energy resources (e.g. interconnectors, pipelines, trade platforms).
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 taken to scale.

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)	CCS is an 'end of pipe' technology that prevents large quantities of CO ₂ to be released into the atmosphere and is to date the only technology available to utilise and mitigate greenhouse gas emissions from large-scale fossil fuel use in 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.
New modes of 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	Energy released from nuclear reactions (fusion/fission) used to generate steam to power turbines for electricity production.
Hydropower	Electricity generated from machines/turbines run by moving water.
Unconventional fossil fuels	Shale gas, oil shale and other 'unconventionals'.
Liquefied natural gas (LNG)	Natural gas (mainly methane) that is converted into its liquid form for ease of storage and transport.
Coal	The role of coal (lignite, anthracite, sub-bituminous, bituminous) as an input to the energy mix.
Renewable energy	Energy created from renewable sources including solar, wind etc.
Biofuels	Fuel generated from biological matter including plant biomass or vegetable oils.
Hydrogen economy	Overcoming barriers to realising its potential.

PROJECT PARTICIPATION

Thanks go to all the World Energy Council national member committees for their active participation in the development of the 2016 World Energy Issues Monitor. Further thanks go to the World Energy Council regional Vice Chairs and Regional Managers for their support in the regional assessments and to each of the energy leaders, experts and policymakers who kindly provided their insights on an anonymous basis.

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