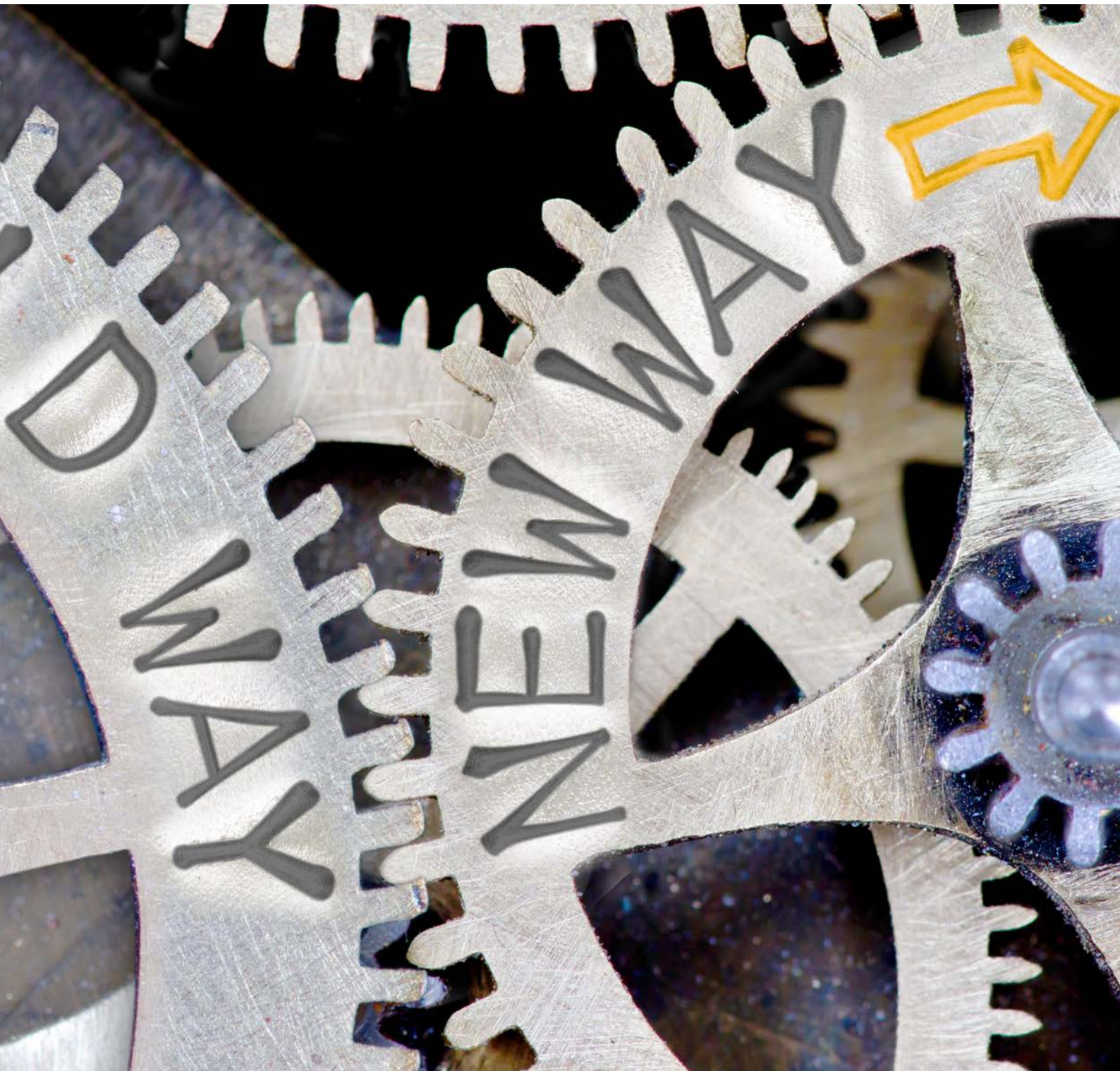
WORLD ENERGY COUNCIL

World Energy Issues Monitor | 2019

GLOBAL AND REGIONAL PERSPECTIVES



ABOUT THE WORLD ENERGY COUNCIL

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

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

Further details at www.worldenergy.org and @WECouncil

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ABOUT ISSUES MONITOR

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

This tenth iteration of the monitor is based on insights provided by more than 2,300 energy leaders to provide 50 national assessments across six world regions.

In addition to this report, the interactive online Issues Monitor tool allows the visualisation of the data that underpins the Issues Maps. This tool has been developed in collaboration with our Project Supporter ARUP.

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OVERVIEW

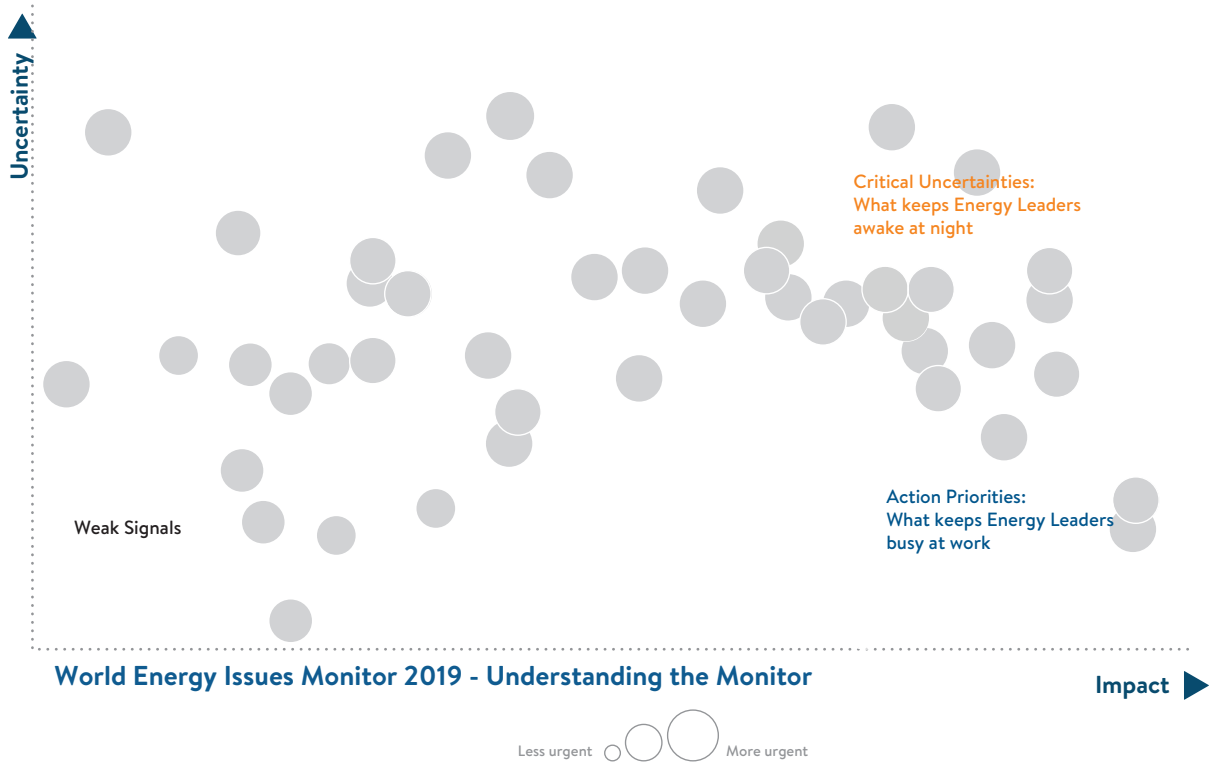
This is the tenth consecutive year of the World Energy Council's (the Council) annual survey of key challenges and opportunities facing energy leaders in managing and shaping Energy Transitions. This year's Issues Monitor report provides seven global maps[1], six regional maps and fifty national maps. These maps have been developed by analysing the responses of nearly 2,300 energy leaders, drawn from across the Council's diverse and truly global energy community[2].

The Council's Issues Monitor identifies the strategic energy landscape of specific countries and regions in the world, through an analysis of 42 issues affecting the energy system. It provides a **unique reality check and horizon scanning** of persistent and emerging concerns involved in whole energy systems transition. This year's report welcomes a significant increase in both the participation of global leaders (up over 75% from 1,300 to nearly 2,300) as well as the participation of 86 countries.

Each Issue Map provides a **visual snapshot** of the uncertainties and action priorities that energy policymakers, CEOs and leading experts strive to address to shape and manage successful Energy Transitions. Maps can be used in the following ways:

- To promote a shared understanding of successful Energy Transitions
- To appreciate and contrast regional variations to better understand differing priorities and areas of concern
- To follow the evolution of specific technology trends related to the energy sector

FIGURE 1: Visual Snapshot – How to read an Issues Map



1. Six of the maps are included in the global overview section while the Future Energy Leader's issue map is presented in the last section.

2. The Council received survey responses from 86 countries via its national Member Committee network. All of these responses have been incorporated into the Global map, but we have produced only 50 national maps, which correspond to the number of countries that were able to meet the minimum response requirements for the production of a national map.

Chapter one
Global Perspective

1. GLOBAL PERSPECTIVE

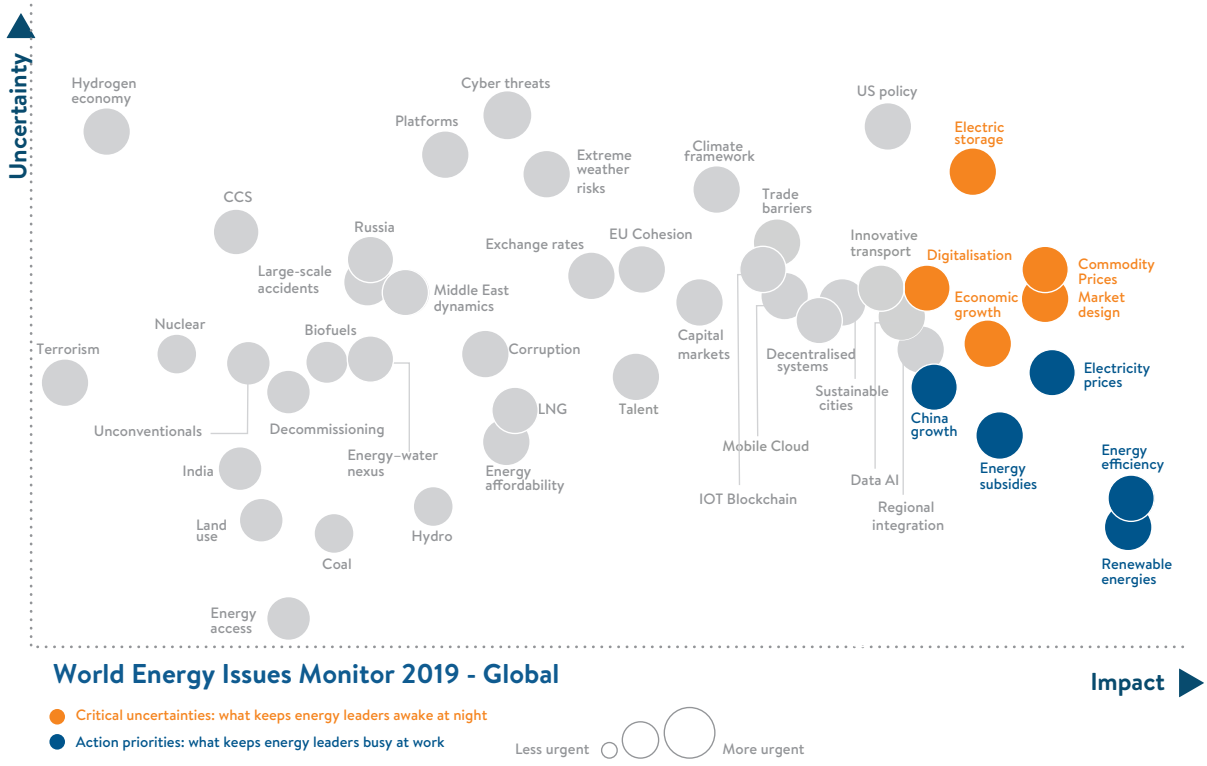
The global map and narrative are built from a synthesis of individual country analyses and commentaries. These provide an informed picture of five categories of transition challenges at national, regional and global levels:

1. macroeconomic risks
2. geopolitics
3. business environment
4. energy vision
5. technology

The 2019 global map incorporates all survey responses, representing the views of nearly 2,300 energy leaders from 86 countries.

In an era referred to by the Council as the Grand Transition[1], energy leaders must pay attention to many different signals of change and distinguish key issues from the noise. The Issues Monitor identifies shifting patterns of connected issues which are shaping Energy Transitions.

FIGURE 2: The Global Perspective on the Energy Transition



1. Since 1970, the world has seen rapid growth in energy demand, mainly satisfied by fossil fuels & centralised power generation. The future is expected to be different. Energy Transition does not happen in a vacuum. It is shaped by a much broader and fundamental shift in prosperity, progress, politics and planet. We call this faster & fundamental shift in context – The Grand Transition. https://www.worldenergy.org/publications/2016/world-energy-scenarios-2016-the-grand-transition

Over the course of the past six months the Council has evaluated nearly 2,300 survey responses, synthesized expert analyses from Member Committees and conducted supplemental research. The Council observes four key strategic priorities for energy leaders to consider in 2019. They are:

A. ***Market design*** rules will need to be updated to incorporate the growing move towards decentralisation
B. ***Electrification*** is being used as a means to decarbonise the energy sector
C. ***Global strategic competition*** and the rise of nationalism will impact the pace of the Energy Transition
D. ***Lithium and cobalt*** will play a growing role in commodity market risks, traditionally dominated by oil and gas price fluctuations

Market Design

The growing abundance of cost-competitive renewable energy technologies (especially solar) is accelerating transition towards decarbonised, decentralised and digitalised energy systems. **Market design** rules (from electricity trading to grid operation rules) will need to be updated to integrate a growing share of intermittent renewable energy supply (RES) from a diversity of zero and low-carbon sources. Maintaining investment in electrical supply security, grid reliability and resiliency emerges as a strategic priority.

> *Concerns are growing about electricity security and the adequacy of power supplies in some European countries and regions in the coming years. Closures of a significant number of thermal facilities are planned in the short to mid-term, while the current regulatory framework needs a robust overhaul in order to deliver the needed price signals to trigger investments in capacities and to enhance flexibility.*
>
> European Regional Commentary on page 87

This year's survey responses and follow-up commentaries indicate that **innovation in market design** is of significant leadership interest and key in realising new opportunities for integrating cost-competitive renewable energy at scale while also utilising existing centralised systems. How energy leaders face this new dynamic will determine the market design of the energy sector as it diversifies the supply mix with more RES. It is worth noting that survey results indicate that innovation is not just about new technologies shaping market design. The synthesis of commentaries clearly indicates that innovation in policy and regulatory reform are just as significant as technology innovation.

> **Policy Innovation:**
>
> *"Energy Efficiency is an action priority for Algeria ever since the Algerian government announced a new national programme on energy efficiency (EE) for the years 2015 to 2030. The EE programme mainly targets three sectors: the building sector, transport and industry. The objectives include the thermal insulation of 100,000 homes per year, distributing 10 million energy efficient lamps and switching 1.3 million vehicles to liquid petrol gas. Through the measures, 180,000 jobs are supposed to be created."*
>
> Algerian National Commentary on page 24

> "The national policy for energy efficiency is robust and well designed as it is based on a transparent financial support scheme. It is attractive for companies, which use opportunity to offer a complete service for energy efficiency engineering. In view of these facts, energy efficiency will remain as one of the action priorities for Slovenia."
>
> Slovenian National Commentary on page 138

Electrification

The accelerating pace of electrification remains the focus for energy leaders, with RES ranking highest in terms of impact (see Figure 2). Nevertheless, energy leaders remain concerned about the rapid scalability of renewables and perceive fluctuating oil prices and trends of nationalism as risk to successfully managing a global Energy Transition. Overall, as showcased in the national commentaries developed by the Council's Member Committees, the focus on global Energy Transition centres on four drivers – Decarbonisation, Decentralisation, Digitalisation, and Demographics as well as the disruptive potential of impacts from their interactions.

> *"Renewable energy coupled with energy efficiency and electrification of the end users is the area of focus for the policy makers in the country. The layering of information technology onto the energy sector results in new challenges and opportunities. Similar to the energy leaders around the world, commodity prices are of concern for long term planning."*
>
> UAE National Commentary on page 186

> *"Driven by strong demographic growth, electricity consumption in Burkina Faso grows by more than 8% every year according to the World Bank. In this context, several solar plants have been developed to both reduce the country's dependence on hydrocarbon imports and to produce electricity at lower cost to accelerate the electrification of the country."*
>
> Burkina Faso National Commentary on page 26

Global Strategic Competition

Survey responses indicate energy leaders are conscious of the political economy impact of large-scale RES development. Whilst strategic competition is focused on high tech ecosystems (digitalisation), rather than energy resources per se, the emphasis on commodity prices highlights current concerns about access to resources required for electrical storage. Furthermore, the new geopolitics of technology (data protection, cyber security) raises questions about the role of digitalisation in energy in the long term. Many national Member Committees identified the rising trend of global strategic competition and nationalism as critical uncertainties for the energy sector. Policy developments in China and the US, as well as trade tensions between them, are a source of uncertainty for energy leaders worldwide. In 2018, the United States imposed new tariffs and quotas on its imports (solar panels, steel, aluminium, etc.), to which China responded by imposing new tariffs on US imports of liquefied natural gas (LNG). More generally, for the survey respondents, the trade policy of the current US administration raises questions about the stability of US commitments.

> *"US policy is by far the most urgent Critical Uncertainty for Asia, not only given the impact this has on the mainly import-dependent countries in the region, but also due to the resulting effect on China's economic growth, which is now at its lowest level in ten years, and the knock-on effect for other Asian countries. A dip in foreign investment, particularly in China, coupled with slowing productivity and tightening monetary policies, will likely mean that Asian countries may need to turn to heavier reliance on available (and cheaper) domestic resources, such as coal."*
>
> Japan National Commentary on page 55

Commodity Prices

Oil and gas prices played a major role in 2018 influencing the tracking of commodity prices on the global map. They will continue to impact the speed and direction of the global Energy Transition. It is noteworthy to point out the emergence of other resources, such as cobalt and lithium, as key commodities which will have an ever-expanding role in price fluctuation concerns, which traditionally have been dominated by oil and gas prices.

> *"Commodity Prices is a critical uncertainty because of the region's economic dependence on oil. Crude oil price experienced an improvement, from around $60 per barrel to a high of $85 per barrel and a low by year-end of $50 per barrel. These fluctuations are deeply affecting the economies of LAC countries. South American countries budget depends on oil exports while many of the Central American and Caribbean countries are highly dependent on fuel imports to generate electricity."*
>
> LAC Regional Commentary on page 157

In February 2018, the US added cobalt to a list of 35 mineral commodities which are critical to the economy[2] and has begun mining for cobalt for the first time in decades. Clear market signals can be traced in the rising price of cobalt: $32,000 per tonne in 2017, $81,000 per tonne in 2018[3]. The market penetration rate of electric vehicles (EV) will be determined by the price of cobalt and lithium, as batteries represent up to half the cost of a purely electric vehicle.

Coupled with EV, the large-scale uptake of RES is intrinsically dependant on **new storage pathways**. For example, the general trend towards the electrification of smart vehicles relies on battery-intense applications which, in turn, increase demand for commodities such as cobalt and lithium. Consequently, non-energy **commodity prices** have become a critical uncertainty for energy leaders globally. For instance, the Democratic Republic of Congo, which has the world's largest natural supply of cobalt, recently tripled its tariffs in a move that could result in higher prices for EV producers[4]. This has a rippling impact on renewable energies, electric vehicles, electric storage and other battery-intense technologies.

2. https://www.federalregister.gov/documents/2018/05/18/2018-10667/final-list-of-critical-minerals-2018
3. https://www.chemistryworld.com/news/battery-builders-get-the-cobalt-blues/3008738.article
4. https://www.bloomberg.com/news/articles/2018-12-03/congo-triples-levy-on-cobalt-with-strategic-minerals-decree

Uncertainty about short and long-term oil prices makes it harder for some countries to plan and accelerate national Energy Transitions. Hydrocarbon producing countries such as Ecuador, Canada, Argentina and Russia have stated that they will continue to produce, export and consume fossil-fuels while also incorporating non-fossil fuel sources.

> *"Natural resource development is a significant component of the GDP for all three North American countries. Since both the production and use of fossil fuels plays a large role in the North American energy sector, the challenge of meeting emissions reduction targets is significantly greater than it would be for countries lacking fossil fuel resources. While greater electrification, using less-emitting generation sources remains a general policy objective across Canada, Mexico and the US, overall energy end-use remains primarily non-renewable, fossil-based sources."*
>
> North America Regional Commentary on page 188

> *"Russia remains at the forefront of hydrocarbon production and export. However, the country has taken important steps towards the development of renewable energy projects, reconsideration nuclear energy prominent impact and digitalization of the energy sector."*
>
> Russian National Commentary on page 133

The global narrative is not complete without mentioning decarbonisation. Commentaries provided by Member Committees note that climate commitments are shaping their action priorities and are central to the process of decentralisation. This stands out in the global map (Figure 2) with **renewable energies** and **energy efficiency** as the two main action priorities.

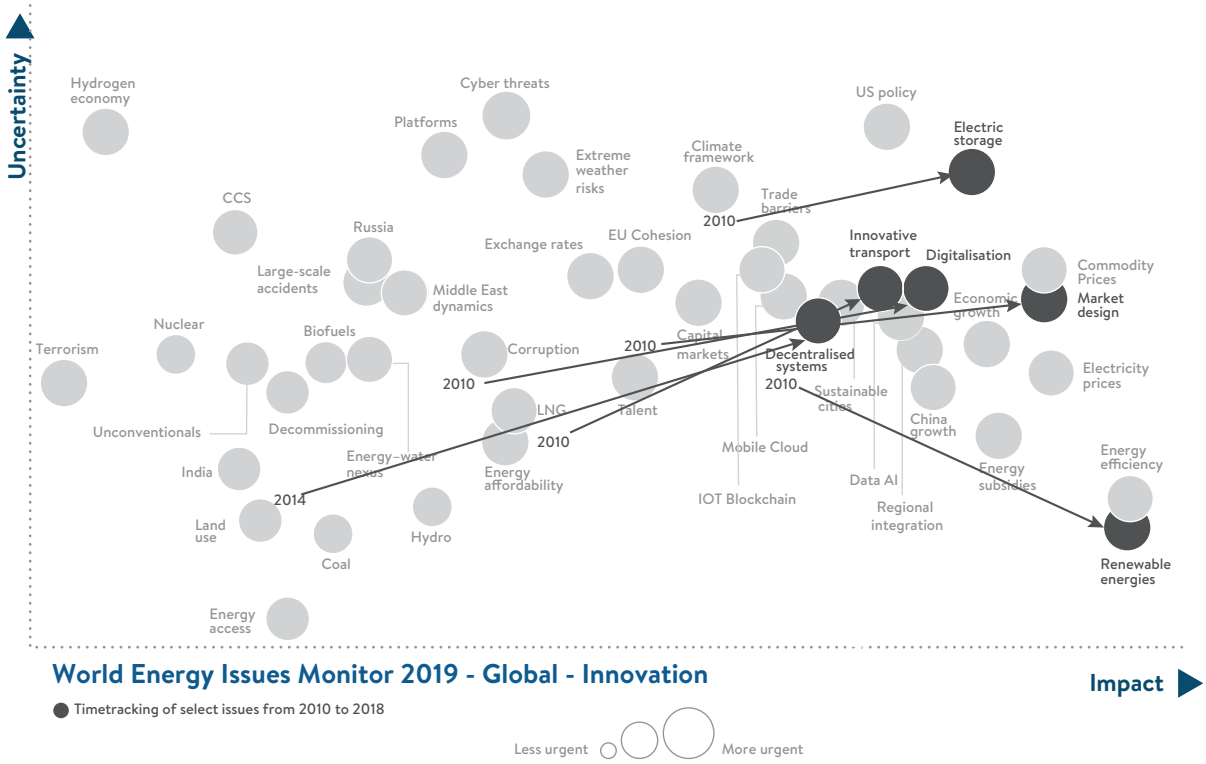
> *"The issue that keeps French actors awake at night is climate change. The sensitivity of French energy leaders is high, and their commitment is undeniable."*
>
> France National Commentary on page 101

> *"To help meet its Paris Climate Framework commitments, the Canadian Government has been negotiating policy actions with the Provinces. The Government has put in place an effective national price on carbon, beginning at $20 per tonne of CO2 from January 1 2019, rising by $10 per tonne annually to $50 per tonne in 2022. Provinces that do not implement plans to price carbon will have a federal backstop plan imposed upon them. This will remain a contentious national issue for the foreseeable future."*
>
> Canada National Commentary on page 192

TRACKING INNOVATION

Globally, as seen in Figure 3, the energy-transport-information nexus emerges as the key innovation cluster shaping global Energy Transition over the past decade - renewable energies, innovative transport, decentralised systems, digitalisation, and electric storage are the biggest movers since 2008.

FIGURE 3: Continued Rise of Innovation



Tracing the movements in global, regional and nation issues (spatial tracking) can reveal important shifts in perspectives on critical issues. For example, although **hydrogen** does not emerge as a leading indicator in the global map, some of the responses of energy leaders in the Council's Asia region, reflect growing interest in a "new" hydrogen economy.

> *"...uncertainty about US policy will create even higher pressure for more rapid development of viable alternatives, such as electric storage and affordable hydrogen, to meet rapidly rising energy demand."*

Asia Regional Commentary on page 55

> *"Hydrogen could play an important role in supporting 100% renewable electricity generation, potentially helping to solve New Zealand's dry year risk problem. However, today, hydrogen produced from renewable energy is about six times more expensive than hydrogen produced from natural gas, causing energy leaders headaches. Executives signal their concerns as hydrogen shifts dramatically towards the high impact high uncertainty zone."*

New Zealand National Commentary on page 79

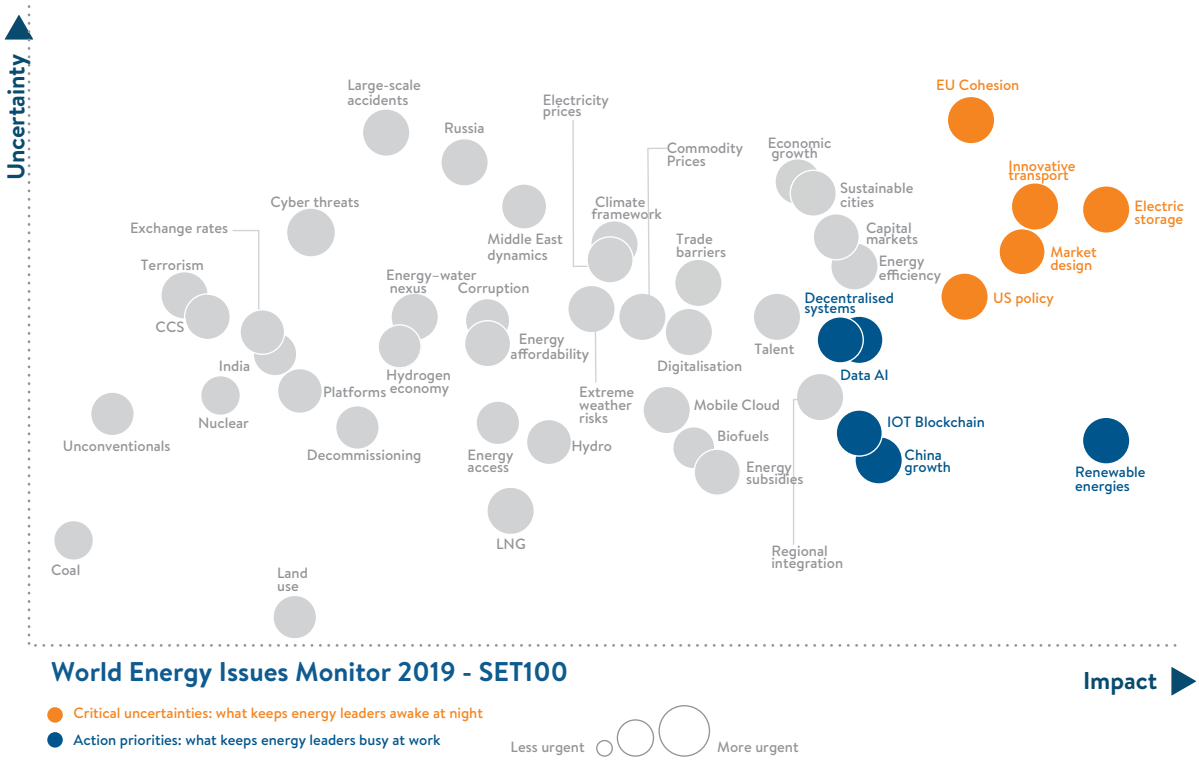
Since the energy crisis in the 1970s, hydrogen has been recurrently cited as a potential successor to oil, especially in uses that require very high energy density. In a 2018 report, the International Renewable Energy Agency (IRENA) described hydrogen as the possible missing link in the transformation of the global energy system[5]. Indeed, if produced from zero carbon power generation (renewables, nuclear or gas with CCS), hydrogen could be used to accelerate decarbonisation of industrial processes and transport systems and enable long distance trade in renewable energy[6].

Hydrogen is just one example of a weak signal on the 2019 global map – an issue gaining momentum as some individual countries view it with greater urgency, but globally it has yet to emerge as a leading indicator. Similarly, there are other technologies and policy issues that are of much higher priority for specific countries that may not be indicated with the same level of action and urgency at a global level.

THE START UP ENERGY TRANSITION AWARD – THE INNOVATORS AGENDA

Start Up Energy Transition (SET) is an international platform hosted by the Germany Energy Agency (dena) in collaboration with the Council supporting innovation in Energy Transition[7]. It is comprised of the annual SET Award and SET Tech Festival. This initiative brings together the 100 most outstanding international start-ups in the energy field with key stakeholders of the sector.

FIGURE 4: Survey of Innovators – SET100



5. https://www.irena.org/publications/2018/Sep/Hydrogen-from-renewable-power

6. The World Energy Council has a study underway on the role of hydrogen in global Energy Transition as part of its global foresight refresh and World Energy Scenarios update. In June the Council will host an Innovation Forum on challenges associated with production, storage, infrastructure, distribution, consumption and financial viability of hydrogen.

7. https://www.startup-energy-transition.com

It is the second year that the SET100 community has participated in the Issues Monitor survey. This is an important global perspective to understand, as innovators, much like early adopters, set the tone for what is to come. Figure 4 illustrates the views of energy innovators from around the world. The most common areas in which these innovators focused on in 2018 are;

- Decentralised systems and distributed generation
- Energy access
- Energy efficiency
- Solar
- Energy vision and technology

Last year's class of top 100 innovators identified **Blockchain** in energy as a key technology that would have a lasting impact on the energy sector. In 2018 blockchain appeared as a critical uncertainty, whereas this year the innovators have begun to better understand its scalability and viability and are piloting many different projects. Consequently, blockchain in this year's report appears as an action priority for innovators, reflecting the reduced uncertainty. This year's cohort has identified **electric storage** as the key technology that will shape the future of energy. It is a critical uncertainty because the impact of electric storage and its deployment is expanding beyond EV to base load generation and, of course, as a means to stabilise the increasing renewable generation supply.

MEETING GLOBAL VISIONS

Managing global Energy Transitions and enabling the benefits of sustainable energy to be shared by everyone is one, if not the, most pressing and urgent leadership challenge of modern times.

The Issues Monitor survey is a practical and flexible tool that can be used by energy leaders as a reality check to define and clarify the current state of global, regional and national Energy Transitions. It can also be used to forge a global energy leadership agenda that facilitates new and better collaborative innovation in meeting global visions and goals.

For example, decision makers within and beyond the energy sector can use the IM 2019 survey results and interactive online tool[8] to explore the links between energy systems transition and three United Nations proclamations:

1. UNFCCC – Climate Change
2. UN SDG7 – Universal Energy Access by 2030
3. UN CBD – Convention on Biological Diversity

In this year's Issues Monitor we illustrate links between the various agencies to highlight the potential for synergies. These maps were recently presented to delegates at COP24.

Managing Energy Transition to Avoid Climate Catastrophe

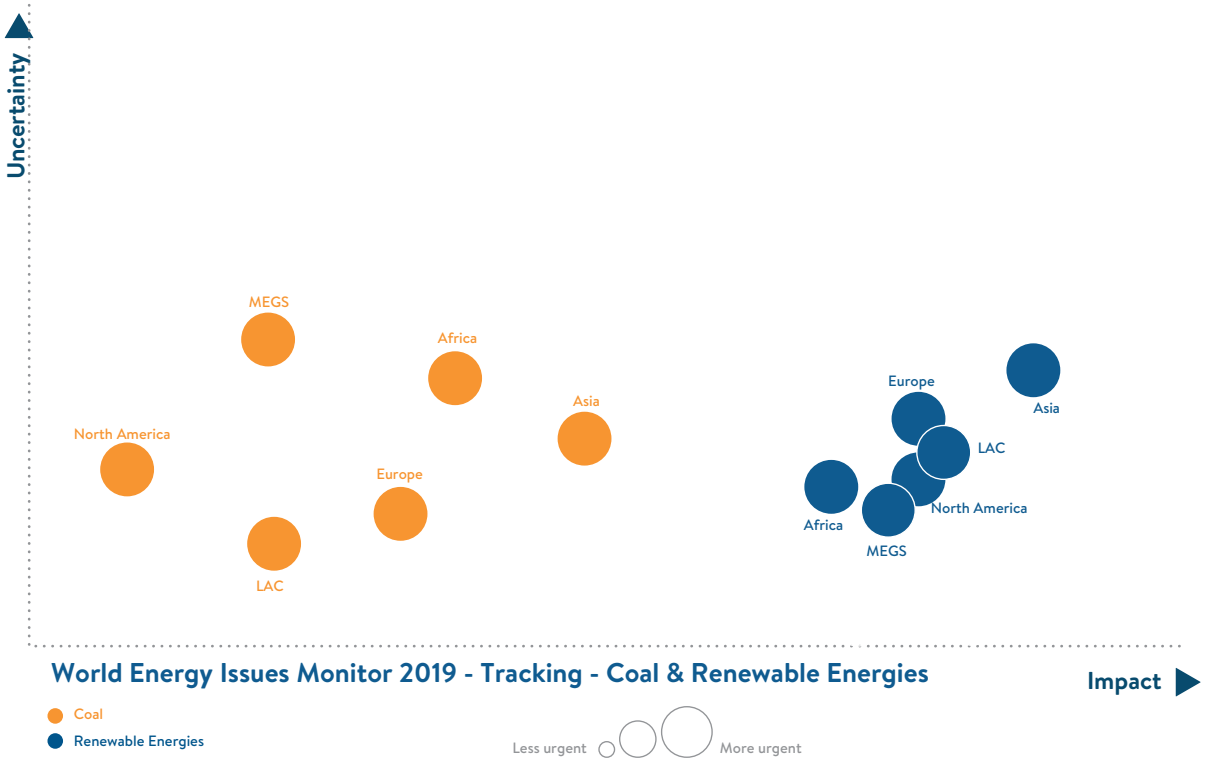
Greenhouse gas emissions from the global energy system continue to rise. Accelerating decarbonisation of the energy sector, by preventing and mitigating greenhouse gas emissions from

8. http://www.im.worldenergy.org/

energy production and use is a pressing challenge. Figure 5 illustrates that while energy leaders' daily decision making is highly impacted by new possibilities in renewable energies, a role for coal remains. World coal production in 2017 **increased by 3.2%**, the fastest rate of growth since 2011[9]. Commentaries highlight that coal is no longer just about energy and carbon – jobs and water use are also on the agenda.

Clearly, decarbonisation is a crucial, but not the only challenge in successfully managing a global Energy Transition for better lives and a healthy planet.

FIGURE 5: Tracking Coal & Renewable Energies



Managing Energy Transitions for Better Livelihoods

For decarbonisation to be successful, energy leaders around the world must also enable solutions to the challenge of improving livelihoods. A goal for sustainable development is improving affordable and reliable access to modern energy for enabling prosperity. According to recent statistics published by the IEA[10], nearly 1 billion people do not have access to any form of electricity. As embodied by the UN SDG 7, the challenge of decarbonisation is intrinsic to expanding affordable and reliable access, as these 1 billion people could resort to more carbon intensive sources of energy for access, if alternatives are not in place.

Figure 6 illustrates the progress different regions are making toward universal basic energy access. The survey and ensuing commentaries demonstrate that whilst Africa is the only region where

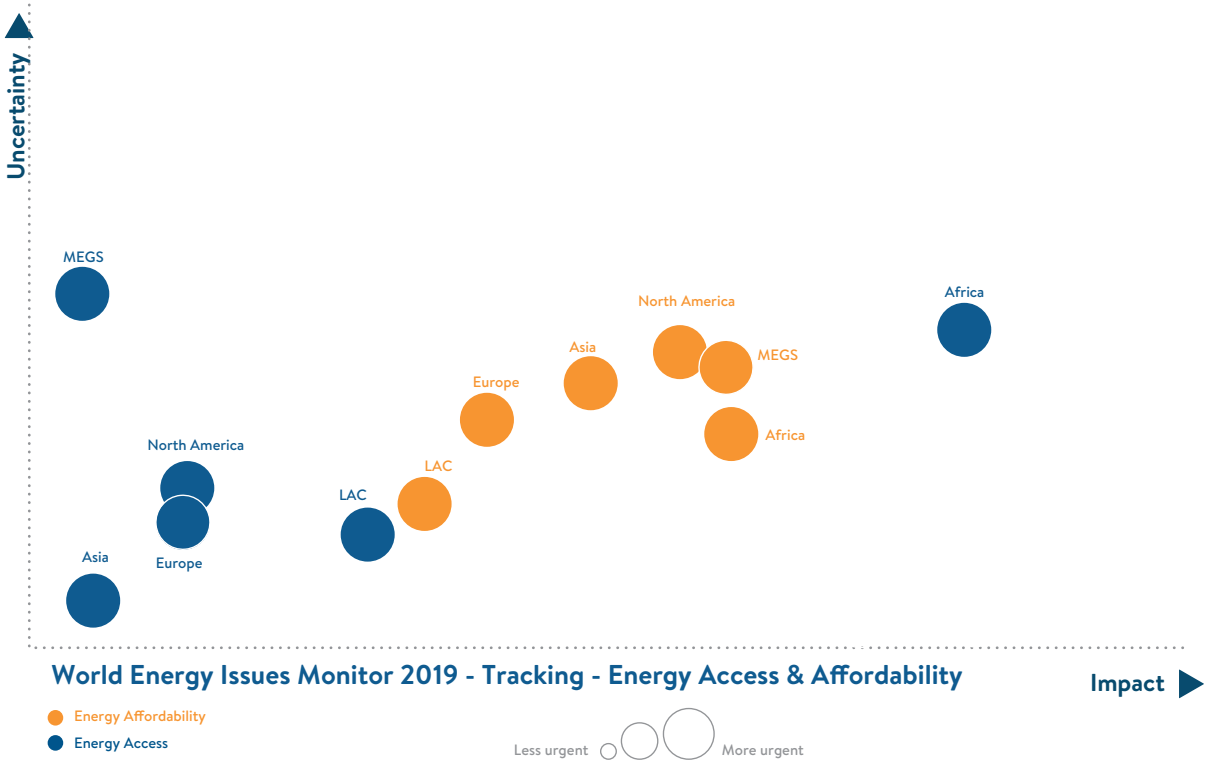
9. https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-coal.pdf
10. https://www.iea.org/energyaccess/

energy leaders are actively talking about solutions to problems of **basic** access, affordability is an emerging concern within and beyond OECD countries.[11]

> *"The cost of the Energy Transition is at the heart of debates and this is reflected in the importance given by many to the consequences on household purchasing power and business competitiveness with a central upcoming debate about burden sharing."*
>
> France National commentary on page 101

It is important that progress on basic access to electricity continues and does not detract attention from the need for all countries – developing, emerging and developed – to enable quality access[12] for better livelihoods.

FIGURE 6: Tracking Energy Access & Affordability



A Healthy Planet

Forests, watersheds, and oceans are impacted by Energy Transitions and vice versa. The links between land use, water, energy and food systems are already complex and variously impacted by climate change.

Whole societies and the modern energy systems on which they depend, are facing connected environmental challenges, including – non-energy resource scarcities, land use competition, increasing global water stress, forest fires and more frequent and severe extreme weather events.

11. https://www.oecdwatch.org/oecd-guidelines/oecd

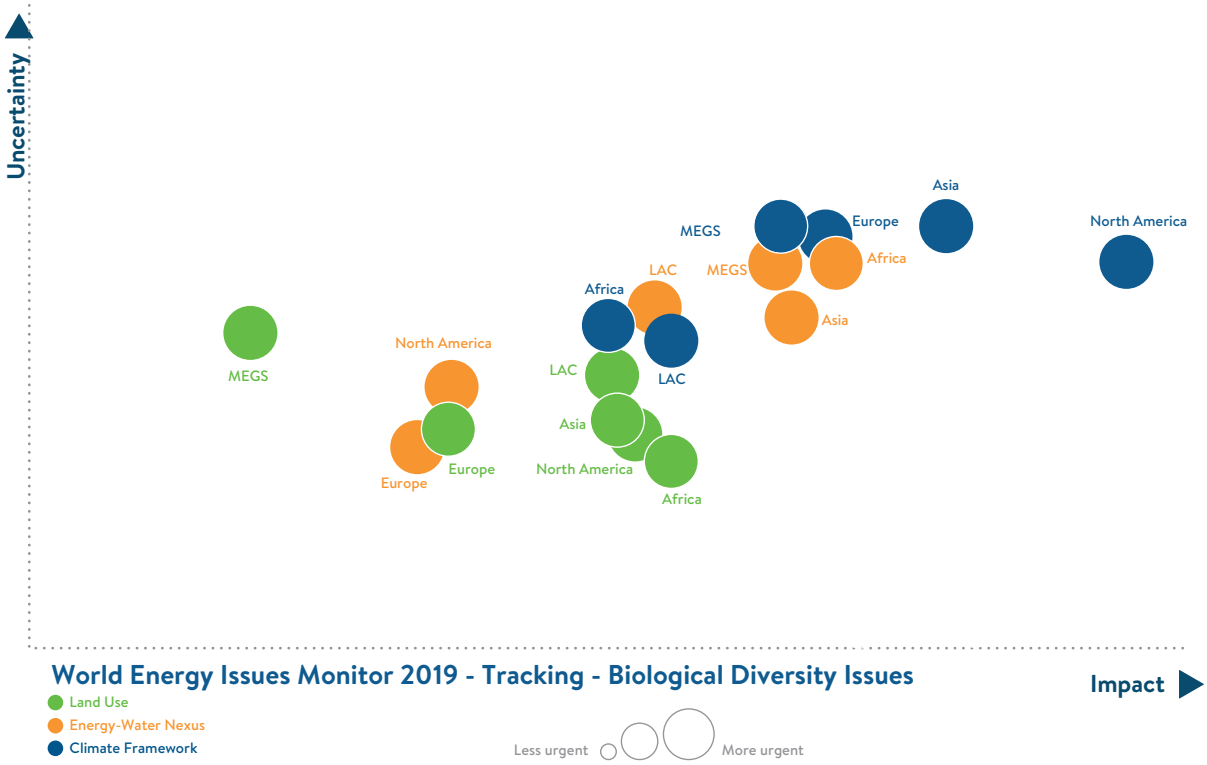
12. The Council is exploring the theme of quality access as part of its Innovation in the Energy Transition work programme.

"Niger is highly vulnerable to natural hazards, particularly droughts, floods, and landslides. Climate change is causing increasingly irregular rainfall, rising temperatures, and desertification which impacts agricultural productivity and food insecurity. Extreme weather risks will continue to create uncertainty for Niger's economic growth opportunities."

Niger National Commentary on page 44

Figure 7 illustrates how energy leaders and other decision makers can use the Issue Monitor 2019 to understand the impact of Energy Transition on ecosystems and communities as well as land (food)-energy-water nexus issues. For instance, to accelerate battery technology and support electric vehicles and resolve intermittency issues surrounding RES, lithium is critical. The production of RES technologies, including PV panels and wind turbines is also reliant on mined materials. The extractive industries, and specifically non-conventional methods like fracking, are reliant on a stable water supply for mining. Through survey responses and national commentaries that interpret those responses, the Issues Monitor tracks energy leaders' perspectives and perceptions on land used for energy production, the nexus between water and energy and the climate framework of a region. As illustrated in Figure 7, these are all intertwined. For instance, the biggest polluters seem to have their energy leaders actively planning and acting on climate issues while regions like Middle East and Africa are equally concerned about the water-energy nexus.

FIGURE 7: Tracking Issues Impacting Biological Diversity



NEXT STEPS - REGIONAL AND NATIONAL PERSPECTIVES

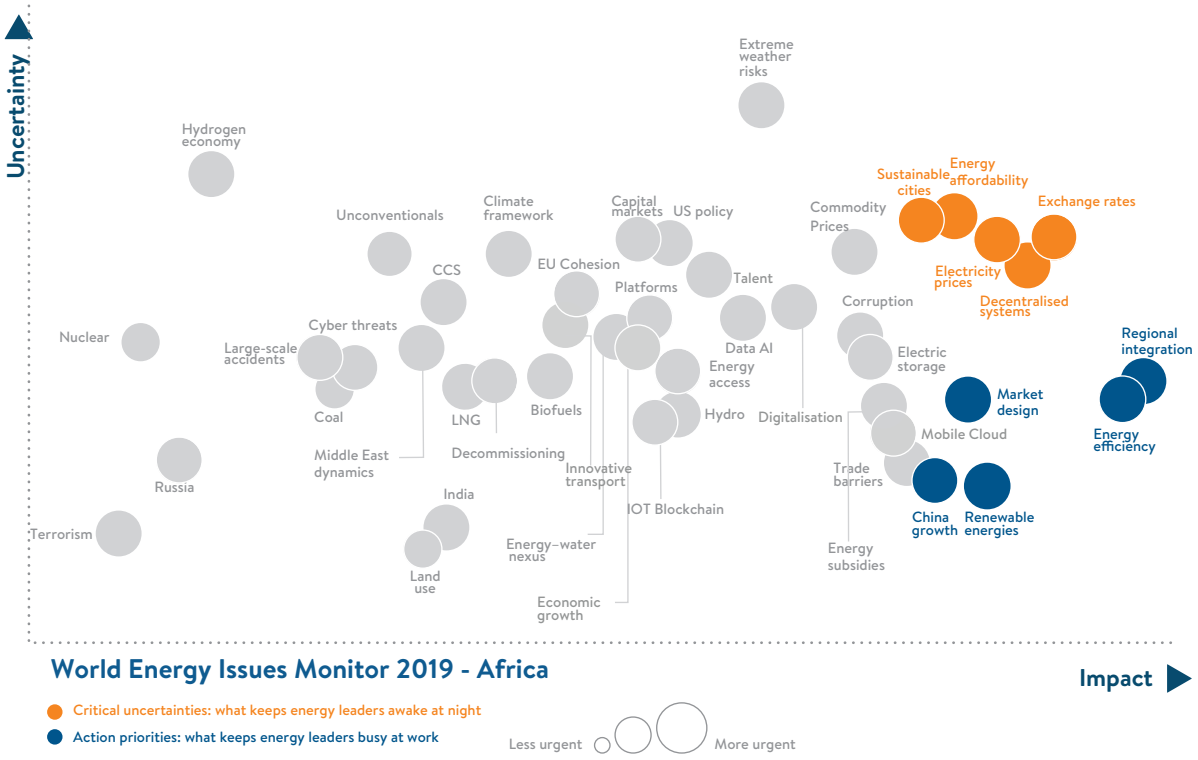
The remaining chapters of this report provide six regional outlooks followed by 50 national issues maps and commentaries. The national maps and specific commentaries are invaluable not only to energy leaders active in these countries, but also to the global energy community. The survey outcomes are a self-reflection of where the respective national leaders see themselves in the Energy Transition. They can be used by neighbouring countries and regions as a point of comparison and a way to learn from the experiences and policies of others.

In addition to the maps displayed in this document, the Council, in partnership with **Arup**, has built an **interactive tool**. This tool is a digital platform designed to coalesce dynamic map views of the decade of Issues Monitor data that has been collated by the World Energy Council. This interactive tool allows the preparation of different maps for comparison and allows the analysis of data by geography, over time, or in relation to specific energy issues.

> *"Imagining a better energy future is tantalising: realising it cannot be done all at once or by working alone."*
>
> Dr Angela Wilkinson - Sr. Director, World Energy Council

Chapter two
Assessing the energy agenda for Africa

2. AFRICA



REGIONAL OVERVIEW & CONTEXT

A historic step was taken by African Leaders in 2018 with the creation of the African Free Trade market. This move will definitively impact the trade of goods and services, including in the energy sector, and is expected to boost intra-Africa trade and, by extension, regional integration and industrial development. Another notable step in the region is the steady progress towards building the critical ingredients for sustainable and resilient societies. This is in line with the implementation of the 2030 UN Agenda for Sustainable Development (e.g. Goal 7) and the 2063 African Union Agenda. Energy infrastructure development and access to modern energy services are improving, but still challenging in most countries in Africa.

- Based on the 2018 World Energy Issues Survey responses, energy leaders in Africa recognise a number of critical uncertainties and action priorities.

- Comparing 2017 responses to 2018, key critical uncertainties such as **electricity prices** and **decentralised systems** continue to be uncertainties, while **market design and China** moved to the action priorities area.

- Action priorities keeping similar positions to previous years, but with higher degree of impact, include **renewable energies, energy efficiency and regional integration.** These issues have been stable in the African energy agenda over the past years.

- **Energy access** remains an overarching challenge, particularly in Sub-Saharan Africa where the electricity access rate is 35 % overall, and only 19% in rural areas.

- **Commodity prices** moved from action priorities to high uncertainties, around the same position the issue had in 2016. The fluctuation of commodity prices has led to the decrease in value of many export products. The high global uncertainty drives energy leaders to diversify their exports.

KEY ISSUES FROM THE REGIONAL MONITOR

Energy affordability remains a serious concern, due to high electricity prices and high connection fees. The issue has a special impact on low-income household budgets and limits the expansion of electricity access. With growing popular pressure, some African governments are resorting to subsidies to mitigate social concerns. Affordable electricity tariffs would improve living standards, and boost access to modern energy services (bringing electricity to a greater proportion of the population).

Decentralised systems continue to be considered a critical uncertainty. However, the 2018 survey responses show greater impact and urgency in this area. Decentralised systems are viewed as a solution to deliver socio-economic dividends faster and at lower costs than the conventional past solutions. They can offer an attractive option for closing the energy access gap in a faster way by contributing to meet the territorial energy demand, especially in remote and rural areas, through on-grid and off-grid systems. To further sustain their development, robust actions should be applied to their use for energy supply and distribution, with much focus on renewable energies supply. Policymakers need to evolve regulatory frameworks to integrate new opportunities and respond to evolving energy supply options to allow for their sustainable deployment.

Sustainable cities are now perceived as a greater critical uncertainty, while keeping almost the same level of urgency. The need of sustainable cities is particularly urgent, and most African cities are struggling to deal with fast-growing populations and widespread poverty, exacerbated by migration from rural areas. Consequently, the need for access to adequate basic services is dramatically increasing. Climate change is adding uncertainties, as Africa's urban environments are particularly susceptible to flooding and outbreaks of diseases such as malaria. The path to Africa's cities sustainability lies in improving urban planning, adequate urban policies and legislation, and adequate infrastructure financing.

Energy Efficiency maintains its position with high impact and great urgency because it is perceived as an indispensable and critical tool for the energy system, requiring pressing and bold actions to reap the benefits of this major but "hidden fuel". New lighting technologies, energy-efficient appliances, use of renewables, and improvement of energy efficient standards and labelling have all contributed to substantial reductions of energy use in residential and commercial sector; but there are substantial challenges remaining in the transportation, industrial and power sectors. Awareness, education, assessments, access to adequate financing, regulations and effective policies would contribute to make more progress and to encourage savings.

Renewable energies maintain a high impact role on the African agenda and are expected to increase roll-out (for power generation in grid-connected areas and remote communities) and to deliver on three critical goals: energy access, climate mitigation and lower air pollution. Substantial

developments have been recently made in leading countries forming the breakthrough of Renewable Energy Transition in Africa. Nevertheless, there are still some key challenges to address for the deployment of variable renewable energy sources, including enabling policy frameworks, adaptive regulations and access to adequate finance, as well as strong support from governments and other policymakers.

Market design has made a strong impact in the action priority area. This renewed and great interest is due to the fact that Governments and the Industry are keen to further expand access to markets to finance energy infrastructure. There is a growing acknowledgement that a market-driven investment environment is the best means to trigger investments and lower the cost of capital, while providing the right market signals to enable an affordable, secure and decarbonised electricity supply. Designing and implementing efficient electricity markets is key to the success of the African Union Free Trade Market and the achievement of the African Common Market by 2025.

Regional integration and power interconnection continue appealing for key priority actions, because offering huge opportunities to the African region and nations and expecting to deliver the three dimensions of the Energy Trilemma in a rapid and sustainable way.

China emerged as a privileged partner in the Action priorities area and is expected to sustain the development ambitions of many Africa countries. The recent Beijing Summit (September 2018) marked a strong new path of collaboration towards strengthening their partnership with Africa - the two sides engaging in concrete actions to enhance the synergy between their strategies and policies, advance cooperation under the Belt and Road Initiative and the Africa Union Agenda 2063.

Exchange rates moved up substantially along the uncertainties axis and gained greater impact. This is due to volatility of many African currencies and the subsequent implications of exchange rates on energy trade. Moreover, the strengthening of the US Dollar against many African currencies translates into strong prices disadvantage for export markets.

CONCLUSION

Closing the energy infrastructure gap of the region and adopting better project management policies are crucial to Africa's sustainability. To advance along the Energy Transition path and overcome the daunting challenge of energy access, countries in the region need to tackle inefficiencies in the electricity sector and related issues (power shortage, high tariffs and connection fees, huge backlog of investments, etc.). There is also a need to promote centralised and decentralised grids, and to adopt innovative and disruptive distributed generation technologies.

There is a growing push and adoption of renewable energies; and almost all African countries are now promoting renewable solutions. Solar and wind have increased markedly due to improved efficiencies and the falling cost of technologies, making these solutions competitive and suitable for energy decentralisation, as they can smoothly operate both on-grid and off-grid systems. Ultimately, there is an urgent need for action on all technologies, especially on renewables and energy efficiency, which are key for delivering on three critical goals – energy access, climate mitigation and lower air pollution. Some of these technologies are still in their infancy, so right approaches, policies and best practices are required to sustain their deployment and ensure their wider deployment and sustainable use.

ACKNOWLEDGEMENTS

Dr Elham Mahmoud Ahmed Ibrahim, Vice Chair of Africa, World Energy Council
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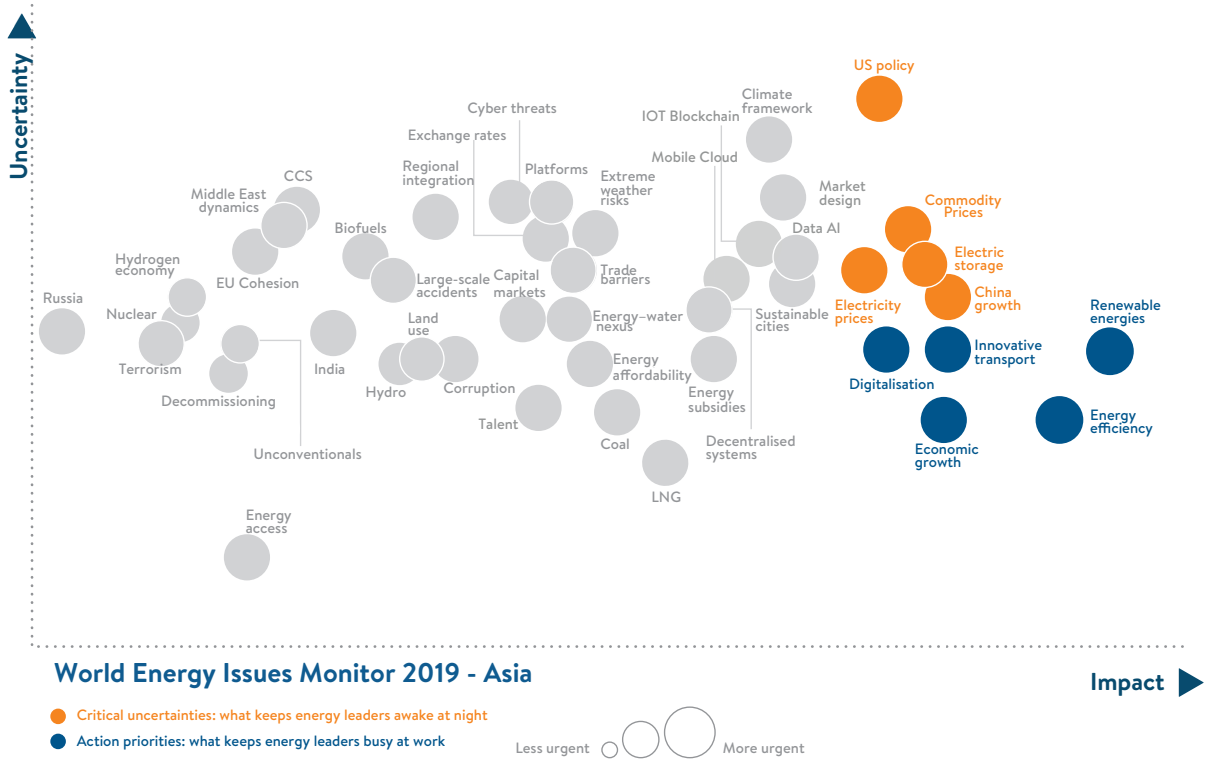
Chapter three
Assessing the energy agenda for Asia

ASIA



REGIONAL OVERVIEW & CONTEXT

A significant shift has occurred in the Critical Uncertainties in Asia over the past year. The 2018 report identified the top critical uncertainties as electric storage, IoT/Blockchain and digitalization, but for 2019, the biggest uncertainty is US policy, followed by commodity prices, with electricity prices, electric storage and China clustered in "third place". Climate framework, which was an Action Priority last year, rose back into the Critical Uncertainty quadrant, although with less perceived impact than other issues.

The fact that many countries in Asia depend heavily on trade with the US, coupled with the recent slow-down in China's economic growth – which has a trickle-down effect – has created high levels of uncertainty, not only for the region, but also for foreign businesses with operations in Asia and for foreign investors seeking to enter the Asian market.

Concerns about commodity prices is a natural result of uncertainty about US policy and is seen as potentially affecting the availability of foreign imports in a region which is highly dependent on imports. The urgent need to meet increasing demand for affordable electricity in the most populous region of the world and to make electric storage a feasible option is reflected in the positions of these elements in the map.

Under action priorities, renewable energies and energy efficiency are the most urgent issues, as countries seek to meet the ever-growing demand for electricity, manage air pollution levels and still meet their climate action goals. Digitalisation has moved from uncertainty to action priority as pressure on companies to make their operations more efficient increases. The shift of innovative

transport from Critical Uncertainty in 2018 to Action Priority in 2019 reflects concerns about the increasing number of vehicles on the road, especially in urban centres, and the urgent need to manage the emissions they create.

Finally, economic growth has become an Action Priority as countries seek to offset the potential impact of US trade policies, tighter financial policies, weaker earnings growth and global political challenges.

KEY ISSUES FROM THE REGIONAL MONITOR

US policy is by far the most urgent Critical Uncertainty for Asia, not only given the impact this has on the mainly import-dependent countries in the region, but also due to the resulting effect on China's economic growth, which is now at its lowest level in ten years, and the knock-on effect for other Asian countries. A dip in foreign investment, particularly in China, coupled with slowing productivity and tightening monetary policies, will likely mean that Asian countries may need to turn to heavier reliance on available (and cheaper) domestic resources, such as coal. In addition, uncertainty about US policy will create even higher pressure for more rapid development of viable alternatives, such as electric storage and affordable hydrogen, to meet rapidly rising energy demand.

It is not surprising that **commodity prices** are a Critical Uncertainty for Asia. The net-import dependence of the region and the potential volatility of global commodity prices created both by US President Donald Trump's opposition to imports into the US, and by his policies on trade and tariffs, impact the entire region. These also potentially create barriers to foreign investment while placing increased pressure on development of energy efficient technologies and a shift to renewable energy in a region where many countries struggle to meet the steadily increasing demand for electricity and high levels of stress on the system caused by rising use of vehicles and migration to cities.

Electric storage, China and electricity prices are closely grouped as critical uncertainties for Asia in 2019. Finding viable, reliable, affordable forms of electric storage is a critical priority for a region where energy demand is rising exponentially, but the economics and scalability make this a challenge. China's slowing economy and the impact of US trade policies and tariffs on that country have a significant impact on the region and create uncertainty for both domestic and foreign investment. Keeping electricity prices affordable is a key challenge in a region where dependence on imports and volatile commodity prices create significant obstacles for business and government.

Renewable energies are the most urgent action priority for a region where many countries struggle with high emission levels; widespread use of cheap, readily available coal; lack of access to electricity and population shifts to urban areas. Asia's highly developed economies are already progressing with development of renewables. Japan is exploring the potential of hydrogen and ammonia as carbon-free fuels and is developing ammonia utilisation technologies which have drawn strong interest from Europe, Australia, the US and Saudi Arabia. New Zealand aims to achieve a zero-net carbon economy by 2050 and 100% renewable electricity generation by 2035. But some of the rapidly developing Asia economies, such as India, Bhutan and Myanmar, must balance rapid economic growth and increased focus on renewable development with challenges of access and fragile

infrastructure. Developing economies, such as Bangladesh and Nepal, need to balance basic human and infrastructure requirements with rapidly growing energy demand and emphasis on sustainable energy systems.

Coupled with the urgent need to expand renewable energy in Asia is a strong focus on increasing **energy efficiency** at all stages of the energy value chain. In a region expected to become the world's largest energy consumer by 2025, energy efficiency measures are already being implemented in many countries to control the level of energy use and help extend the life of existing transmission and distribution systems. Distributed energy systems, smart grids, smart metering and blockchain are seen as viable options to increase efficiency in many Asian countries.

Innovative transport and digitalisation are also viewed as important action priorities for Asia. The increase in urban population, the growing number of vehicles on the road and limited transport systems have not only created traffic congestion but have also increased emissions levels at a time when emissions reduction is critical. Increasing the number of electric vehicles and investment in technology and urban transportation systems are therefore a priority for many Asian countries. While uncertainty about the cost, viability and feasibility of **digitalisation** still remains, businesses see that digitalisation is an important option for growing their business and improving both efficiency and service; it is not a question of "if" any longer, but "when".

China is not only experiencing its own Energy Transition away from coal and toward renewables, but also because of its economic power it is shaping the transition of the rest of the world. China is increasingly looking toward securing its future energy needs with sustainable alternatives. Much of its foreign energy supply comes from politically unstable regions and must travel through narrow straits and contested waterways before reaching the country. Securing guaranteed access to foreign sources of energy is vital for China's ongoing growth and development.

CONCLUSION

Trade policies, economic uncertainty, volatile commodity prices and China's economic slowdown are key elements in the thinking of Asian energy leaders for 2019 and are the issues most likely to keep those leaders awake at night. It is not possible to control either what happens or when it happens with respect to these issues. Asia is therefore focusing on areas where it can, at least to some extent, exert control and move ahead. These include increasing the share of renewables in the energy mix; using new technologies to drive improvements in efficiency and access; seeking economically viable alternatives to make energy both accessible and affordable; developing domestic markets and energy efficient systems to lower reliance on imports; exploring regional interconnection and integration options; and continuing to be committed to ensuring a sustainable energy future for its citizens. The challenges are significant, but in a region that is the largest, most diverse and most populous and which continues to be a global growth leader, there is no doubt that Asia can and must progress.

ACKNOWLEDGEMENTS

Shigeru Muraki, Asia Regional Vice Chair, World Energy Council
Emily Melton, Asia Regional Manager, World Energy Council

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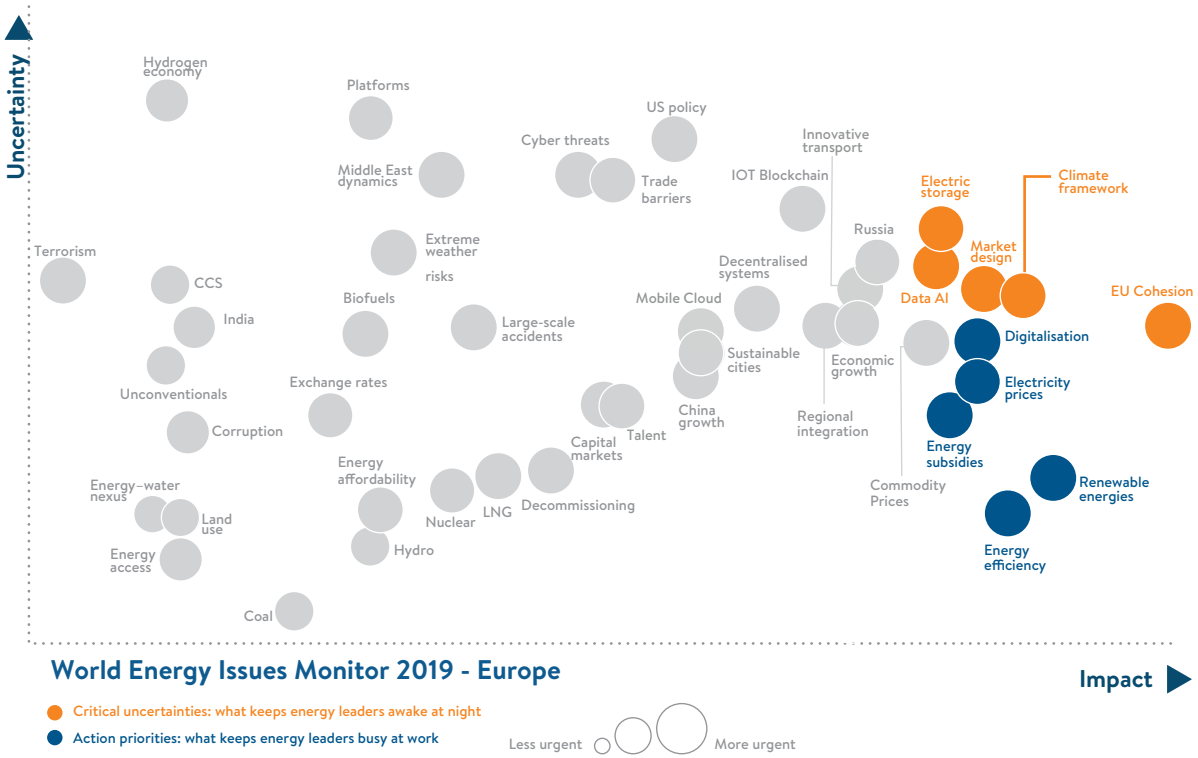
Chapter four
Assessing the energy agenda for Europe

EUROPE



REGIONAL OVERVIEW & CONTEXT

The 2019 European Issues Monitor outcomes are largely influenced by technology developments, geopolitics and regulatory frameworks. While the general level of uncertainty among all issues has significantly decreased in Europe over the last year, a lack of confidence remains on a series of technological and political topics.

Key Critical Uncertainties in Europe are associated with the technology cluster – developments in electric storage, Internet of Things and Artificial Intelligence are followed with interest, but their applications are still facing doubts among legislators, consumers and companies. Intriguingly, the perceived levels of risk around digitalisation are varied between European states, showing lower levels of uncertainty in countries that have made more progress in the field.

Concerns about Market Design remain high despite the progress of new EU energy market regulations being processed in the European Parliament. This highlights the persistence of uncertainties regarding the financing of future energy investments, electricity prices and increasing commodity price volatility. In terms of geopolitics, while the uncertainty about Russia has significantly reduced since last year, the potential impact associated with EU cohesion has increased in importance, in the context of Brexit negotiations and upcoming European Parliament elections. It is also notable that the potential impact of US Policy has considerably increased during the year in Europe.

Key Action Priorities have remained current for Europe for number of years. Energy Efficiency and Renewables become even stronger investment priorities, supported by increased energy and carbon

prices in the EU and new regulatory frameworks developed under the new EU energy package.

In parallel, energy and electricity prices have gained steam during 2018, delivering more financial confidence to EU market players while raising political issues in some European countries.

KEY ISSUES FROM THE REGIONAL MONITOR

Electric Storage: Battery developments in the mobility sector are followed with great interest as they can also potentially provide breakthrough solutions for electricity systems, and impacts for the building and heating sector. There is potential for changes in the management and design of power networks. However, regulatory frameworks may not yet be suited in all countries to implement such solutions, and consumer confidence must be built up for these new technologies.

Data and Artificial Intelligence: It is recognised that data management and services based on artificial intelligence (AI) can have a great potential for the energy sector. Many solutions are currently being developed or tested. Nevertheless, the concerns regarding upcoming new regulations in the EU about cybersecurity and data protection as well as uncertainties concerning associated business models may reduce the appetite for fast and massive application of these solutions.

EU Cohesion: While the 26 Members of the EU have shown a significant level of cohesion, risks remain high about the future outcome of Brexit negotiations and its potential impact to both sides. The upcoming elections of the European Parliament in May 2019 may lead to political agenda and priority changes in the coming years in Europe. Given the importance of Europe for energy regulation, this may have also a significant impact on the energy and climate frameworks.

Energy Efficiency: Economic conditions for investments into energy efficiency have strengthened due to the increase of prices of commodities, power and heat. This trend has also been supported by the new directive of energy efficiency of buildings that has been introduced into the European Union legislation. Keeping in check the costs of energy efficiency measures remain a key objective in order to ensure affordability in the long run.

Renewable Energies: The decrease in prices of photovoltaic (PV) panels and wind turbines has boosted the attractiveness to invest into these technologies. In several European countries, these prices have reached a point where no direct subsidies are needed anymore for some utility-scale projects to be competitive in the power market. Supported by political objectives, price reduction has led to the significant investments into renewables raising the questions of grid development and of the remuneration of flexibility. Significant uncertainties remain regarding the development of renewables in buildings or transportation.

Electricity Prices: The prices of electricity have increased in Europe, driven by higher commodity prices, tighter offer-demand balance in some countries and increased CO2 prices. Stronger integration of the European power markets has also enabled the coupling of power prices across regional markets. These short-term trends have enhanced the trust towards power markets and has triggered political concerns about affordability of electricity in many European countries.

High level of concern and significant impact level of **Market Design** reflect the number of challenges that the European energy system still must face and the needed regulatory framework changes. Concerns are growing about electricity security and the adequacy of power supplies in some European countries and regions in the coming years. Closures of a significant number of thermal facilities are planned in the short to mid-term, while the current regulatory framework needs a robust overhaul in order to deliver the needed price signals to trigger investments in capacities and to enhance flexibility.

CONCLUSION

Technology developments, geopolitics and regulatory frameworks are the keywords to understand the evolution of the energy landscape in Europe and its perception by European stakeholders. Energy efficiency and renewable energies are clearly prioritised to deliver a decarbonised, affordable and secure energy supply. This has the potential to set European countries and the whole region into a forefront in the Energy Trilemma Index. However, concerns remain high today regarding the necessary evolutions of the market design, especially in the electricity sector, to secure the significant investment levels ahead to ensure electricity security. The jury is still out on concerning the pace of Internet of Things (IoT) and Data AI developments in the European Energy sector as business models are being built up and tested.

ACKNOWLEDGEMENTS

Cedric Lewandowski, Vice Chair for Europe, World Energy Council
Dr Einari Kisel, Regional Manager for Europe, World Energy Council

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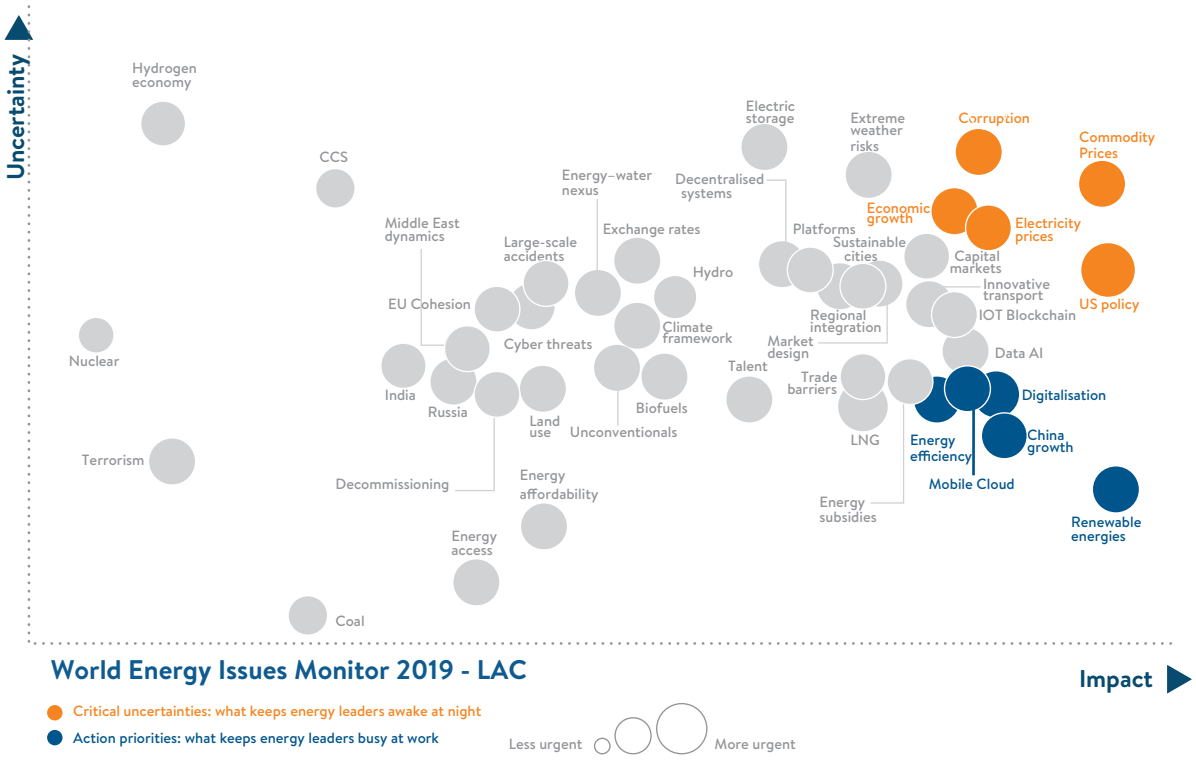
Chapter five
Assessing the energy agenda for Latin America and the Caribbean

LATIN AMERICA AND THE CARIBBEAN



REGIONAL OVERVIEW & CONTEXT

In 2018, Latin America and the Caribbean countries (LAC) signed the Escazú Agreement. The objective of this important agreement is for protection of the right of every person of present and future generations to live in a healthy environment. 16 of the 33 countries in the region have signed the agreement (a minimum of 11 signatures were needed for it to be ratified). The agreement allows access to environmental information, public participation in the environmental decision-making process and access to justice in environmental matters.

The LAC region has large endowments of hydrocarbons reserves, a massive hydroelectric potential, as well as wind and solar energy potential. The strong sunshine in Bolivia, Peru and Chile, with the latter's 38,000 square mile-Atacama Desert, provides huge solar potential. Meanwhile, Brazil has major wind capacity at night that could perfectly complement its Andean neighbours' daytime sunshine, potentially providing vast quantities of free energy for all four countries on a 24-hour basis the necessary international transmission lines were available. This comparative advantage allows the countries in the region to utilise available resources, transforming the energy mix and incorporate new technologies for the development of renewable energies.

On the other hand, the LAC region is still dealing with the fluctuation in commodity prices as it is shown in the last two years' Issues Monitor Maps. This uncertainty and dependence on the oil price highly affects national budgets and investments. Further consequences include instability, inflation, devaluation and rising unemployment.

In 2018 survey respondents identified corruption as a critical uncertainty in the region, but in the prior year's survey, this issue was seen an action priority. The corresponding national commentaries discuss the negative impact of corruption affecting the region's economic growth.

KEY ISSUES FROM THE REGIONAL MONITOR

Infrastructure constraints and **markets design** are being affected by the political and economic crisis in the region due to political upheavals and the fluctuation in oil prices. There is a growing tendency to open economies, but the regulatory framework is still weak for private investments, making market design a critical uncertainty. In some countries, the state-owned companies, integrated electricity monopolies failed in the end to manage the electricity prices which is another critical uncertainty based on survey responses. In Bolivia, Peru and Ecuador governments failed on raising their budgets for the electricity sectors but, at the same time, the tariff is subsidised for low-income consumers.

Commodity Prices is a critical uncertainty because of the region's economic dependence on oil. Crude oil price experienced an improvement, from around $60 per barrel to a high of $85 per barrel and a low by year-end of $50 per barrel. These fluctuations are deeply affecting the economies of LAC countries. South American countries budget depends on oil exports while many of the Central American and Caribbean countries are highly dependent on fuel imports to generate electricity.

Corruption continues to be a critical uncertainty and is undermining the economic growth and generating political instability. Stemming from this, corruption is the lack of legal security which delays the development of large energy projects, interrupting discussions and discouraging investments that directly affect local markets, and therefore regional growth. On a larger scale, corruption is undermining public institutions.

Renewable Energies has been an action priority in the region as it has been prioritised in the governmental plan of most of the countries in order to take advantage of its large endowment on hydro, wind and solar energy potential. Chile, Colombia, Ecuador and Uruguay are examples of big efforts towards the change of the energy mix to replace the use of fossil fuels. Governments and companies continue to invest in this area with innovation and new technology but remain concerned about the effects of climate change that can affect the generation of energy from renewable sources.

Energy Efficiency is not an uncertain issue but requires focused attention and action to realise its potential. The region must work on critical aspects such regulatory frameworks, tax incentives and dissemination on good energy efficiency practices among the entire population. Colombia and Chile are moving forward to improve the use of energy efficiency mainly on what refers to electric vehicles. The Colombian Member Committee of the World Energy Council develops an annual event on e-mobility that promotes sustainable mobility, through the use of clean technologies in transport. In the same line, Chile has replaced the vehicles from some governmental institutions to electric vehicles which reduces the GHG and improves the use of this technology from the public perspective.

Digitalisation is viewed as a key action for energy leaders as companies need to adapt to an increasingly complex supply chain. The growth of renewable resources is increasing daily variability. This lack of predictability creates a big challenge to match the energy supply and demand in a very complex way. Brazil has shown that to withstand this complexity, the use of smart meters, remote

controls, automated systems, real-time simulators, and other new technologies will allow energy companies to be able to respond to the challenges brought on by renewable sources.

Economic growth and its interlinkages with corruption will define the pace of transition in the energy sector in the LAC region. Also, **US Policy** and **China's** presence in the region are key issues to understand some of the large-scale projects being developed.

CONCLUSION

The slight economic growth experienced by the region in 2018 from the rise in the price of oil allowed South American countries to slightly recover. However, addressing uncertainties remains critical to achieving the stability needed to take action on new issues that are priorities at the global level, especially those related to the use of technology, new business models, digitalisation and innovation.

The LAC region needs to focus its efforts on dealing with the uncertainty of extreme weather events through investments in resilient infrastructure, risk prevention management and systems that allow recovery after an extreme weather event, as indicated by Colombia, Ecuador and Peru, affected by the El Niño phenomenon, Central America with hurricanes and tornadoes, and some countries of South America with seasons of extreme drought.

ACKNOWLEDGEMENTS

Andrea Arrobo, Latin America and Caribbean Regional Manager, World Energy Council

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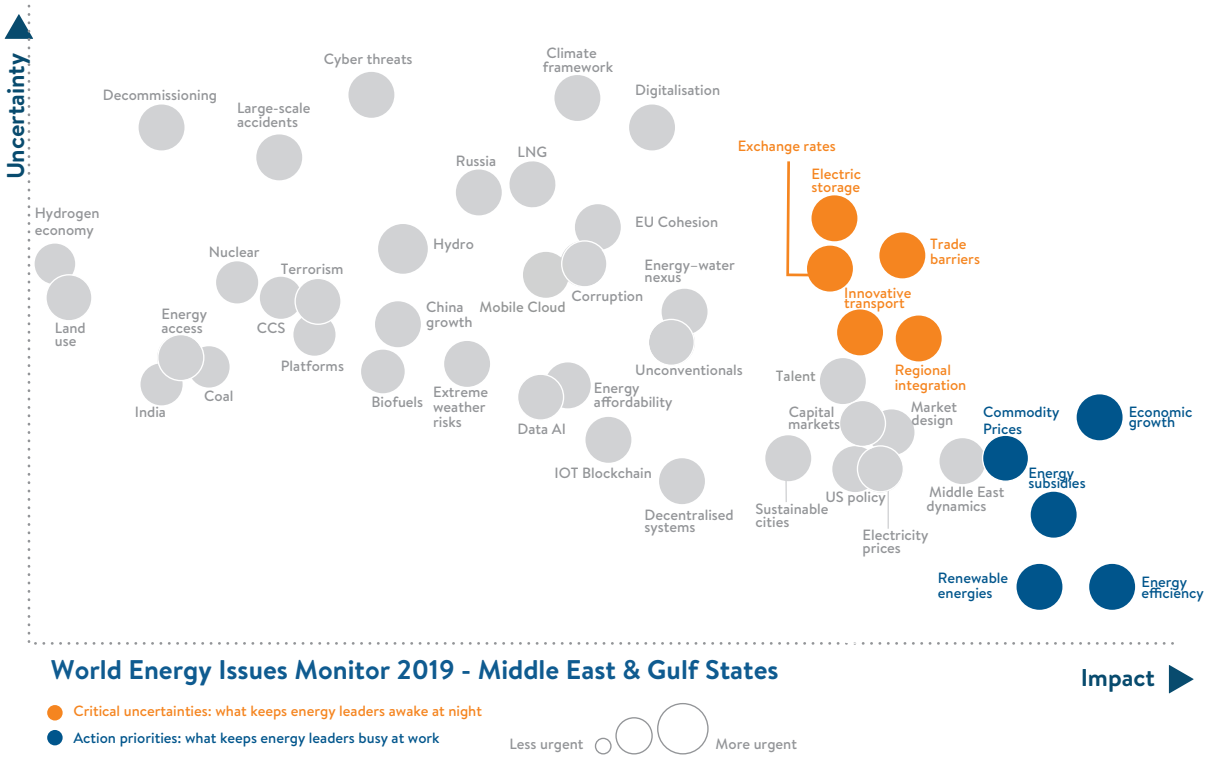
Chapter six

Assessing the energy agenda for the Middle East and Gulf States

MIDDLE EAST AND GULF STATES



REGIONAL OVERVIEW & CONTEXT

The Middle East grappled with a highly volatile oil market in 2018 as the region's largest oil producers, led by Saudi Arabia, the UAE and Kuwait, were forced to cut production to prevent oil prices from sinking under the weight of excess supply as they did by the end of last year. The surplus was caused largely by the relentless rise in US shale oil output, making the US the world's largest producer of oil ahead of Middle Eastern kingpin Saudi Arabia. This changing dynamic has eroded the power that the Arab members of the Organization of the Petroleum Exporting Countries (OPEC) once wielded over the oil market and the price of a commodity that is the mainstay of their economies, which remain highly dependent on oil revenues. That is why Commodity Prices have been identified in the 2018 Issues Survey as an action priority for the Middle Eastern states. The region's oil importers such as Jordan, Lebanon and Israel, are affected positively by lower oil prices while for governments in the oil producing nations, a lower oil price provides an opportunity to remove remaining subsidies on fossil fuels and electricity without the risk of a public backlash while boosting revenues and curbing domestic consumption.

The Gulf states, including Saudi Arabia and the UAE, began introducing subsidy reforms when oil prices collapsed in late 2014 and are in the process of lifting remaining subsidies that previously ate up a large chunk of state budgets and allowed for rampant energy consumption. Energy Subsidies remain an action priority and success in implementing planned price reforms are crucial as the Middle Eastern nations have begun to diversify their energy sources, particularly in power generation, where oil and gas are dominant.

Demand for electricity in the Middle East is growing in line with economic growth and an expanding industrial sector, coupled with high demand for energy for air conditioning during the summer

months and for desalination of water. According to the Arab Petroleum Investments Corporation (APICORP), electricity demand in the Arab world has increased 10-fold since 1980 due to population growth, industrialisation, urbanisation and subsidies. APICORP says that although growth rates have slowed because of slower economic growth and the partial removal of subsidies, the MENA region will need to add capacity at 7.4 percent annually until 2021, which corresponds to additions of more than 130GW and would require investments of approximately USD180 billion.

Governments continue to meet this challenge by expediting new projects and upgrading their infrastructure while also encouraging the private sector to join as partners and financiers. Most Arab countries are struggling to meet increasing electricity demand and thus experience frequent blackouts, as has been the case in Kuwait. Iraq is a special case due to the damage to its infrastructure after decades of war and internal conflict, a situation that has led to constant power shortages and social unrest. In Lebanon, subsidies on petroleum products and the state electricity utility are making it difficult for renewables to compete with fossil fuel powered generation despite the rapid decline in the cost of wind and solar technologies, which are being introduced gradually. Although the global trend is toward more decentralised power systems in much of the developed and developing world, in Lebanon, the government is trying to recentralise the power sector given the heavy reliance on higher cost private diesel generators.

KEY ISSUES FROM THE REGIONAL MONITOR

The introduction of variable energy sources such as wind and solar means that **Electricity Storage** is a critical uncertainty though not one of overriding concern. It may become a bigger concern as the share of renewable energy technologies increases across the region. In many of the countries of the region, energy efficiency has not kept pace with the deployment of renewable technologies.

Both **Energy Efficiency and Renewable Energies** are identified as action priorities in this year's Issues Monitor, but there appears to be a two-track approach by many governments, which need to apply stricter energy conservation and efficiency measures to go hand in hand with the expansion of clean energy technologies. As the Middle East and Gulf regions are at risk from the impact of climate change and CO2 emissions, partly emanating from the energy sector, and fossil-fuel based transport sectors, urgent mitigation action is needed sooner rather than later.

Innovative Transport is identified as a critical uncertainty in the latest survey because there has been little done to encourage the use of electric or hybrid vehicles except perhaps in the UAE. UAE has also taken the regional lead in introducing technologies such as Carbon Capture Storage and Utilisation (CCSU) and is set to have the region's first nuclear power plant operational soon.

These action priorities are coupled with Energy Efficiency and Renewable Energy policy actions that are still lagging in much of the region except in the UAE, where solar power has now been integrated into the energy mix to lessen reliance on natural gas (natural gas accounts for more than 90% of the energy mix in power generation). This has forced the UAE to become an importer of LNG. The same applies to Kuwait, which is building a permanent LNG receiving terminal to cope with rising power demand. The UAE and Oman are still importing pipeline gas from Qatar through the Dolphin pipeline though the continued diplomatic rupture between Abu Dhabi and Qatar after the UAE, Saudi Arabia

and Bahrain imposed a trade embargo on Qatar, makes an increase in volumes from Qatar to the UAE unlikely. The crisis with Qatar, where there has been no sign of progress toward a resolution, has complicated efforts to achieve broad **Regional Integration** which looms large as a critical uncertainty.

CONCLUSION

The Middle East and Gulf States regional energy commentary would not be complete without mention of Iran and the impact of the US' withdrawal from the nuclear agreement known as the JCPOA and the imposition of new sanctions against Tehran's energy, banking and shipping sectors by Washington. The sanctions have introduced a new level of volatility to oil markets, at one point forcing oil prices to rise above USD80 per barrel for benchmark Brent Blend in late 2018. This and the threat of slower global economic growth due to the still ongoing trade dispute between the United States and China, added to oil market volatility. That is why Trade Barriers are included as a critical uncertainty for the Middle Eastern states, which export the bulk of their oil and gas to the Asian market with China in the lead as the largest consumer of energy.

ACKNOWLEDGEMENTS

Kate Dourian, Middle East and Gulf States Regional Manager, World Energy Council

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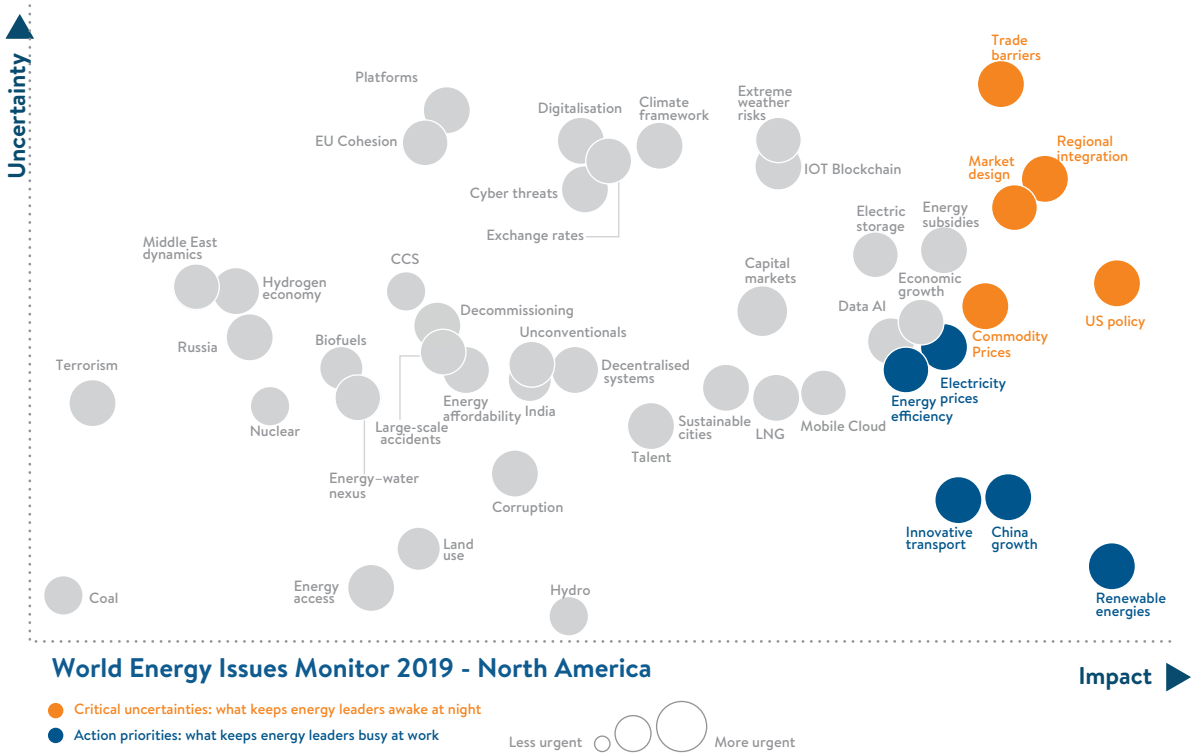
Chapter seven
Assessing the energy agenda for North America

NORTH AMERICA



REGIONAL OVERVIEW & CONTEXT

Natural resource development is a significant component of the GDP for all three North American countries. Since both the production and use of fossil fuels play a large role in the North American energy sector, the challenge of meeting emissions reduction targets is significantly greater than it would be for countries lacking fossil fuel resources. While greater electrification, using less-emitting generation sources remains a general policy objective across Canada, Mexico and the US, overall energy end-use remains primarily non-renewable, fossil-based sources.

On the economic front, the US-initiated renegotiation of the North American Free Trade Agreement presented a degree of inevitable uncertainty for the North American energy sector in 2018. Tariffs and countervailing tariffs in the steel and aluminium sectors present negative cost effects on energy projects in all three countries. Despite some areas of cooperation, disparate frameworks continue to hinder the optimal effectiveness of a North America response to the global issue of climate change.

North American energy professionals remain keenly aware of the fast-paced disruption, and enhancement opportunities, that big data, artificial intelligence, and the internet of things (IoT) are presenting to established business models. The advent of blockchain technology in particular is of special interest for those involved in electricity distribution and trade. Increased energy efficiency continues to be one of the most common and cost-effective ways to reduce greenhouse gas emissions across North America. The widespread deployment of new renewables is also helpful in this regard however, but they can present both physical and operational challenges.

KEY ISSUES FROM THE REGIONAL MONITOR

For the North American region, **US policy** poses a continued uncertainty. Strong and sometimes threatening rhetoric characterised talks between the US, Canada and Mexico during the renegotiation of the North American Free Trade Agreement in 2018. Trade wars and tariffs, both real and threatened, added additional uncertainty as different sectors of the economy, including energy, worried how they may be directly or tangentially affected. US federal reductions in taxes and regulations have Canada and Mexico reviewing their competitiveness, particularly in the energy sector.

The ever-increasing gathering of real-time **data**, combined with the growing deployment of **artificial intelligence** to analyse and act upon it, presents challenges and opportunities to the energy sector. It also produces a persistent and potentially growing new source of uncertainty in decision making. While this evolution may promise significant new energy sector efficiencies, it will also disrupt established business and economic models. It also necessitates persistent vigilance in the domain of cyber-security.

Canada, Mexico and the US are all constitutional democracies and federated countries with unaligned and frequent elections. They each face persistent challenges in aligning their own internal **climate change frameworks** at national, sub-national and municipal levels, let alone pursuing a consistent continental approach. Yet, without greater continental policy alignment, concerns such as carbon leakage and competitiveness issues persist. Frequent sub-national and national changes in climate policy directions in all three countries produce collective uncertainty for the energy sector.

International wisdom says that the least expensive and most environmentally benign unit of energy, is the unit that is not consumed or produced in the first place. Since no form of energy comes without cost or impact, it is not surprising that North American respondents rank **energy efficiency** as their primary action priority. Notwithstanding any relative strengths or weaknesses in energy production or distribution, increased energy efficiency is equally beneficial and important to all consumers in all countries.

While reducing the use of energy through conservation and efficiency remains the best method for cutting costs and emissions, energy demand generally continues to grow. Canada, Mexico and the US have experienced significant emissions reductions by deploying **renewable energies**. Technological improvements, reductions in equipment cost, and economies of scale achieved through larger scale adoption, have made renewables increasingly viable and attractive. Better integration of North American renewables may offer additional advantage.

Energy **blockchain** straddles Critical Uncertainty and Action Priority as the energy sector monitors developments and attempts to discern how profound or potentially disruptive advancements in this area may be. Greater automatic communication between people and their houses, devices, appliances, vehicles etc. offers opportunities for more precise, tailored, peer to peer management and trade of energy. Pilot projects and experimentation has occurred, the North American energy sector will need to remain watchful in this area.

CONCLUSION

Despite any uncertainty from the renegotiation of the North American Free Trade Agreement, the free and fair trade of energy between Canada, the United States and Mexico continues to enhance the three economies. Prior preoccupations with energy self-sufficiency are ceding to new conversations about greater energy trade both within North America and with the rest of the world. Significant new supplies of North American oil and natural gas are looking for new domestic, continental and international markets. Meanwhile, all three countries on balance, will likely seek to continue reducing emissions through national and sub-national policy initiatives. Collaboration around climate policy offers a significant area of opportunity for achieving emissions reductions while enhancing North American economies.

ACKNOWLEDGEMENTS

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

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

We have all six regions of the world represented in this year's edition. Currently, 52 countries provide the basis for the global issues map. In the near-term, we are striving to include all member countries in future publications. We are also committing ourselves to broaden the survey participation to include new voices of new energy shapers within and beyond the energy system.

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