

World Energy Issues Monitor | 2020



2020

DECODING NEW SIGNALS OF CHANGE

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

Further details at www.worldenergy.org and @WECouncil

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ABOUT THE ISSUES MONITOR

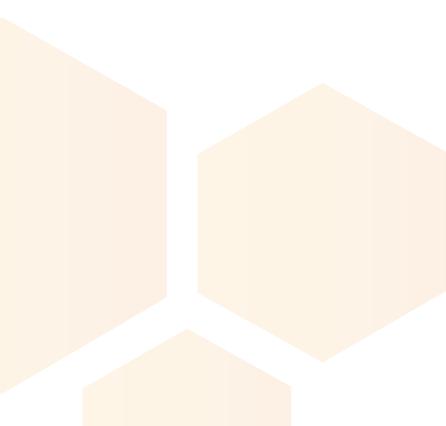
The World Energy Issues Monitor provides a snapshot of what keeps CEOs, Ministers and experts awake at night in over 100 countries. The Monitor helps to define the world energy agenda and its evolution over time. It provides a high-level perception of what constitute issues of critical uncertainty, in 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 eleventh iteration of the Issues Monitor is based on insights of more than 3,000 energy leaders in 104 countries to provide 58 national assessments across six world regions. This year's report also provides the perspectives of 550 energy customers across 50 countries on the role of individuals in the Energy Transition.

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.

World Energy Issues Monitor | 2020, published by the World Energy Council.



A futuristic digital cityscape with glowing skyscrapers, data streams, and binary code. The scene is set in a dark, blue-toned environment. Several tall, rectangular buildings are illuminated with bright blue and white lights, creating a sense of depth and scale. The buildings are interconnected by a network of glowing yellow and orange lines that resemble data paths or fiber optic cables. The background is filled with floating binary code (0s and 1s) and various data-related terms like 'info', 'file', 'data', and '01'. The overall atmosphere is one of high-tech innovation and digital connectivity.

DECODING NEW SIGNALS OF CHANGE

FOREWORD

I am delighted to share this insightful and useful resource which has been developed with and for use by our global member community network in nearly 90 countries.

In September 2019, the 24th World Energy Congress convened more than 18,000 energy leaders and experts from 146 countries in Abu Dhabi. Concerns about fragmentation emerged as the greatest risk to accelerating the pace of global energy transition and meeting the challenges of energy for humanity.

As the first global energy transition community, we have promoted a neutral and collaborative approach to closing the gap between human ambition and energy solutions for nearly 100 years.

Our annual Energy Issues Monitor provides an essential tool for enabling shared understanding of the complex issues involved in accelerating energy transition in regionally diverse energy societies with different energy systems.

The global, regional and national maps contained in this 11th annual survey report can be used to decode new signals of change and to forge a new common ground that motivates transition coalitions to form and to move forward, faster and together.

Signals in this year's global energy Issues Monitor indicate:

- The outlook shows a greater mix of clean heat, clean power and clean fuels solutions in response to new and shifting demand in regionally diverse energy systems. Peak value in commodities is expected as value continues to migrate to services.
- A disruptive combination of financial- and technology-innovation continues to accelerate the pace of energy transition. There is growing demand for smart systems integration and flexible storage solutions to meet the challenges of variable generation and provide affordable access solutions to rural communities. New nuclear interest is evident in Europe, China, Africa and the Middle East. Coal-fired power is peaking in the USA and growing fast in India. The global clean molecules 'transition bridge' is expanding to include gas with carbon capture and storage (CCS), green gas and an array of hydrogen-based fuels. The future beyond peak oil demand will be determined by the development of the circular carbon economy.
- Accelerating deeper and more affordable decarbonisation is a common, but not easy, ambition. Climate change activism and mitigation actions are picking up pace as, once again, global emissions increase from energy use. Green investors and non-state actors are stepping up action even as some states roll back environmental regulations. Climate sensitivity remains the key uncertainty in the science of climate change. Meanwhile the severity of impacts, frequency and costs of extreme weather events is expected to increase in every region. Even though climate adaptation is not being universally addressed, the search is on for enhanced systems resilience to extreme events – including cyber threats, water stress and weather-related disruptions.

- The geopolitics of energy have broadened beyond oil and gas to include the non-energy resource implications of the renewables revolution and the security implications of the cyber-energy technology nexus.

Within the supporting regional and national commentaries, we also detect new signals that energy transition has entered a new era.

The social costs and implications of accelerating global energy transition are becoming more pressing. In response, we have started to shape and address the social energy agenda and reach out beyond the energy sector to engage new and non-traditional energy transition leaders.

Our first Energy Pulse – a social media compliment to our annual leaders' survey – has looked at implications for the customer-centric energy future. The initial findings confirm that changes in behaviour will not be automatic, without more active customer engagement.

I believe that we have entered a new era of energy for humanity. Global energy transition is now being shaped by the 5Ds – decarbonisation, decentralisation, digitalisation, democratisation and demand-centric (energy-plus) services.

Focussing on actions at the human level and addressing the social impacts of an accelerating energy transition will contribute to healthy, harmonious and happy energy societies.



Dr Angela Wilkinson
Secretary General & CEO,
World Energy Council



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OVERVIEW

The World Energy Issues Monitor is published annually, providing unique insight into what keeps policymakers, CEOs and leading experts awake at night, globally, regionally and nationally.

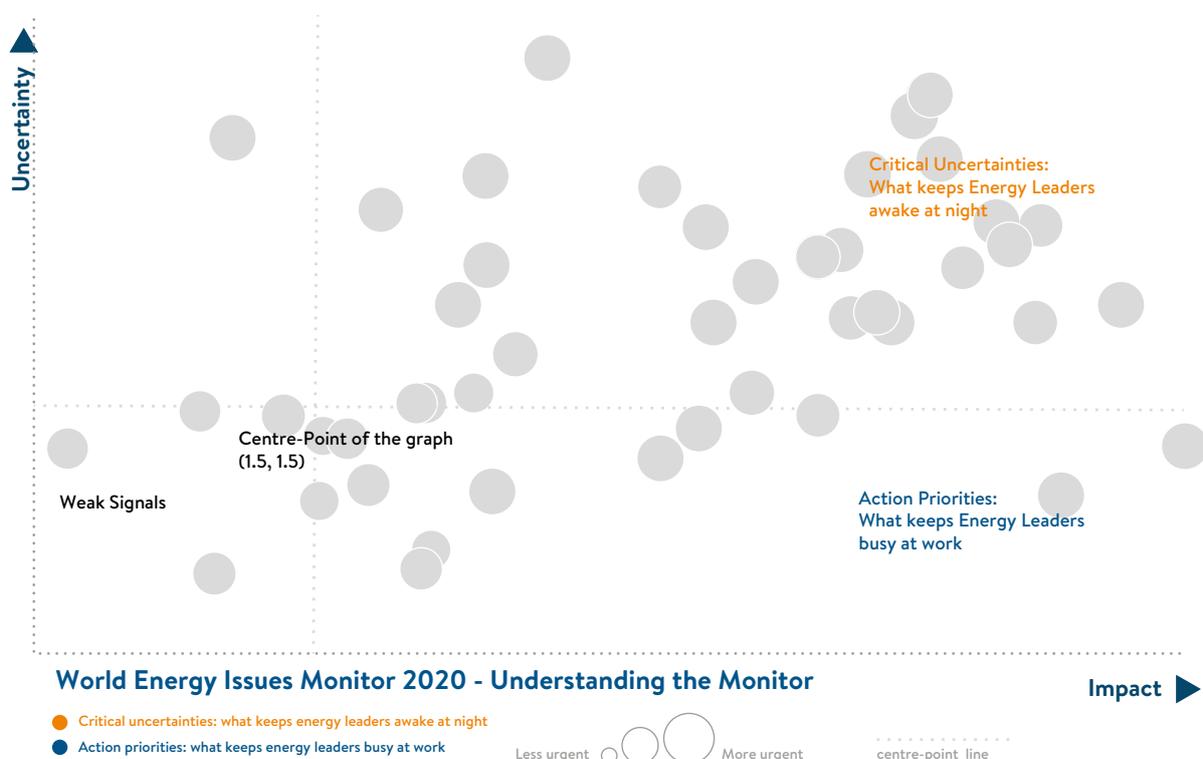
The Council has been conducting the Issues Monitor survey since 2009.¹ The survey looks at 42 issues (and 4 digitalisation-specific issues) and how they are perceived by energy leaders from different parts of the world. These 42 issues show the progression of the energy transition in terms of the operation of the energy system.

New this year, the Issues Monitor also provides readers with the views of the individual customer, detailing their perceptions of their role in the overall energy system.²

Each Issues Map provides a visual snapshot of the uncertainties and action priorities that policymakers, CEOs and leading experts strive to address to shape and manage successful energy transitions. The Issue 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 0: Visual Snapshot – How to read an Issues Map



1. For an overview of how to reach the map and the methodology behind the Issues Monitor, please see the Issues Monitor Methodology on page 158.

2. In 2019 the Council initiated a new survey – The Energy Pulse; while the Issues Monitor looks at existing issues, the Pulse is an ad-hoc survey mechanism that aims to dig into issues that are emerging and not covered directly within the Issues Monitor.

GLOBAL PERSPECTIVES

The global map and narrative are produced by synthesising individual country analyses and commentaries.³ These provide an informed picture of five categories of transition challenges at national, regional and global levels:

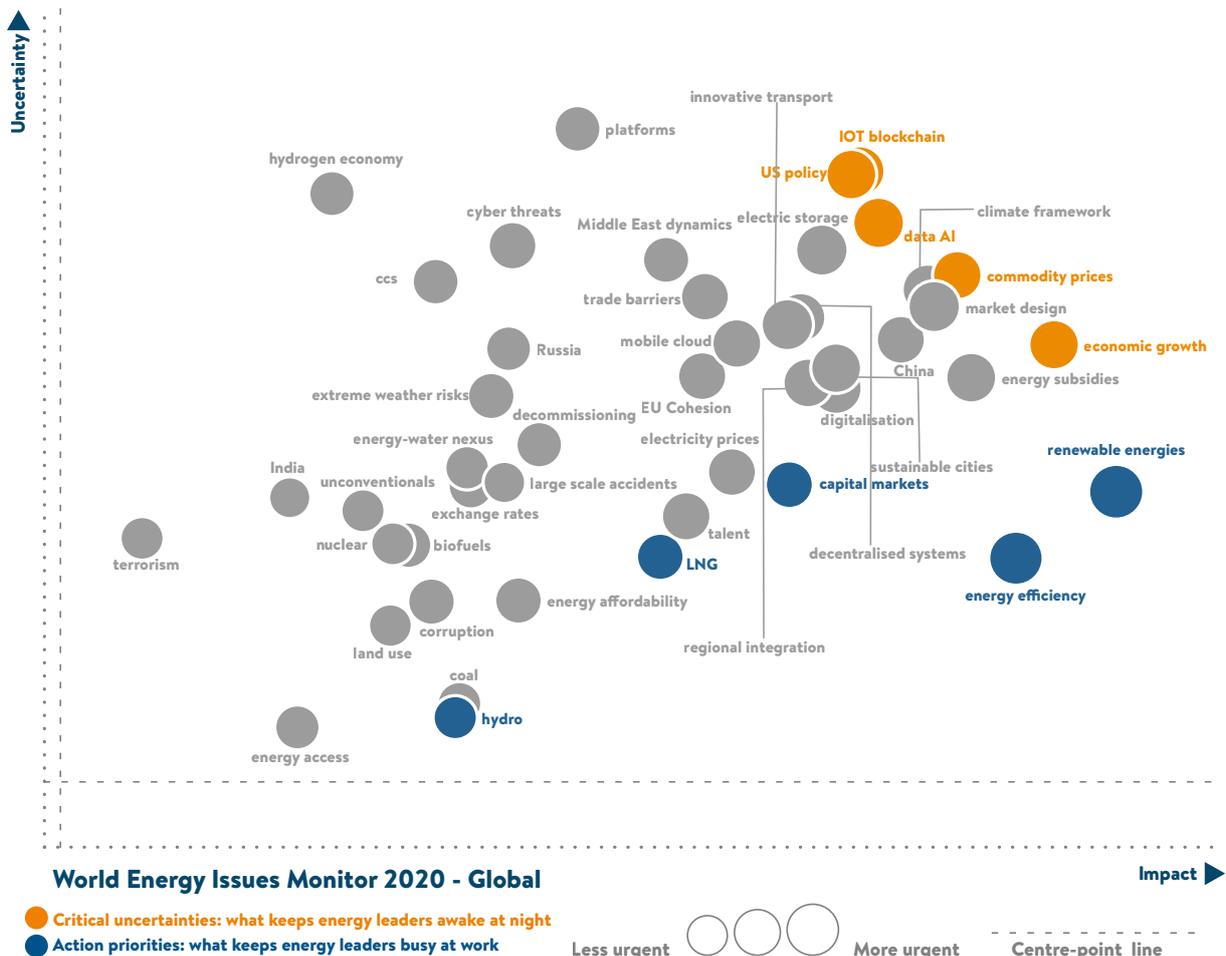
1. macroeconomic risks
2. geopolitics
3. business environment
4. energy vision
5. technology



The 2020 global map incorporates all survey responses representing the views of over 3,000 energy leaders from 104 countries.

In this era of transition defined by decentralisation, digitalisation and decarbonisation, 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 shaping energy transitions.

Figure 1 Global Perspectives on the Energy Transition



3. For an overview of how to reach the map and the methodology behind the Issues Monitor, please see the Issues Monitor Methodology on page 158.

Based on the results obtained from the national and regional analyses, three main insights have emerged from this year's World Energy Issues Monitor Survey:

- Macroeconomic and geopolitical issues define Critical Uncertainties
- Technology issues define Action Priorities
- Regional integration is a “desired” means of improving energy security

MACROECONOMIC AND GEOPOLITICAL ISSUES DRIVE CRITICAL UNCERTAINTIES

A. Ongoing US-China trade dispute

The strained trade relations between the United States and China have led to higher uncertainty across all regions. Tariffs imposed on energy and other goods between the US and China together with emerging technology tensions (e.g. with Huawei and 5G infrastructure) are seen globally as having an impact beyond just the world's two largest economies. The uncertainty has affected confidence and led to lower energy demand growth prospects. After two years of uncertainty, the US and China signed a phase one trade agreement in January 2020 that eased some tensions, leaving other issues unresolved for later.

- China plays a crucial global role as an energy infrastructure investor, with particular relevance for growing economies. In Argentina, for instance, large Chinese investments such as the Caucharí Solar Park complex positions the country as an enabler of new business opportunities and growth. As the world's leading energy consumer and importer, China also represents a demand and revenue source for energy exporting countries.
- The United States plays a critical role as a leading energy exporter and an active development partner. Its development support provides crucial finance for growing economies such as Chile, where it can also be a key trading partner and leading investor in infrastructure and innovation.

B. Growth prospects clouded by macroeconomic risks

Volatile commodity prices is a key source of instability for both energy consumers and producers. This reflects changes in the balance of oil and gas supply and demand, especially the growth of US oil and gas production reducing the import demand from the world's second largest energy consumer.

- While consumer countries face economic challenges, those countries that rely heavily on hydrocarbon exports for state revenues are particularly exposed and face significant challenges. Nigeria, for instance, saw a significant decline in energy export revenues from lower prices. Colombia's economy continues to be severely impacted by the oil price collapse of 2014, as the commodity has historically accounted for most of the country's export income.
- Governments have responded differently to these energy price fluctuations, with some

reducing expenditure on infrastructure projects and others using the opportunity to eliminate subsidies. A few countries have raised import duties to manage trade balances. Algeria responded to decreased export revenues by raising domestic fuel prices in an effort to reduce the subsidies bill. But there can also be risk. The Ecuadorian government's decision to eliminate fuel subsidies as part of public spending cuts led to massive protests in late 2019.

C. Climate issues are seen as a priority, but there is still high uncertainty

Although the Climate Framework issue receives priority attention in all countries, uncertainty remains around the impact of intensifying extreme weather events and the need to adopt climate adaptation and mitigation measures. Countries with greater exposure to extreme weather events show more concern about the pace of climate-change with more frequent incidents of extreme weather events such as flooding, droughts and forest fires.

- Although individual countries are able to reduce emissions and improve their own climate performance, they remain concerned with the pace of collective global actions. For instance, in Japan there is growing concern that the frequency and severity of heavy rains and super typhoons may increase further as a consequence of climate change. Chile is concerned that global warming will melt glaciers and lead to increasing water scarcity - in October 2019, the country faced its worst drought that led to the death of around 10,000 animals.
- National targets for cleaner energy use range from a minimum 20% renewables share of the energy mix to complete carbon neutrality (the European Union 2050 objective). Germany's 2019 climate protection package lists more than 60 measures for transport, agriculture, industry and other sectors to lower their respective CO₂ emissions. Key challenges relate to the transport sector as the biggest emitter, and the need to protect industrial competitiveness and vulnerable communities.

TECHNOLOGY ISSUES LEAD ACTION PRIORITIES

A. Technology improvements are seen to provide solutions for greater affordability and sustainability

Governments are beginning to design pathways for the wider adoption of renewables, digitalisation, energy efficiency, energy storage, and other innovative technologies as part of national energy transitions.

- Blockchain remains seen as an enabling solution for affordability of distributed energy systems. While start-ups are proving the value and usability of the technology, governments in different regions are beginning to open opportunities for innovative solutions. In Switzerland, start-ups are developing blockchain-enabled energy technology for smart meters and transactional power grids aimed at reducing network and grid operation costs.
- Smart cities are gaining momentum especially in Latin America and the Caribbean, where the environmental impacts of fast-paced urbanisation are balanced with supporting policies and

investments in smart grids, innovative transport and storage technologies. In 2019, Panama approved an Electric Mobility Strategy with the support of the UN Environment Programme and the European Union as a way to reduce greenhouse gas emissions from the transport sector.

B. Energy Efficiency appears as a key theme with clear measures being universally adopted

The high potential impacts and relatively low costs of Energy Efficiency measures are recognised in nearly all countries and led to adoption of a number of plans to improve the performance of appliances, buildings, the electricity and gas distribution grids.

- Building efficiency is a particularly important focus for Europe, where the European Commission estimates that buildings account for 40% of energy consumption and 36% of CO₂ emissions. Governments are using tax incentives for building renovation to reduce energy consumption. For example, since 2010, Switzerland has prioritised improving building efficiency through the Swiss federal and cantonal Buildings Programme that incentivises the energy-efficient renovation of buildings through investment in renewable energies, waste heat recovery and the optimisation of building services technology.

C. Focus on distributed systems to achieve accessibility and decarbonisation goals

Distributed policy initiatives are being promoted to achieve universal energy access by 2030. However, while supporting regulatory frameworks may exist, project finance in emerging markets remains a challenge as business cases usually rely on subsidised support.

- In western Mongolia, the Asian Development Bank is supporting a project to develop a 40.5MW distributed renewable energy system to reduce import dependency and improve affordability and environmental sustainability.
- In developed markets such as Sweden, distributed generation is promoted to help decarbonisation with taxes, clean energy certificates for renewables generation and white certificates for energy efficiency being used as incentives.

REGIONAL INTEGRATION IS A “DESIRED” MEANS OF IMPROVING ENERGY SECURITY

A. Working toward strengthening regional integration

Energy integration can increase regional cooperation and diversify countries' sources of energy supply to enhance energy supply security.

- EU Cohesion is seen as necessary for more supply diversification for greater energy security. Bulgaria, for instance, is investing in the Greece–Bulgaria (IGB) gas pipeline and the

Alexandroupolis LNG terminal. It is also modernising the existing national gas transmission network, expanding gas storage and liberalising the gas market to support the creation of a Balkan gas distribution centre. Across the region, US LNG supply agreements are being discussed to diversify imports and increase market competitiveness.

- Regional electricity and gas integration in Africa can help meet countries' growing energy needs. In September 2019, the World Bank approved a financing scheme for the construction of the Mozambique–Malawi Interconnector that will link Malawi to the Southern African Power Pool, helping to address the country's insufficient power generation capacity. China's "One Belt, One Road" initiative is supporting investment in infrastructure projects for regional integration.

B. National energy strategies aim to diversify the energy mix and reduce overreliance on one supplier or one energy source

While regional integration remains important for all countries surveyed, there remains a strong focus on self-reliance.

- Countries reliant upon oil and gas imports recognise that this dependency renders their economies vulnerable to supply disruptions.
- Energy mix diversification is a key objective for countries reliant upon few supply sources. Diversification plans frequently target increasing the share of renewables to reduce imports and lower carbon emission. For example, Belgium's National Energy Plan targets a rise in the share of renewables to 18.4% by 2030 (from 8.65% in 2017) as part of its diversification strategy.

C. Renewables are an important focal point for boosting electricity production

The expansion of renewable energy, especially solar and wind, is included in many countries' energy strategies to increase clean domestic energy supply.

- Lebanon currently relies on imports for most of its energy demand but is looking to renewable energy to increase domestic production with a target of 12% by 2030
- Countries with significant coal generation are also looking to increase renewables capacity while CCS could be an important technology to reduce emissions from coal use

KEY TRENDS

This section highlights some key trends and perspectives that have emerged from tracking the Issues Monitor.

A NEW PULSE: The Decade of the Customer

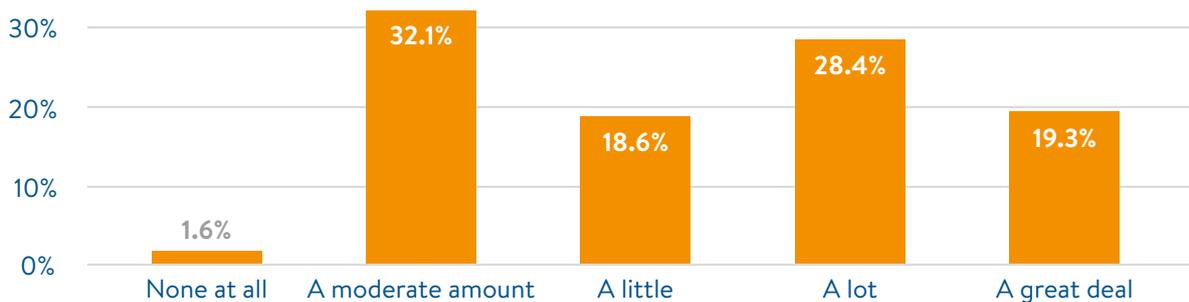
The focus for the 2010s was about trying to automate and upgrade the energy system and set targets to move the energy transition forward. Digitalisation accelerated the transition of all sectors towards a more customer-centric environment. New policies and regulations were introduced to facilitate this transition and empower consumers.

As a result, the 2020s may very well be about realising those targets through a transition from activism to action.

Interestingly, customers do not appear to appreciate fully how individual behaviour can contribute to the larger effort to decarbonise economies. In 2019, we piloted a short survey to ask 550 customers from 50 countries to what extent they thought their actions could help reduce emissions from energy. As shown in Figure 2, many do not see a direct connection between their individual behaviour and overall energy demand. Effective decarbonisation requires much of the population to understand that their actions can contribute “a great deal” to reducing emissions from energy.

Figure 2: Customer perspectives on their individual role to control energy demand and reduce emissions from energy

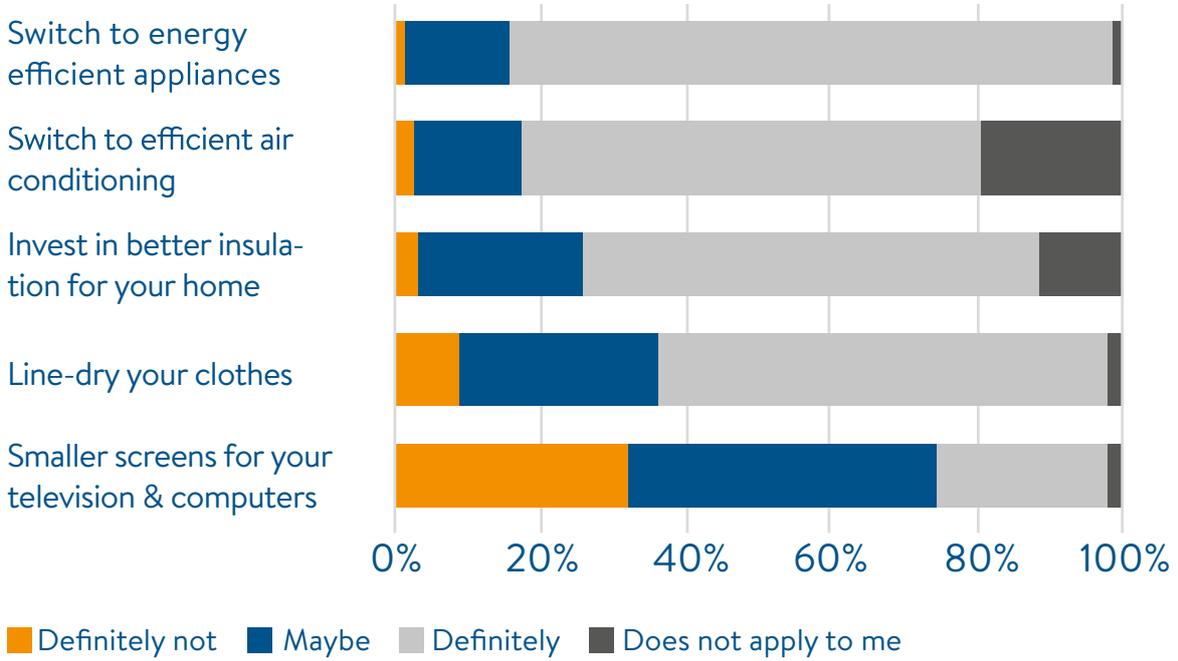
| How much do you think your actions can help reduce emissions from energy?



At the same time, many customers are willing to be more efficient. The same respondents who seem unaware that individual efforts could contribute strongly to climate mitigation and adaptation are willing to switch to more energy efficient domestic appliances (see figure 3).

Figure 3: Customer willingness to become more energy efficient

| What steps are you willing to take to help decrease your emissions in your home?

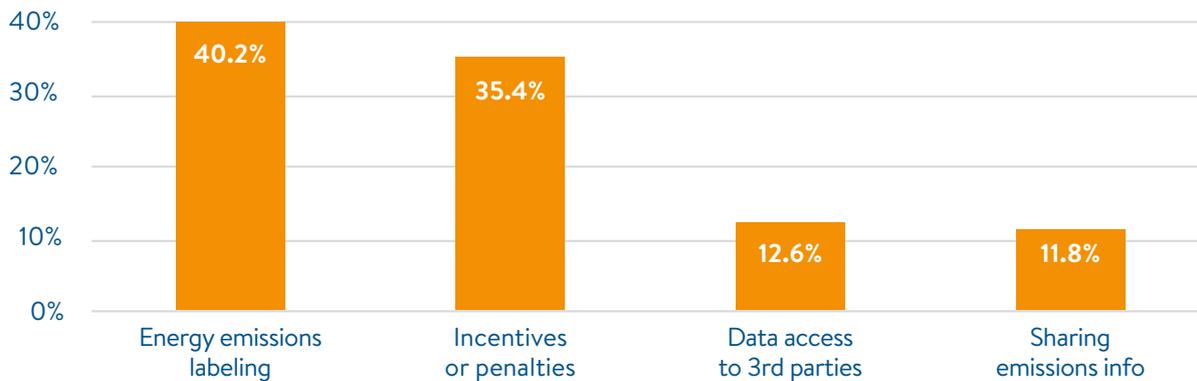


Over the last 10 years, the energy sector has invested significantly to build two-way capability into the grid to allow for more renewables and distributed generation, and equip the customer with new controls (e.g. smart meters, demand response programs, time of use rates, etc.) that provide more oversight of their energy use. As energy systems develop, customers for the first time are being equipped with the capability to drive the direction of the energy transition.

Our survey gives some insight into the most likely direction customers might follow.

Figure 4: What Customers Need to Take Action

| What would encourage you to better manage your energy consumption?



While financial incentives are an obvious carrot or stick to encourage change, most respondents also wanted more information on emissions labelling on all consumer products. Additionally, they asked for information on the carbon footprint of everything from a pair of jeans to producing a hamburger. This strongly suggests that customers are becoming less passive and much more engaged than before.

The decade of the customer is here with increasing active participation that the energy sector will need to engage with and support.

TREND TRACKING: CCS is gaining in importance within the Oil & Gas sector

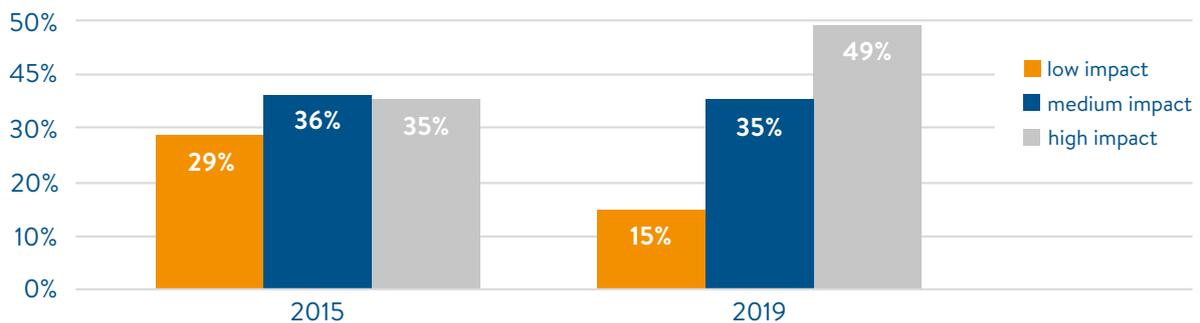
Looking at thousands of survey responses over the years provides an interesting perspective on the evolution of issues. The Council has reviewed the Issues Monitor responses of energy leaders since 2015 to determine whether there are scattered signals that over time may form a global trend.

In comparing response from the Oil & Gas sector in 2015 with 2019, we found that almost half of respondents identified Carbon Capture & Storage (CCS) as a high impact issue in 2019, up from about a third in 2015. CCS is increasingly being viewed as an essential option for continued hydrocarbon use although governmental support is needed to enable scalability and cost effectiveness.

According to the latest report from the Global CCS Institute, there are now 19 large-scale CCS projects in operation globally with four projects under construction, and a further 28 in various stages of development. The US government is using financial incentives (45Q tax credit) to encourage more cost effective CCS projects.

Figure 5: Carbon Capture and Storage is Gaining Ground for the Oil & Gas Sector

| Growing impact of CCS for the global O&G sector

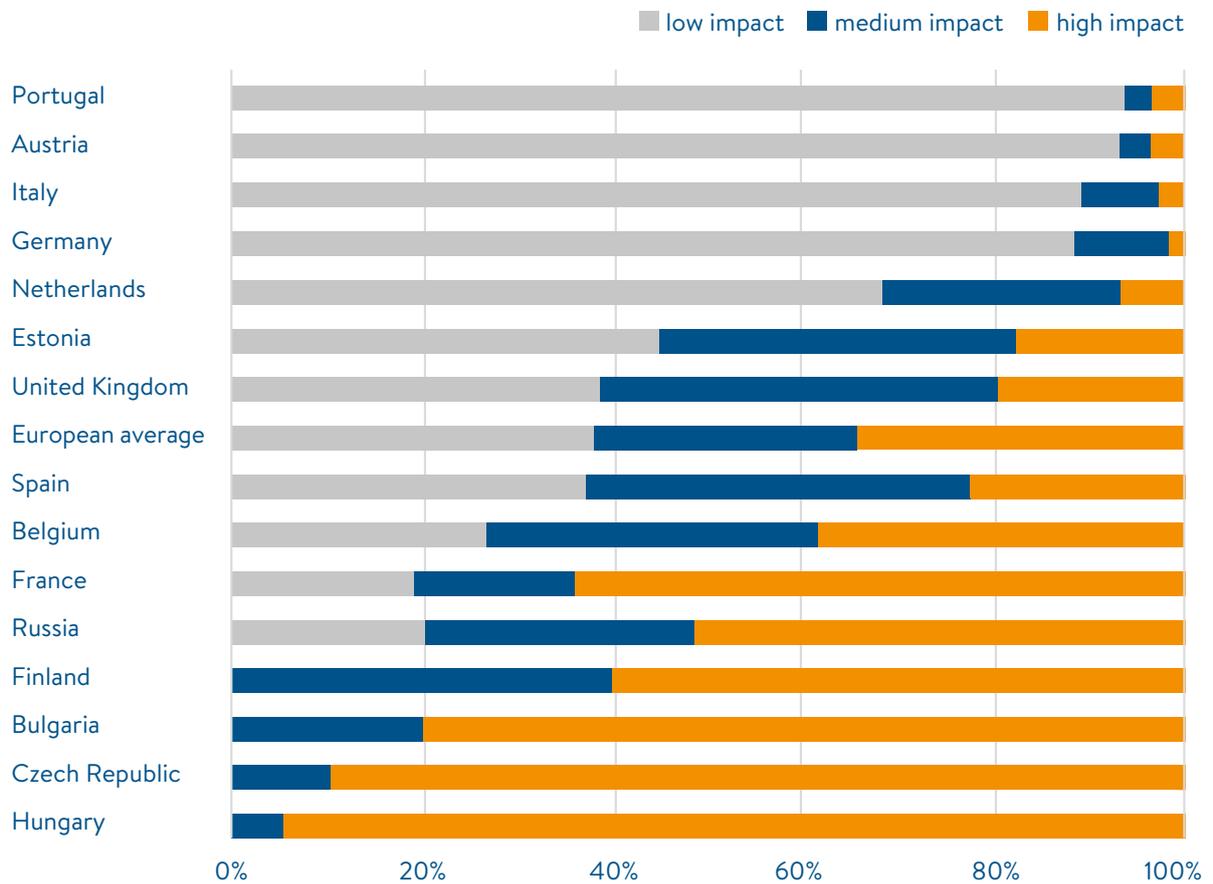


A DIFFERENCE IN OPINIONS: Nuclear power remains important in Europe

The Council investigated how European energy leaders perceive nuclear energy as a carbon-free resource for meeting electricity demand. Opinions remain polarised but in many European countries, nuclear power is increasingly recognised as a carbon-free energy source and potentially an integral part of the future energy mix. In December 2019, the European Commission set a target of net-zero carbon emissions by 2050. There is qualified support among energy leaders to include nuclear energy to help create a carbon neutral continent and enable a just energy transition. Figure 6 illustrates the diversity in the perceptions of European energy leaders on the role of nuclear power in meeting electricity demand.

Figure 6: Nuclear Energy’s Role in Europe:⁴

| Impact of nuclear within European countries



4. The Europe Average in this chart is calculated from the responses of European countries in this Issues Survey. For a comprehensive list of countries included in the survey see page 168.

Assessing The Energy Agenda for Africa





CRITICAL UNCERTAINTIES

Decentralised Systems are again viewed as issues of high uncertainty and impact. Distributed electricity generation systems, which enjoy government subsidies, offer a solution to the region's energy access challenge. Attracting private capital and boosting market competitiveness will allow for wider deployment to meet rising electricity demand resulting from rapid urbanisation.

Mobile Cloud emerges as a Critical Uncertainty with potentially greater impact as energy leaders see potential for the technology but are concerned about the measures needed for implementation. Africa has a developing information technology (IT) industry but more infrastructure is needed to provide momentum for enhanced deployment as part of wider digitalisation.

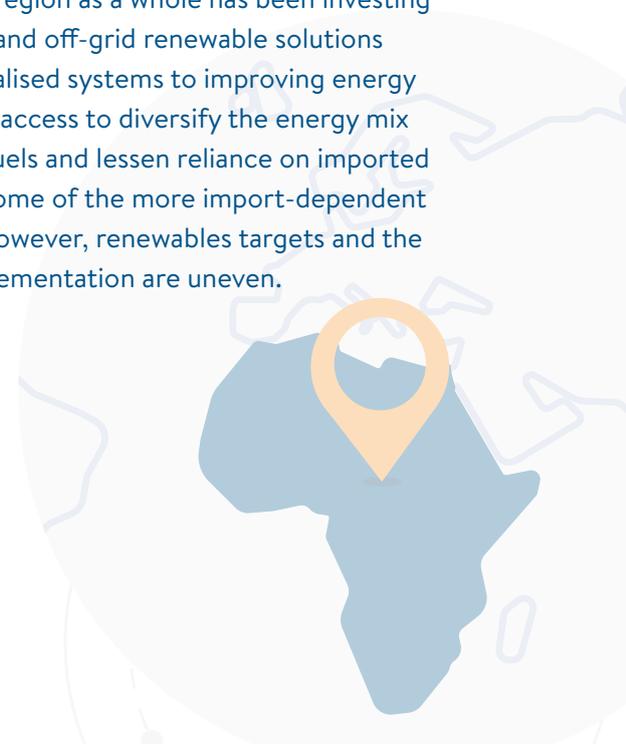
Trade Barriers are a Critical Uncertainty with implications for energy access and regional integration as well as a hindrance to economic growth. The African Continental Free Trade Area (AfCFTA) initiative, led by the African Union, is designed to improve intra-regional trade and allow more goods and services to flow across borders. This would also unlock economic opportunities across the Continent and contribute to regional integration and industrial development.

ACTION PRIORITIES

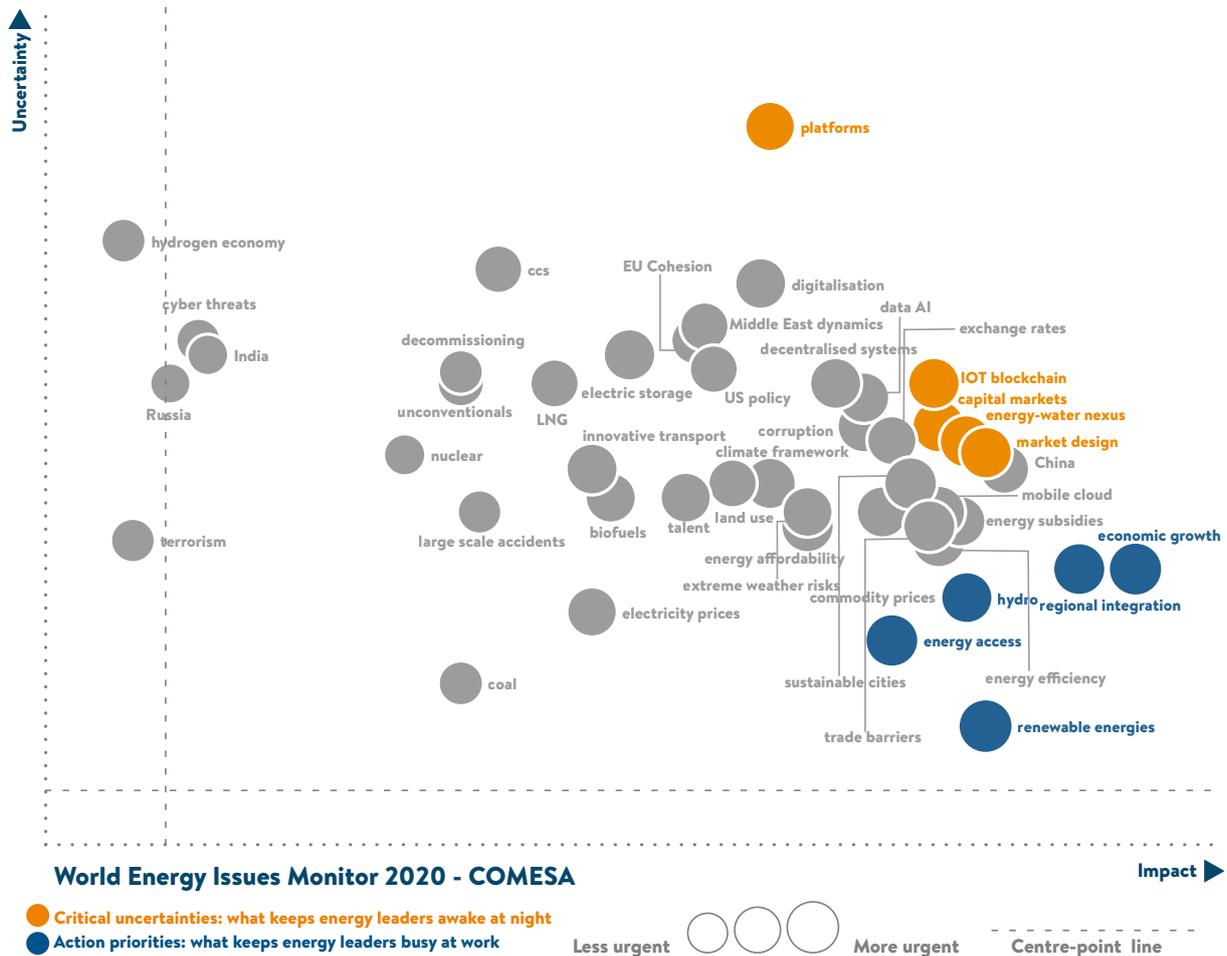
Economic Growth moves up the scale of Action Priorities as economic growth prospects are linked closely to the uneven distribution of energy. The problem is most acute in Sub-Saharan Africa, where the World Bank says economic growth "has remained sluggish, hampered by persistent uncertainty in the global economy and the slow pace of reforms to enhance domestic resilience." There is a disparity in economic performance between northern and southern African countries, where electricity demand growth is concentrated, reflecting stronger economies. However, it is Sub-Saharan Africa that will see the biggest electricity demand growth that will require policy improvements, more attractive investment frameworks and a more active private sector.

Energy Efficiency remains a high impact issue. The introduction of more efficient lighting and energy efficient electrical appliances and labelling has contributed to substantial reductions in energy use in the residential and commercial sectors. Modernising energy infrastructure and establishing decentralised systems are among plans to boost energy efficiency.

Renewable Energies remain in the Actions Priority area and are seen as having greater impact. The region as a whole has been investing in both grid and off-grid renewable solutions and decentralised systems to improve energy security and access to diversify the energy mix away from fossil fuels and lessen reliance on imported energy for some of the more import-dependent countries. However, renewables targets and the pace of implementation are uneven.



COMMON MARKET FOR EASTERN AND SOUTHERN AFRICA (COMESA)



REGIONAL OVERVIEW & CONTEXT:

The Common Market for Eastern and Southern Africa, COMESA is a regional economic body comprising 21 Member Countries. COMESA’s current strategy aims at “economic prosperity through regional integration”. With a population of over 540 million and global trade in goods worth more than US\$ 235 billion, COMESA forms a major marketplace for both internal and external trading.

CRITICAL UNCERTAINTIES

Market Design is perceived with high uncertainty. Some COMESA countries still grapple with the issue of low electricity tariffs which impacts the returns on investments. Uncertainty also derives from government influence on state-owned utilities, sometimes perceived as detrimental to the effective management of these institutions. Furthermore, vertically integrated utilities are usually viewed as a hindrance for private sector participation in the market due to restrained access to the transmission system. The perceived lack of transparency in procurement of new capacity in some countries adds uncertainty to this issue.

Energy-Water Nexus is also perceived as a Critical Uncertainty. In 2019, Zambia and Zimbabwe experienced erratic rainfall patterns which resulted in low water levels at the Kariba dam leading to loss of more than 70% electricity production from this plant. The transboundary nature of water resources requires intergovernmental cooperation. Often, riparian countries may not agree on the terms of utilisation of these resources.

Capital Markets is identified as the third Critical Uncertainty. Uncertainty in the African capital markets, which generally applies across most regions/countries of COMESA, leads to investors requiring a higher rate of return on their capital through higher risk premia. Stock price volatility in the less-developed markets has led to a decline in investor participation. Dependence on foreign currency persists in the power sector where most PPAs are denominated in dollars.

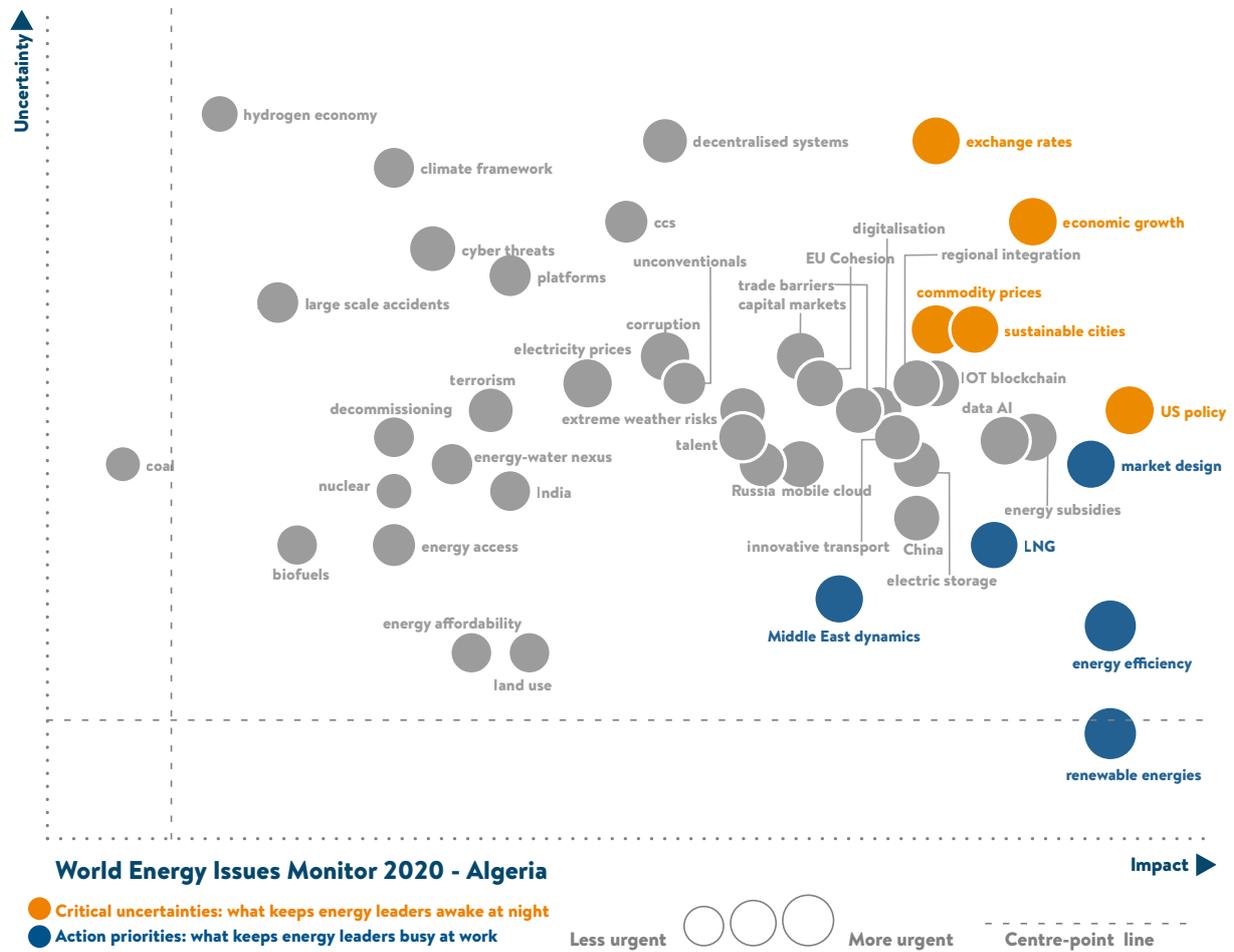
ACTION PRIORITIES

Economic Growth leads the Actions section. Most countries in the region are faced with high rates of unemployment with a predominantly young population. Low affordability remains a challenge, especially in the rural parts of the region. While the need for cost reflective electricity tariffs is recognised, the tension between affordability and cost reflectivity has been often taken into consideration in tariff-related decisions.

Regional Integration is seen as an Action Priority. Currently, several power interconnections projects are under implementation in the region. The Eastern Africa Power Pool (EAPP) is in the process of developing market instruments for the operation a power pool in this part of the continent. With most interconnection projects expected to be completed in 2021, there is a strong expectation that by 2022 the regional market will be operational.

Renewable Energies are seen with low uncertainty and high impact. The cost of renewables has drastically reduced over the last decade, leading to renewables being more and more viewed as a viable alternative electricity source. In the COMESA region, examples include the inauguration of 1100MW wind farm and ongoing development of a 1465 solar farm in Egypt, the recent installation of a 50MW solar plant in Uganda, the inauguration of a 54MW and a 34MW solar plant in Zambia and the recent additions of 310MW wind and 50MW solar capacity in Kenya.

ALGERIA



NATIONAL OVERVIEW & CONTEXT:

Comparing the survey results of 2019 and 2020, Algeria’s energy leaders place greater emphasis on economic growth and related issues in uncertainties landscape. Action Priorities continue to revolve around energy technologies and renewable energies.

CRITICAL UNCERTAINTIES

Commodity Prices are seen as an issue of high uncertainty and high impact. Algeria remains heavily dependent on oil and gas exports. Along with OPEC cuts, the cyclical decline of domestic oil production capacity and an increasingly competitive global natural gas market pose new challenges. As an oil and gas exporter, Algeria is vulnerable to commodity price fluctuations because hydrocarbons account for more than 90% of export revenues. The government has introduced several measures, including increased taxes on some imports, to manage its trade balance.

Economic Growth is tied to Commodity Prices, given the dominant role of hydrocarbons in the economy. Algeria currently produces oil at maximum capacity and natural gas capacity additions have only partially compensated for declines from existing fields. Domestic fuel prices are being raised to reduce the subsidies bill, estimated at \$17 billion in 2018, according to the IEA. However, the need to develop sustainable financial resources from hydrocarbon exports constitutes the central pillar of Algeria's economic and social development strategy.

Sustainable Cities is perceived as a Critical Uncertainty, following the need to cut spending on infrastructure projects in recent years due to declining hydrocarbon revenues. This has led to delays in implementation of key projects, including the Algiers Smart City Project. The government plans to improve the management of urban systems by removing investment barriers.

ACTION PRIORITIES

Renewable Energies lead the Action Priority section with the highest impact, as Algeria tries to diversify its domestic energy sources and ease near total reliance on oil and gas for power generation. Renewables make up a very small percentage of installed capacity, mainly in the form of hydropower and solar. Algeria has set a target of 22GW of renewables capacity but has made little progress in this direction. Currently the country has 400MW of solar PV, mostly off grid, and 276MW of hydropower installed. The government plans to raise renewables generation in the medium term by adding 4500MW of renewables capacity.

Energy Efficiency remains an Action Priority. The government plans to cut consumption by 10% by 2030 through various measures including thermal insulation for buildings, the conversion of 50,000 light-duty vehicles to liquid petroleum gas per year and the installation of 12 million smart lighting units per year.

LNG grows in impact but with low uncertainty. Algeria has an LNG production capacity of 56 million m³/year. Although this makes the country a player in the international gas market, its potential is currently limited after it lost its key US market in recent years and is having to compete in a well-supplied Asian market. Algeria remains, however, one of the major suppliers of piped natural gas to Europe.

CRITICAL UNCERTAINTIES

Commodity Prices move from the Actions section into the Uncertainties section. Botswana is 100% dependent on fuel imports and its petroleum products supplies are fully controlled by the private sector. As international fuel product prices are unpredictable, clearance of high debt to oil companies could result in negative cash flows. Uncertainties emerge as this presents a risk to fuel supply.

LNG's perceived impact has greatly increased and moves into the Critical Uncertainty section. In May 2019, the Botswana Department of Environmental Affairs (DEA) approved an Environmental Impact Assessment for a coal bed methane project and construction of the country's first gas-fired power plant. The project has already achieved sustained gas flow rates, raising expectations for increased power supply for domestic and regional use.

Exchange Rates are also perceived as having greater Impact and with more Uncertainty. Most energy products and services are traded in US Dollars in the international market, although they are sold in the local currency to final consumers. These products are directly affected by multi-tier exchange rate movements such as BWP/ZAR and ZAR/USD.

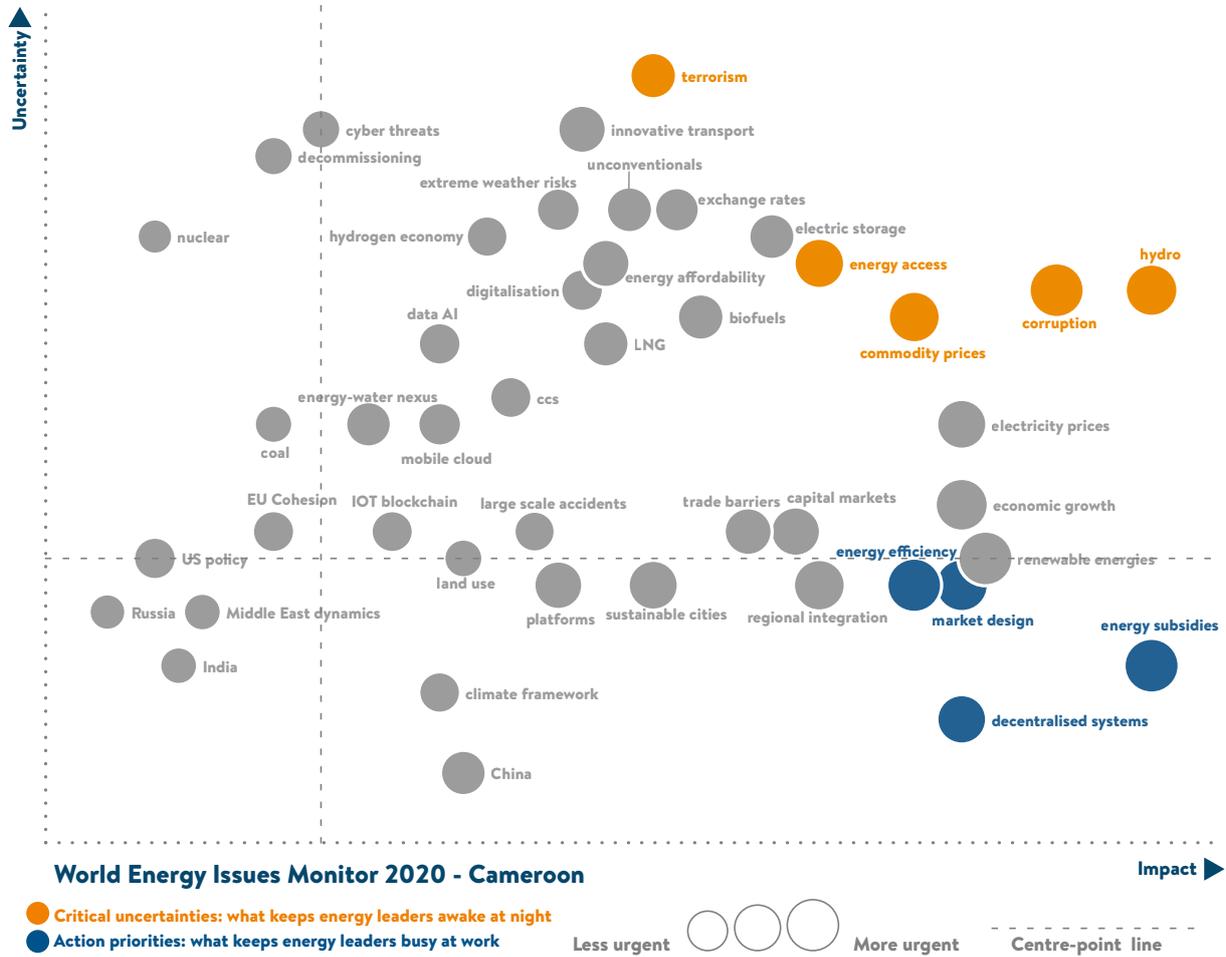
ACTION PRIORITIES

Coal leads the Action Priorities section as the Masama Coal Project becomes operational, producing saleable volumes as of August 2019. This is the second of Botswana's two coal plants aimed for the export markets of South Africa and Namibia. However, domestic coal use may decline after the withdrawal of a major investor in the 300MW extension project for the Morupule B coal power plant in October 2019.

Talent emerges as an Action Priority. There is an increased level of collaboration between the energy sector and academia in major ongoing energy research programmes. Examples of this collaboration are the biodiesel and biogas research projects carried out by the Department of Energy with strong engagement of the academic community. The Department of Energy has signed collaboration agreements with local research and academic institutions to facilitate knowledge sharing and capacity building. It also ratified various strategic alliances with international energy institutions.

Regional Integration is also identified with high impact and low uncertainty. Prioritisation of Regional Integration is being actioned with the expansion of the national and regional power grids. Botswana is currently participating in the ongoing SADC Trade in Negotiation Services programme (which is directly related to the World Trade Organisation) with the aim of promoting regional integration in trade. Botswana is also a member of the Interstate Oil Committee under the SACU, which has similar objectives

CAMEROON



NATIONAL OVERVIEW & CONTEXT:

Comparing the survey results of 2019 and 2020, Cameroon’s energy leaders point to greater uncertainty around issues that influence or depend on the country’s economic performance, such as corruption, energy prices and the ability to finance hydro capacity expansion. The Action Priorities section suggests a focus on inclusive and alternative measures to improve energy access.

CRITICAL UNCERTAINTIES

Hydro continues to lead the Critical Uncertainties area. The previous year's concerns about ensuring that finance is available for large hydro projects remains a focus. These projects are critical to the country's objective of becoming a net electricity exporter by 2035. Letters of intent continue to be signed for hydro capacity expansion such as the Grand Eweng hydropower project. Progress has also been achieved in securing a US\$500,000 grant for feasibility studies for the Kpep hydropower project.

Corruption moves from Action Priority to Critical Uncertainty. This year's increased uncertainty may reflect how perceptions were influenced by the removal of Cameroon's eligibility status under the U.S. African Growth and Opportunity Act (AGOA) due to endemic corruption and the post-electoral crisis. The country has also been denied the right to host the 2019 Africa Cup of Nations due to budget corruption allegations. The project would have brought infrastructure and job opportunities.

Electricity Prices are perceived with increased uncertainty, reflecting worries around oil product prices as a result of a fire in late May 2019 at Sonara, the country's only oil refinery. While Cameroon has significant hydroelectric potential, 43% of total electricity production comes from oil and LPG. The fire led to concern about the impact of the accident on fuel supply, with repercussions on electricity and transport prices.

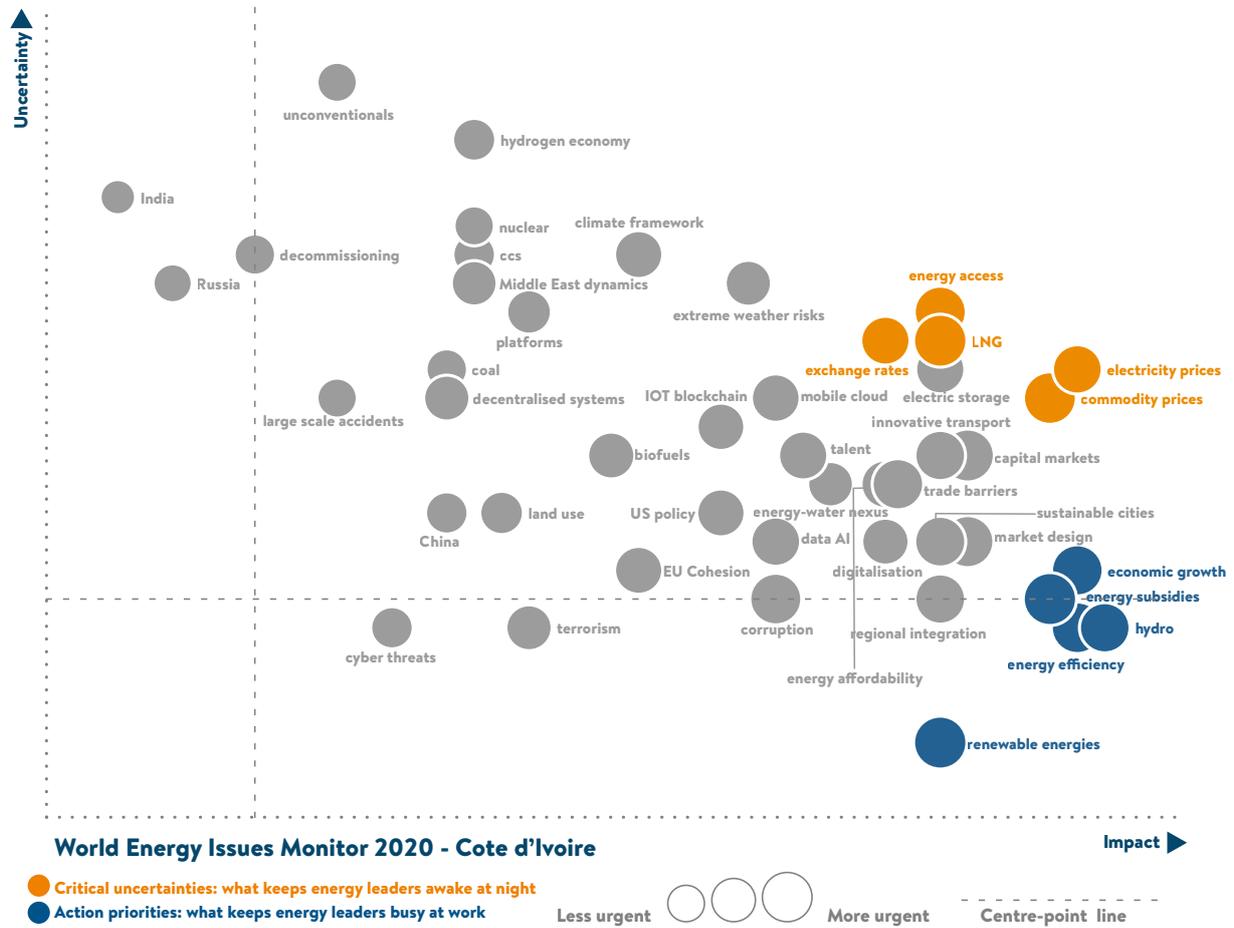
ACTION PRIORITIES

Energy Subsidies are seen with greater impact and lead the Action Priority section. 2019 saw an increase in government oil and gas subsidies to compensate for demand growth and price increases. The added pressure on the state budget is being eased through a World Bank funding agreement for US\$200 million to support fiscal consolidation and inclusive growth. Key objectives include improving the financial sustainability of the energy industry and improving private sector confidence.

Decentralised Systems are less of an uncertainty and become an Action Priority, reflecting active expansion of government-funded solar systems and PV plants to extend energy access. These include a 10MW project in Guider in North Cameroon and a 15MW facility in Maroua, in the far north region. Incremental capacity has come from the installation of solar-powered satellite TV kits in 300 villages donated by the Chinese government.

Market Design is perceived as having increased impact. The structure of the electricity market is expected to change in the short- to medium-terms, especially with the adoption of the Renewable Energy Law. However, the newly created electricity transmission company (SONATREL) and the gradual expansion of the local solar industry with rural electrification projects are perceived as early signs of the changing structure of Cameroon's electricity market.

CÔTE D'IVOIRE



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Côte d'Ivoire's energy leaders have shifted their main uncertainties from Economic Growth and Market Design to Commodity and Electricity Prices. Greater uncertainty is also perceived around LNG and Energy Access. Action Priorities build on reduced uncertainty towards Economic Growth, with a focus on Energy Subsidies, Energy Efficiency and Hydro.

CRITICAL UNCERTAINTIES

Electricity Prices are perceived with increased uncertainty and impact. The government faces the challenge of adjusting electricity prices to balance increased demand with the cost of supplying energy to domestic and commercial users. Uncertainty stems from the fact that the financial stability of the energy sector is tied to electricity pricing. This often leads to challenges to secure investments which are needed to adjust capacity to increased energy demand.

Energy Access enters the Critical Uncertainties section. Although 92% of urban areas have access to electricity, only 38% of rural areas do, according to World Bank data. High upfront costs of grid connection reduce the number of households with access, even where the grid is available. The government is currently focused on grid and off-grid access expansion. It has also adopted a National Development Plan to add 4GW of capacity by 2030. Progress towards this goal includes the World Bank's Scaling Solar Program, which will finance two utility-scale solar projects with a combined generation capacity of 60 MW.

LNG is also seen with much greater impact and uncertainty. In 2016, a consortium led by Total was formed to build an LNG import terminal to feed growing demand. In 2019, the 275MW Soubré hydro plant was inaugurated, providing additional capacity at a lower cost than gas power. However, there is uncertainty about the availability of supply and the commercial viability of LNG in the country.

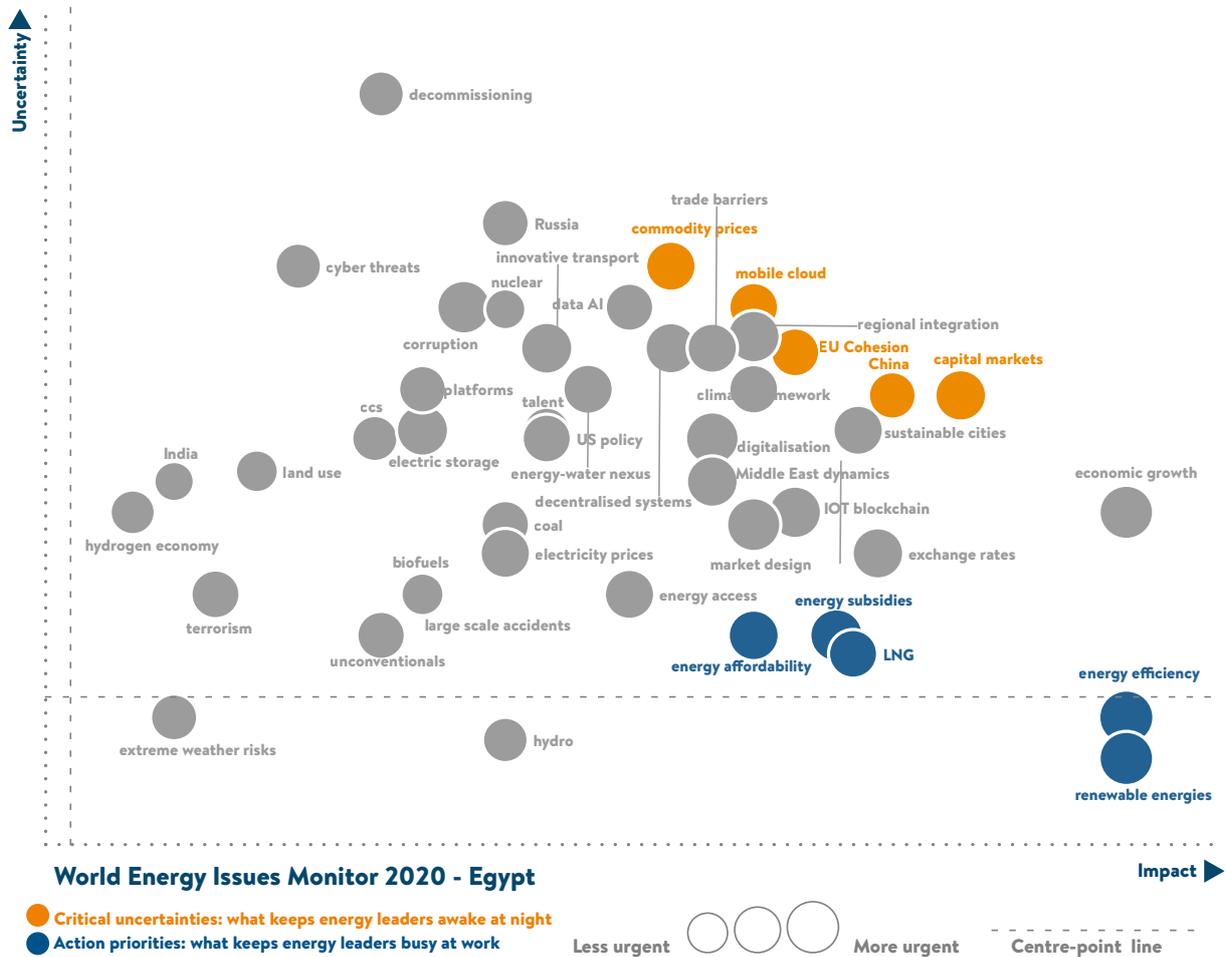
ACTION PRIORITIES

Economic Growth appears with reduced uncertainty and becomes an Action Priority. Economic growth and electricity demand are projected to continue expanding, while energy remains a crucial element in Côte d'Ivoire's development strategies. Capacity expansion, energy mix diversification and LNG imports are some of the main actions being taken. The country currently exports electricity to the West African Power Pool and aims to increase export levels to neighbouring Burkina Faso, Guinea, Liberia and Sierra Leone.

Energy Subsidies continue to be seen as an Action Priority. Presently, more than 46% of the country's population live below the poverty line. Domestic electricity and butane gas prices are subsidised for low income households. The price has been cut by 20% since early 2019. The government aims to increase gas penetration in low income households to replace wood heating and cooking.

Energy Efficiency also remains an Action Priority with increased impact. The Ivorian government has set a target of 16% renewables share in the energy mix by 2030 (excluding big hydro) and to reduce energy consumption in industry by 25% in 2030. Principal measures taken to achieve this include the promotion of energy efficient appliances, the use of renewables in commercial and domestic uses and the development of green infrastructure. Finally, the overhaul of the distribution and transmission network, coupled with new thermal energy generation, will help to reduce grid power losses.

EGYPT



NATIONAL OVERVIEW & CONTEXT:

Egypt’s energy leaders’ perspectives provide an Uncertainties landscape formed around Macroeconomic and Geopolitical issues including Capital Markets, China and EU Cohesion. Action Priorities are led by efforts to promote Renewable Energies and Energy Efficiency, as well as opportunities for a revival of LNG exports.

CRITICAL UNCERTAINTIES

Capital Markets are seen as the most impactful of the country's Critical Uncertainties. The Egyptian government wants to reduce reliance on IMF and other credit agencies by raising capital market funds and attracting foreign direct investments. This strategy has led a sharp rise in portfolio inflows in 2019, leading to appreciation of the Egyptian Pound. In order to remain attractive to foreign investors, Egyptian officials are negotiating a two-year non-loan agreement with the IMF.

China is identified as a high impact issue and a key uncertainty. Chinese investments in Egypt have been mainly directed to the energy sector, infrastructure, telecommunications and development projects. So far, the Chinese have injected over US\$17 billion into the Egyptian economy. These funds were used for the development of the Suez Canal Economic Zone project, a US\$1.2 billion electric train project connecting Cairo to the new capital, and three solar power stations in the Benban solar park. Egypt has become the fourth largest recipient of Chinese investment in Africa.

EU Cohesion is also perceived as a Critical Uncertainty. Although Egypt-EU relations are deeply rooted with several cooperation agreements and support in the energy sector as well as free trade agreements, the ambiguity surrounding Brexit and its impact on Egypt-EU relations is an issue of concern.

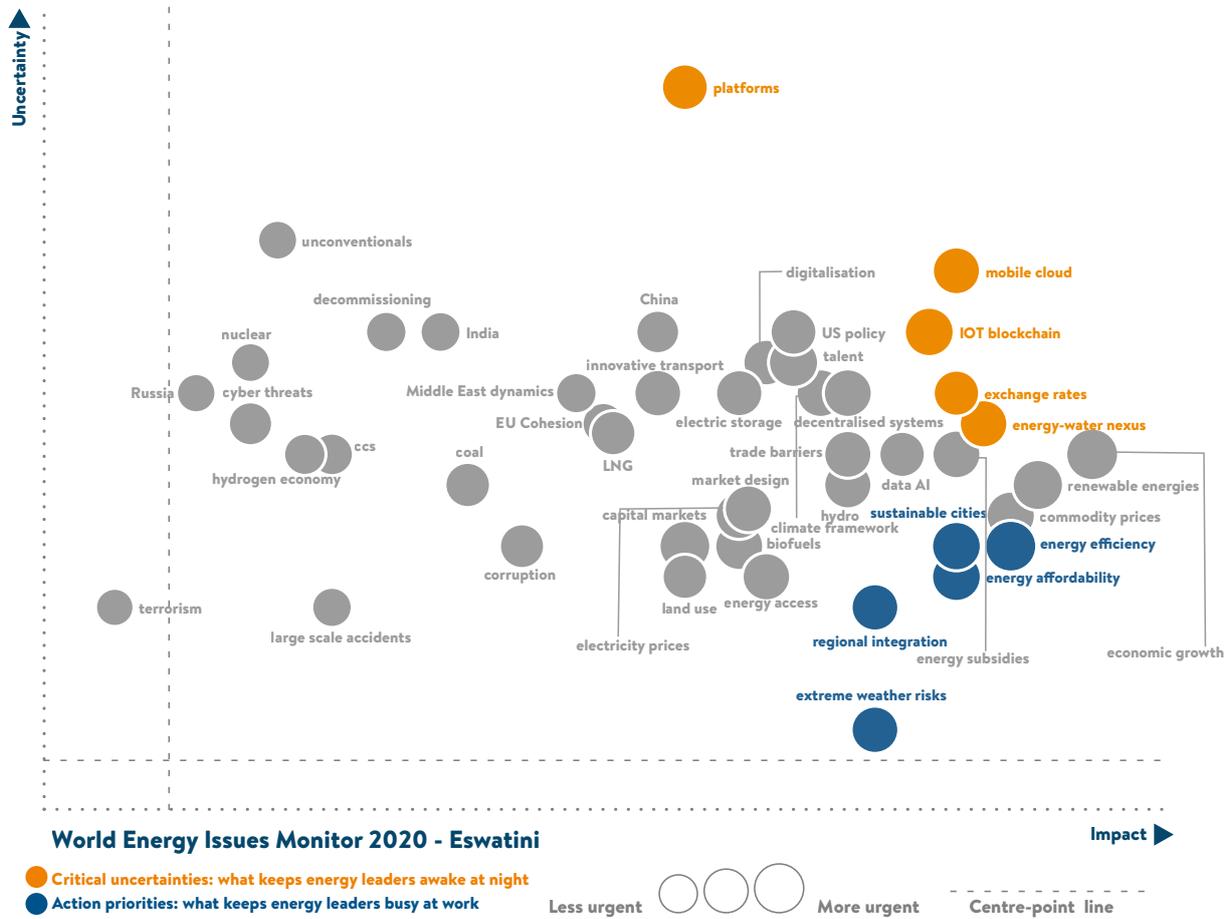
ACTION PRIORITIES

Renewable Energies appear as a key Action Priority. While 94% of electricity is generated from fossil fuels, the Egyptian government aims to generate 20% of electricity from renewables by 2022. In 2019, the Egyptian Ministry of Electricity replaced a US\$4 billion contract for a 2.65GW coal plant with contracts for a 500MW wind farm and two 200MW solar projects.

Energy Efficiency is another leading Action Priority. The government's interest in energy efficiency has grown tremendously in the past few years. Several energy efficiency projects have been undertaken both in both the residential and governmental/public sectors. In the residential sector, the "Improving Energy Efficiency of Lighting and Appliances" project was implemented. Important efforts were also made to promote the use of efficient lighting in homes. For the public sector, an initiative launched to improve energy efficiency in government buildings and to convert streetlights to LED.

LNG is also seen as an actionable issue. Egypt became a net exporter of LNG in 2019, after years of being a net importer. This transformation was led by several gas developments in the Eastern Mediterranean, primarily the 850 billion cubic metre Zohr field. The Egyptian Ministry of Petroleum has ambitions to make Egypt a regional gas hub thanks to its infrastructure, ports, natural gas grids, liquefaction and regasification facilities as well as import/export ports. In October 2019, Egyptian Natural Gas Holding Company (EGAS) signed an MoU with Toyota to study the feasibility of an LNG bunkering project in Egypt

ESWATINI



NATIONAL OVERVIEW & CONTEXT:

Eswatini’s energy leaders see digitalisation issues (including Platforms, Mobile Cloud and IoT/Blockchain) as those with highest uncertainty and impact. Exchange Rates and the Energy-Water Nexus are also considered issues of uncertainty. On the Action Priorities section, Extreme Weather risks are perceived with the lowest uncertainty. Energy Efficiency, Affordability and Regional Integration are additional Action Priorities.

CRITICAL UNCERTAINTIES

IoT/Blockchain is among the key digitalisation issues in Eswatini's Uncertainties section. The role of ICT in all business operations is becoming an increasingly important factor, raising the nature and sophistication of all transactions. The ICT sector, however, is advancing faster than the energy sector, which calls for investment in capacity building and energy systems as well as protection from cyber-attacks.

Exchange Rates are also seen as high uncertainty and high impact issues as Eswatini is a net importer of energy (petroleum and electricity). These perceptions reflect worries about oil and electricity prices that affect energy affordability and security of supply in the country. Monitoring commodity price movements is a government priority

Energy-Water Nexus is seen as a Critical Uncertainty. Eswatini has an agriculture-based economy and energy is also part of the five pillars outlined in the country's strategic road map for 2023. Hydro is currently the main source of local electricity generation and competes with agricultural irrigation for supply from the country's main dams. The 2016 droughts presented challenges in balancing the needs for potable water consumption, irrigation and electricity generation.

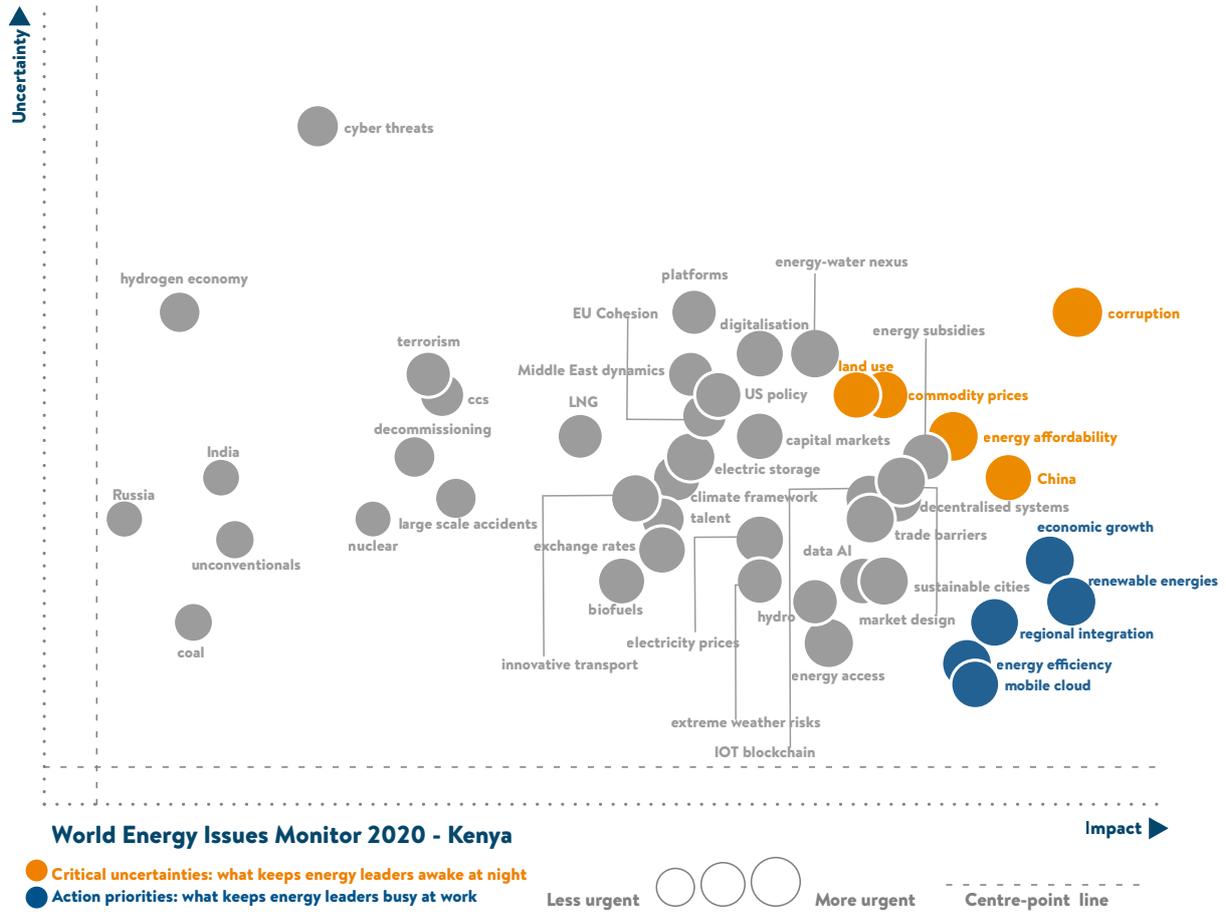
ACTION PRIORITIES

Extreme Weather Risks are perceived with low uncertainty and high impact. The country faces the dual challenge of heavy storms and drought. It has launched its first solar projects to lessen reliance on hydro power, with the auctioning of 40MW of solar PV and the development of 10MW solar capacity by the Eswatini Electricity Company. The procurement of additional 40MW biomass power plants will follow completion of the solar PV project. After this, other technologies will be considered in line with the Energy Masterplan.

Energy Efficiency is a key Action Priority. Eswatini has recently completed its Energy Efficiency Policy and is finalising the implementation strategy. As the country is a net importer of energy, it is engaged in extensive efforts to ensure security of energy supply while remaining mindful of cost implications. As the final cost of power increases, the government is aware of the need to make energy efficiency part of the country's priorities within industry and households.

Regional Integration is also seen as an Action Priority. Because Eswatini is a landlocked country, it is highly dependent on neighbouring countries to access regional and international markets including the Southern African Power Pool (SAPP). Mozambique is rich in natural gas and South Africa has abundant electricity supply. This puts regional integration issues high on the country's agenda. Eswatini is also exploring the potential for an inter-regional natural gas pipeline and related services projects in partnership with South Africa and Mozambique.

KENYA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2017 and 2019 results, Kenya’s energy leaders show a considerably higher level of uncertainty around issues that involve society’s engagement and reactions, such as Corruption, Land Use and Energy Affordability. Action Priorities reflect progress around long-term plans towards Economic Growth and Energy Efficiency and strategic interests towards Regional Integration.

CRITICAL UNCERTAINTIES

Corruption is perceived as a much higher uncertainty issue, particularly with regards to large energy infrastructure projects such as the Kimwarer hydroelectric dam. Cases involving Kenya Power, the national utility, and the Kenya Pipeline Corporation, led to changes in these organisations' top managements.

Land Acquisition for large infrastructural projects is perceived with uncertainty, reflecting the difficulty of land acquisition negotiations which have often led to significant delays in project implementation. A recent example is the acquisition of land for transmission lines to connect the Lake Turkana Wind Power plant. The project was delayed because of the acquisition negotiation process.

Energy Affordability becomes a Critical Uncertainty and ceases to be an Action Priority. 2019 saw heightened tensions as a result of Kenya Power's attempts to increase electricity tariffs. Challenges to the utility's operations include endemic corruption and slow demand growth, which has strained finances. Higher tariffs for urban consumers led to popular discontent.

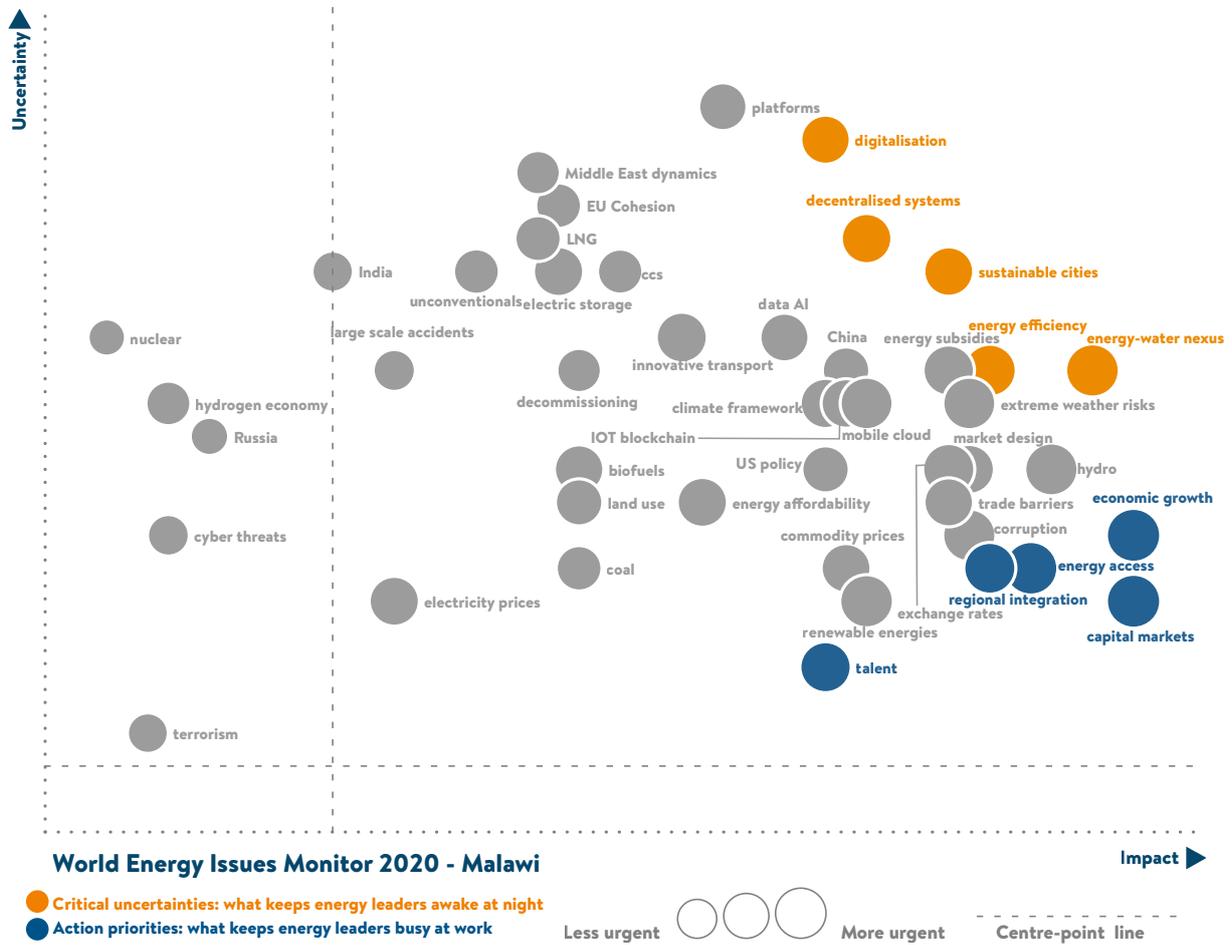
ACTION PRIORITIES

Economic Growth becomes an Action Priority as the third phase of the Vision 2030 development blueprint is being implemented. This medium-term plan focuses on food security, affordable housing, manufacturing and affordable healthcare for all. Reduced uncertainty around Economic Growth coincides with positive expectations from investors regarding Kenya's trade potential, thanks to progress on infrastructure and the ease of doing business.

Regional Integration also becomes an Action Priority. The completed upgrade of Kenyan railways as part of China's "One Belt, One Road" initiative is expected to benefit land and maritime trade routes regionally and internationally. Additionally, increased adherence to the African Continental Free Trade Agreement (AfCFTA) has given rise to confidence on intra-continental growth, as it aims to create a unified regional market with a combined GDP of US\$2.5tn.

Energy Efficiency continues to be seen as an Action Priority with a very reduced degree of uncertainty. Recent measures to improve energy efficiency include the issuing of the Framework for Industrial Energy Efficiency Regulations (IEER) as well as Kenya's first green bond worth 4.3 billion shillings (US\$41.45 million) to build environment-friendly student accommodations.

MALAWI



NATIONAL OVERVIEW & CONTEXT:

Malawi’s energy leaders identify efficiency and digitalisation as issues with the highest uncertainty and impact on the country’s energy landscape. The theme of Decentralised Systems and Sustainable Cities appear as particularly important. Action Priorities revolve around Macroeconomic Risks and Vulnerabilities, such as Economic Growth and Capital Markets. Regional Integration is also seen as an Action Priority.

CRITICAL UNCERTAINTIES

Digitalisation appears with the highest uncertainty among impactful issues, reflecting growing realisation that digitalisation enables sustainable development. Still, digitalisation in Malawi has been slow due to lack of infrastructure and high prices of digital services. Consequently, integrating smart technologies into the national grid has been a long process. The Government plans to increase access to broadband and strengthen ICT services.

Decentralised Systems are also identified with high uncertainty and high impact. Policy makers perceive Rural Electrification Programs and Decentralised Systems as key to achieving universal access to energy in Malawi, especially in the rural areas. A supporting regulatory framework exists but attracting project finance remains a challenge, as existing projects are not seen as sustainable without subsidies.

Sustainable Cities are identified as a Critical Uncertainty and strongly related to perceptions around Energy Efficiency. The rationale is that high urbanisation in Malawi has put pressure on critical social services including energy. As a remedy, the national utility is implementing demand side management programs to achieve energy efficiency. The challenge, however, is that energy efficiency comes second to energy access and the costs for energy efficient systems remain unaffordable for most Malawians.

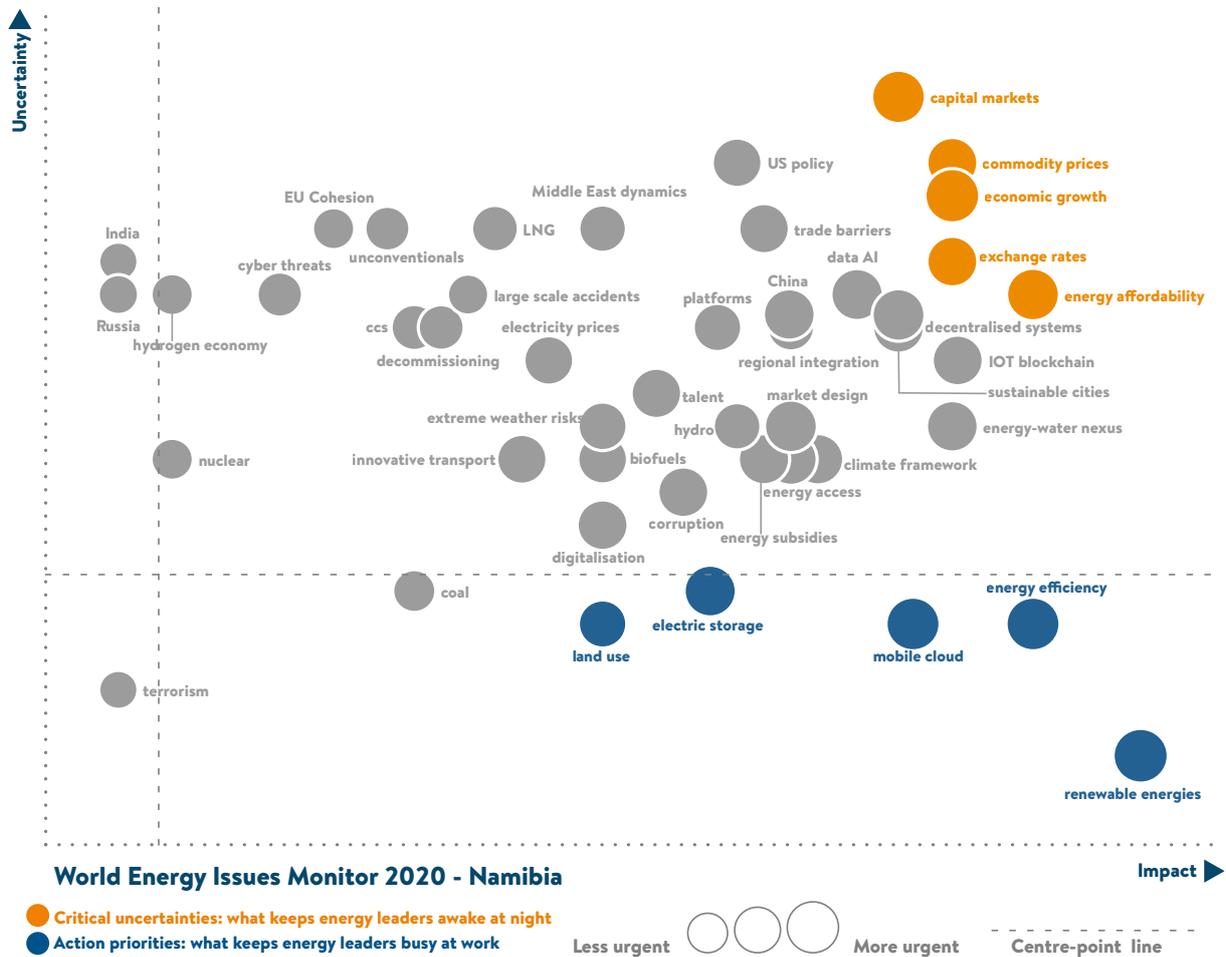
ACTION PRIORITIES

Economic Growth appears as a main Action Priority. The current macroeconomic environment appears stable, but investment has been slow because of the post-election's political impasse. In addition, Malawi's economy, which largely depends on agriculture, is vulnerable to weather shocks. Policy makers are on the lookout for solutions to build a strong resilient economy that would boost Malawians' willingness to pay for energy, thereby enhancing affordability and universal access.

Capital Markets are also identified as an Action Priority. The growth of the Malawian capital market has been slow as few new companies have been listed on the stock market in recent years. Although the electricity market was restructured in 2016 to encourage private sector involvement, the domestic capital market is not liquid enough to support energy projects. Capital market structures need to be developed to a level where they can sustain the new electricity market model.

Regional Integration is another Action Priority. At present, Malawi does not have sufficient power generation capacity. Policy makers are in favour of regional integration as a means to source power from nearby countries that have surplus generation capacity. In support of this, in September 2019, the World Bank approved a financing scheme for the construction of the Mozambique–Malawi Interconnector that will link Malawi to the Southern African Power Pool for regional power trading

NAMIBIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Namibia presents an Uncertainties section purely focused on macroeconomic issues and an actions space that looks specifically to Energy Vision and Technologies as transition tools. Geopolitics and Regional Issues are perceived with reduced impact.

CRITICAL UNCERTAINTIES

Energy Affordability has moved from Action Priority to Critical Uncertainty. The country has vast natural resources but relies on imports for roughly 60% of its energy. The introduction of the Modified Single Buyer Market Framework, introduced competition by offering consumers a choice of electricity supplier and the transfer of risk to the investor. The arrangement will also ease the fiscal burden on NamPower and the government for guarantees and subsidies.

Commodity Prices emerge as a Critical Uncertainty. The mining sector is an important contributor to the Namibian economy. Export revenues are affected by commodity price fluctuations in the international market, particularly for uranium, gold and diamonds. Namibia imports 100% of its petroleum requirements, including coal, largely used for electricity production.

Economic Growth remains a Critical Uncertainty. Namibia's economy contracted 1.7% in 2019 but is expected to return to growth. This contraction is in line with the ongoing devastating drought, as well as an impairment in major sectors such as diamond mining, wholesale and retail trade. The construction sector is also set to shrink, leading to a reduce overall growth.

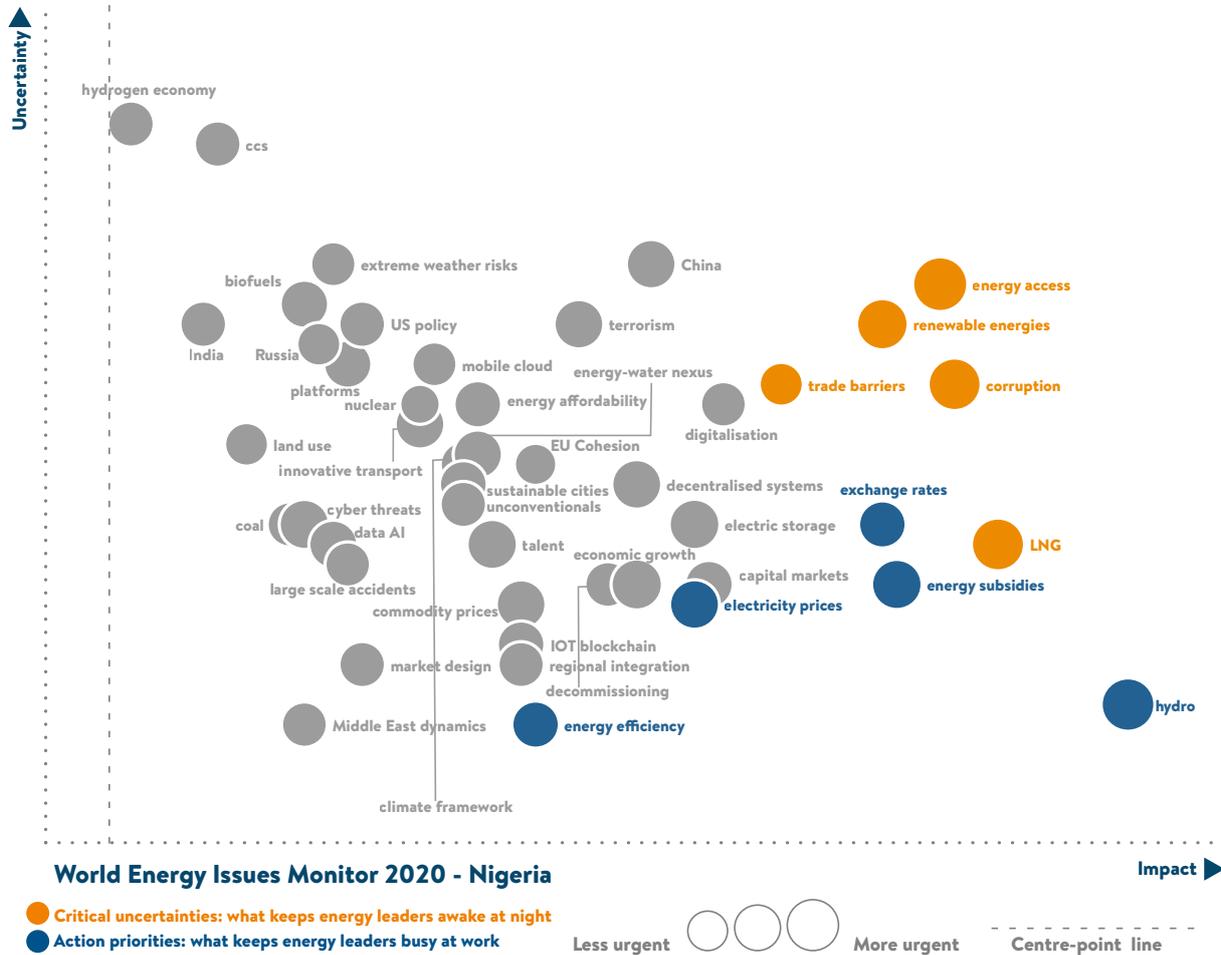
ACTION PRIORITIES

Renewable Energies are perceived as an Action Priority with stronger impact. Namibia has abundant renewable resources such as solar, wind and biomass, but they remain largely under-developed. That makes the country reliant on electricity imports from neighbouring countries, mainly South Africa. The country has announced a five-year energy programme to generate 220MW of renewable power. This development will be led by NamPower in collaboration with the private sector.

Energy Efficiency also emerges as an Action Priority with stronger impact. Increased energy efficiency and more efficient transport are among measures being considered to reduce greenhouse gas emissions. Still, efforts to improve the sector's efficiency in general and the uptake of energy efficient technologies and practices have remained disjointed and limited in both scale and scope. The government is developing legal and regulatory instruments to encourage the adoption of energy efficiency measures.

Electric Storage appears in the Action Priorities section and ties in to plans to expand the use of variable renewable energies, particularly wind and solar. Namibia embarked on a desktop study on energy storage aimed at providing regulatory guidelines for the sector. These include a draft storage licensing guideline, the assessment of existing and emerging energy storage technologies and energy storage standards

NIGERIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Nigerian energy leaders have profiled a revised energy landscape with Energy Access, Renewable Energies and Trade Barriers seen with higher uncertainty and impact. Hydro and LNG remain Action Priorities and are joined by new Energy Policies and Macroeconomic issues, Energy Subsidies, Exchange Rates and Electricity Prices.

CRITICAL UNCERTAINTIES

Energy Access is seen as having more impact and becomes a Critical Uncertainty. Nigeria has seen an improvement in per capita income, but an estimated 40% of the population still lacks access to electricity. Installed generation capacity is above 12GW but only 4.5GW are available due to inadequate gas supplies and the condition of some generating plants. This results in massive load-shedding throughout the country.

Renewable Energies move from the Actions to the Uncertainties section. The Nigerian government has devised policies covering a range of renewable options and a more flexible market design. It plans to expand the grid and green mini grids with financial support from development banks. The government has recently introduced the Energising Education Programme and Energising Markets Initiative through which 37 universities and 4 markets are being powered with off-grid plants (mostly solar photovoltaics).

Trade Barriers are also seen with higher uncertainty and impact. Nigeria is a significant oil producer and relies on oil exports for a large proportion of its external trade volumes. A onetime exporter of crude oil to the US, Nigerian exports have fallen in recent years as US oil production has soared. The economy has suffered from lower oil prices and production outages due to militant activity in the past three years. Nigeria is selling more of its crude to the fast-growing Asian market.

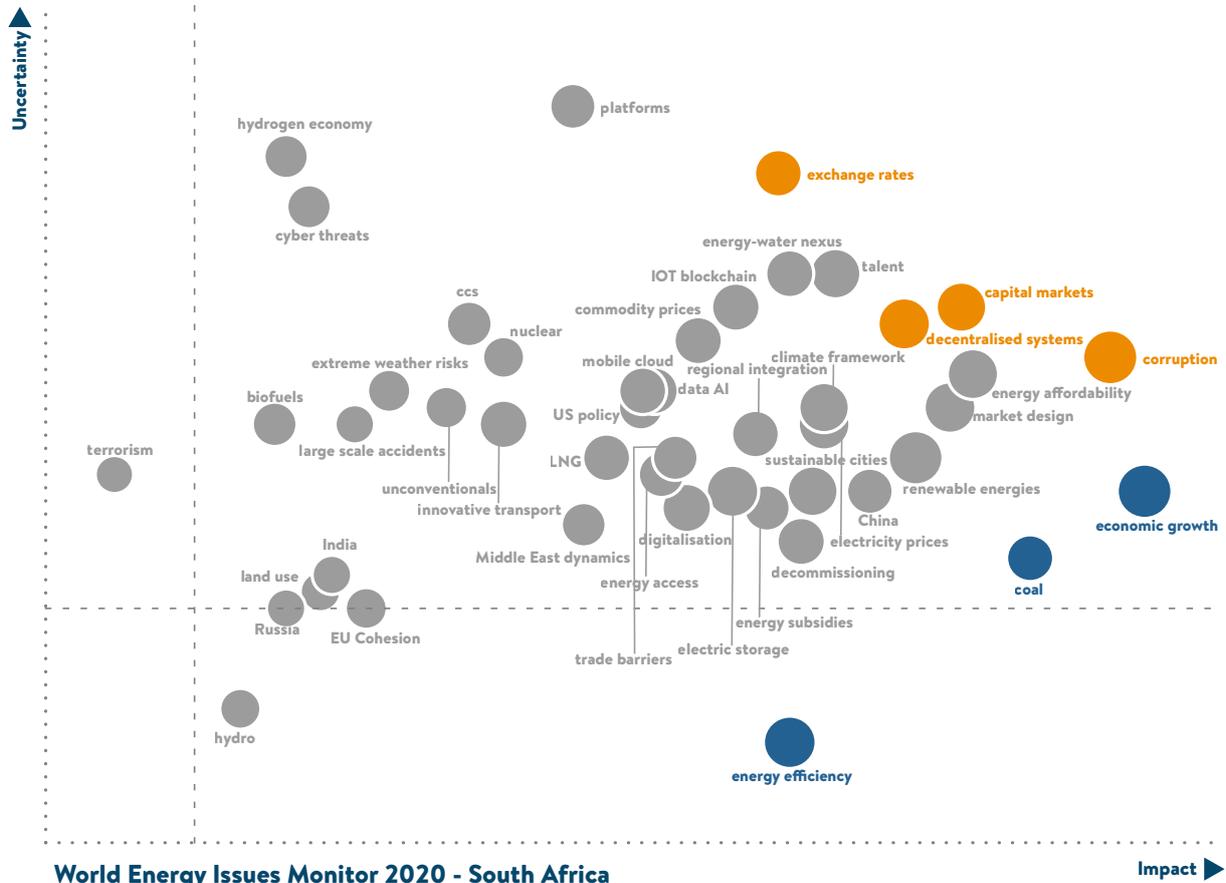
ACTION PRIORITIES

Hydro is seen as the most impactful of the Action Priorities. Like other sub-Saharan African countries, Nigeria relies on hydropower to support its gas-fired power stations. The nation's electricity supply will be boosted significantly when the 3GW Mambilla Hydropower project is completed.

LNG remains an Action Priority. As an LNG exporter, Nigeria is now having to compete with new supply coming on to the market. The Nigeria LNG consortium is adding a seventh train to its facility in Bonny Island and building supporting infrastructure to increase capacity and its share in the global gas market share. The project is due to be completed by 2024.

Energy Subsidies are seen with higher impact. Although Nigeria is a large oil producer and exporter, it does not have enough refining capacity and needs to import oil products. Because domestic prices are subsidised, this creates a burden on the treasury. Attempts by the government to ease subsidies led to strikes and to a much smaller adjustment. The 650,000 barrel per day Dangote mega refinery is due to come online in 2022. This is expected to help alleviate fuel shortages while easing reliance on imports. The government has also issued licences to private groups to install modular refineries. Output from these units, due to come online in 2020, are also expected to contribute to alleviating fuel shortages before Dangote is operational.

SOUTH AFRICA



World Energy Issues Monitor 2020 - South Africa

Impact ►

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, South African energy leaders attribute a higher level of uncertainty to many of the issues that were already highlighted last year. The release of South Africa’s Integrated Resource Plan (IRP) in October 2019 has laid out a clearer vision for the country’s future. Electricity storage has become less important as an Action Priority but remains a key issue, particularly given the rise in renewable energy uptake in the country

CRITICAL UNCERTAINTIES

Energy Affordability rises in the uncertainty section due to changes introduced by the government to split the state electricity utility into separate generation, distribution and transmission businesses under a state holding company. The move is aimed at promoting competition as a driver for higher affordability. As the programme is at an early stage, uncertainty remains high. Electricity and liquid fuel prices have been rising and various mechanisms to reduce electricity costs are under consideration.

Capital Markets are also seen as more uncertain due to recent moves to restructure the state electricity utility. The main concern revolves around the restructuring of Eskom's debt. Investment in renewable energies has risen due to the Renewable Energy Independent Power Producer Programme and the opportunity for rooftop solar.

Decentralised Systems move from Action Priority to Critical Uncertainty. The IRP2019 impacts perceptions around this issue as it aims for 20.4GW of power capacity to be generated through solar and wind between 2022 and 2030. At the same time, Eskom unveiled its Distributed Battery Storage Programme, committing to solar-plus-storage and energy storage projects totalling 1,400MWh. Uncertainty revolves around medium term grid prices.

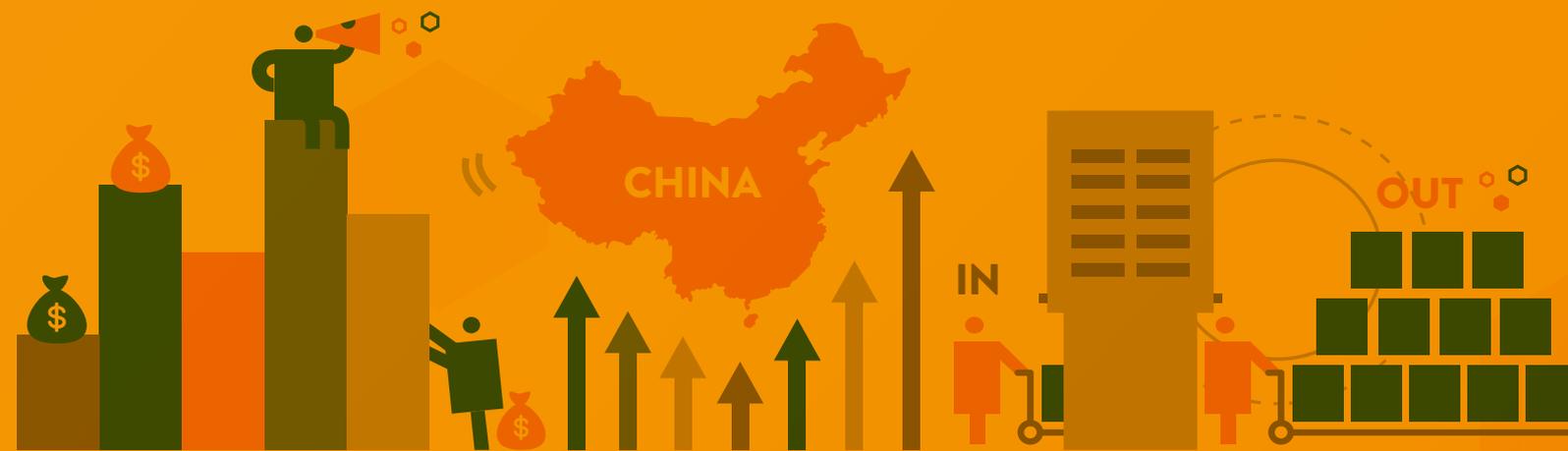
ACTION PRIORITIES

Economic Growth has been the leading Action Priority since 2017. Private sector participation in the economy is being promoted in energy and beyond as a strategy to enable growth. The strategy was put forward by Finance Minister Tito Mboweni in a bid to improve business confidence. However, it faces a challenge from opposition parties and social groups concerned about job losses as a result of privatisation.

Coal is perceived as having much greater impact but still a low level of uncertainty. The IRP2019 projects that by 2030 almost 60% of South Africa's electricity will still be generated from coal, dropping from today's 77% share. Significant increases, primarily in wind and solar, are expected to replace some coal capacity by 2030. Any new coal projects will be designed to be more efficient and with lower emissions.

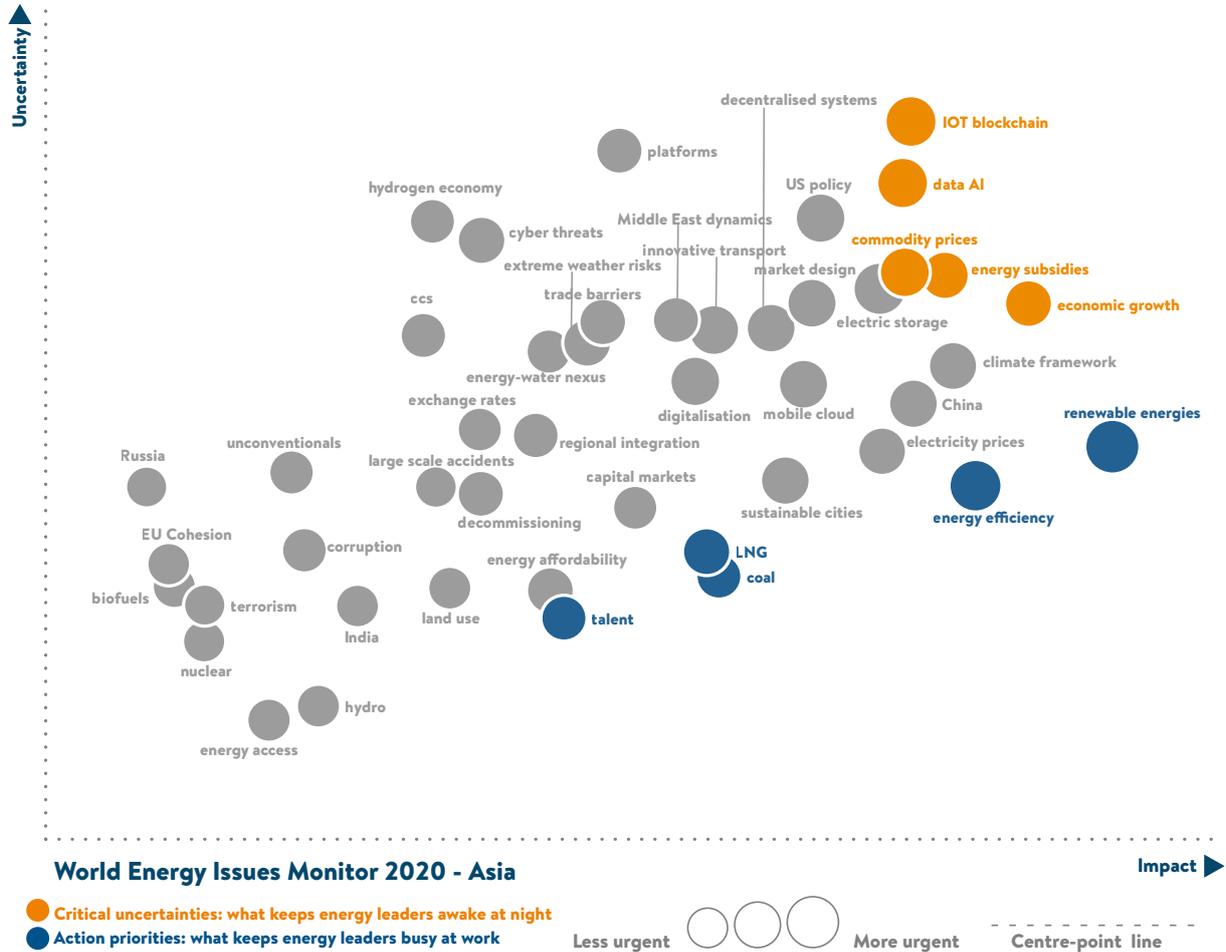
Renewable Energies remain an Action Priority but are considered more uncertain. This may reflect the challenges to integrate new renewable resources into a traditionally centralised energy system. By positioning renewables as a priority area, the IRP2019 should reduce uncertainty around large scale, grid connected renewable energy projects going forward

Assessing The Energy Agenda for Asia





ASSESSING THE ENERGY AGENDA FOR ASIA



REGIONAL OVERVIEW & CONTEXT

Three key themes define the region’s uncertainty landscape: geopolitics, economic growth and sustainability. Evolving dynamics around US and China trade relations, the roles of Russia and the Middle East as fuel suppliers, and import dependence keep Asian energy leaders awake at night. China and India alone are expected to account for more than half of global energy demand growth between now and 2040 and their respective energy pathways will have a significant impact on the overall energy landscape and the pace of decarbonisation. Action Priorities are led by decarbonisation and digitalisation issues. Innovative technology is being adopted to address the energy security challenge while promoting economic development. The Hydrogen Economy is seen as a higher impact issue across the region, particularly in China, Japan and Australia.

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CRITICAL UNCERTAINTIES

Commodity Prices remain a Critical Uncertainty particularly for countries with high dependency on energy imports or exports for continued growth. In Indonesia, for instance, decreasing coal prices and demand translate into a reduced state budget for energy infrastructure improvements and other investments. In Sri Lanka, the high cost of energy imports is being offset by expanding deployment of renewables as a diversification strategy.

IoT/Blockchain is an issue of great uncertainty, as decentralisation is seen as one of the main pathways to improving energy access. IoT/Blockchain has the potential to improve current energy technology and allow development of decentralised systems. Off-grid solutions offer possibilities of access in many rural communities that have limited or no access to national grids.

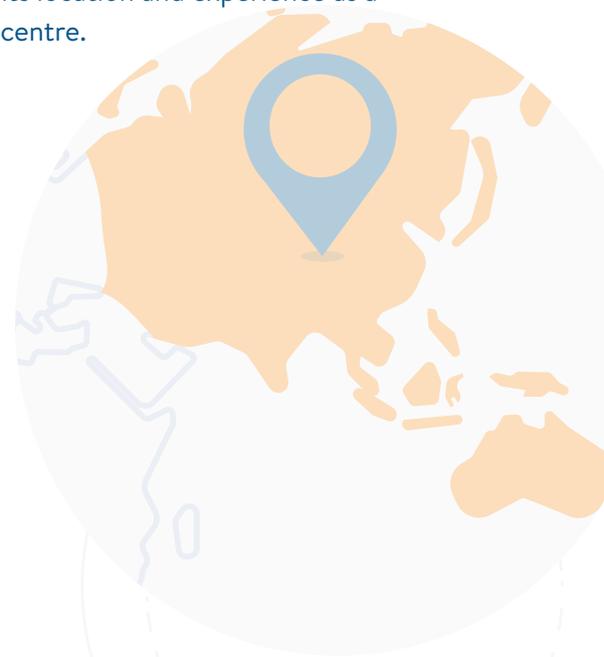
Economic Growth emerges with greater uncertainty. On the one hand, slower energy demand growth in China to 1.1% p.a., one fifth of the average growth rate over the previous 22 years (BP), has led to lower fuel imports with an impact on countries' revenues. This is especially the case for Indonesia. On the other hand, an accumulating trade deficit has affected some countries' ability to sustain the desired pace of economic growth and energy investments. In Pakistan, for instance, surplus capacity can't be fully utilised due to unresolved challenges around reliability and affordability.

ACTION PRIORITIES

Energy Efficiency leads the actions space in the region. India's Perform, Achieve and Trade (PAT) scheme is a good example of a regulatory tool to reduce energy consumption in energy intensive industries while enhancing competitiveness through clean certificates trade. Digital technologies are also being more widely adopted as a way to reduce consumption. In South Korea, artificial intelligence platforms are being implemented to enhance buildings' energy efficiency and to predict demand and market trends.

Coal is seen as an area of greater impact and becomes an Action Priority. While countries are integrating renewable sources to diversify the energy mix and improve energy security, coal still accounts for a large share of power capacity in the region. Asia accounts for 75% of global coal demand (BP). Affordability is a key factor sustaining coal's role as an enabler of economic growth.

LNG has become an Action Priority for Asia. As demand for energy is rising rapidly, LNG has taken a larger share of the energy mix. China has been the main driver of growth in LNG trade in Asia, where new supplies from Australia and the U.S. are being absorbed. Future demand for LNG will be driven by other Asian developing economies as demand for electricity rises. Singapore aims to become a hub for LNG in the region by capitalising on its location and experience as a financial trade centre.



CRITICAL UNCERTAINTIES

US Policy is a key critical uncertainty for China given the unresolved trade disputes with the US and imposition of trade tariffs by both sides. In December 2019, the US and China reached a phase one trade deal that was subsequently signed in January 2020. However, the agreement is a preliminary compromise deal and the trade relationship between the world's two largest economies remains a key uncertainty for the Chinese economy and the energy sector.

Trade Barriers uncertainties are closely related to concerns over US policy. The imposition of trade tariffs by Washington on thousands of Chinese goods hit exports with a knock-on effect on the Chinese economy. The IMF expects a moderate economic slowdown in 2019 due to uncertainty around trade tensions and other risks. China's energy demand growth slowed to 1.1% p.a. in 2019, less than one fifth of its pace in the last 22 years (5.9% p.a.) according to BP. Since China is the world's largest oil importer, global oil demand was also impacted.

Hydrogen Economy emerges as a Critical Uncertainty with increased impact with China focusing increasingly on hydrogen for mobility as a preferred alternative to batteries. In 2018, the subsidy for fuel cell passenger vehicle was US\$29,700 for each car, and US\$44,500/US\$74,300 for each small sized truck and bus/ mid-large sized truck. Additionally, several municipal governments in China are heavily subsidising both refuelling stations and the price of hydrogen.

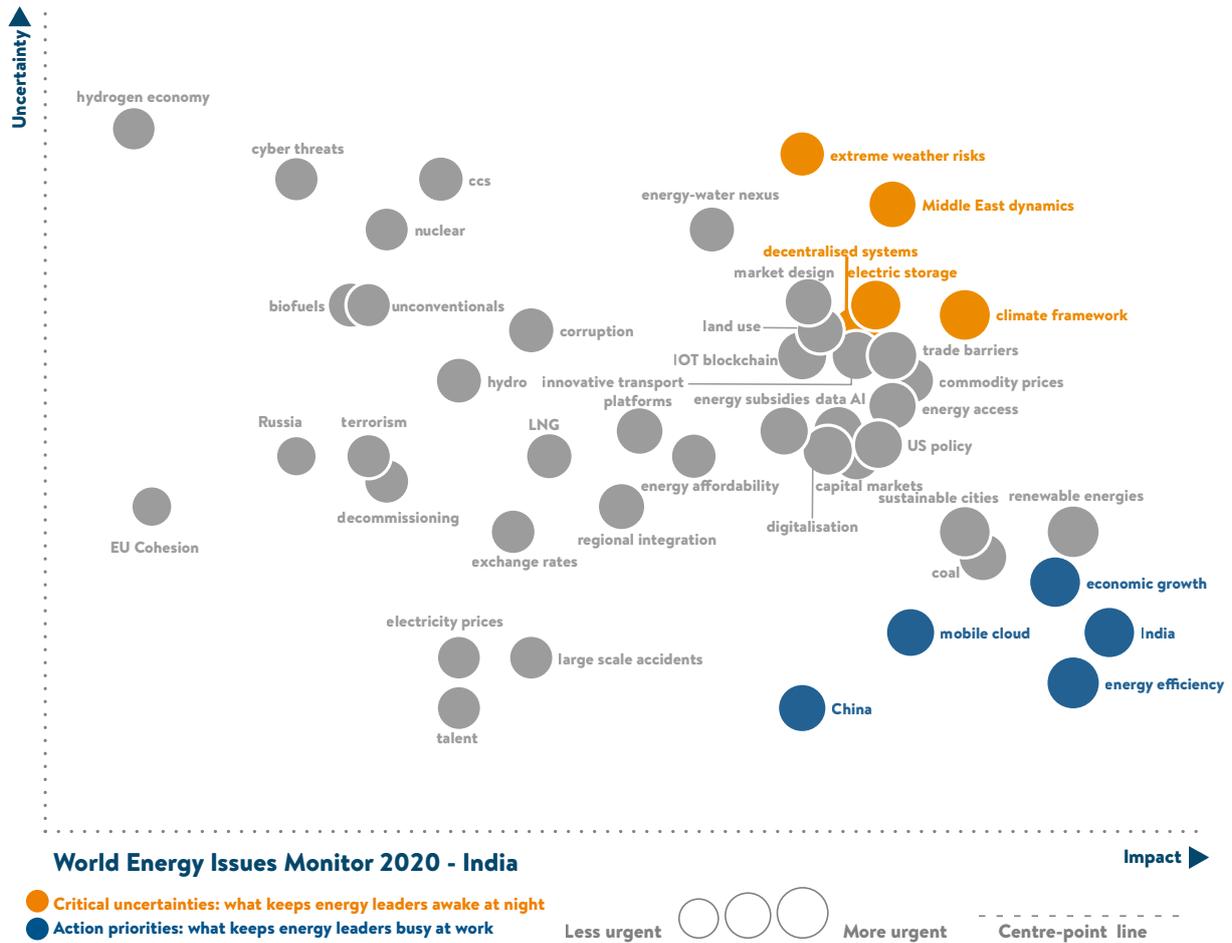
ACTION PRIORITIES

Coal is one of three emerging Action Priorities for China. Although the country is trying to replace coal with lower carbon fuels and renewables, it remains a large coal consumer. This is a challenge to the government's efforts to implement its 'Blue Sky Plan'. To address this, China is implementing measures such as switching to gas and deploying renewable energy.

Sustainable Cities are the second Action Priority, which the Chinese government is fostering through a low-carbon cities programme. China is creating new urban planning clusters of urban living where home, work and services are concentrated in one area as a way of reducing emissions from transportation.

Electricity Prices are the third Action Priority. The Chinese government cut electricity prices for small and medium sized industrial and commercial consumers by 10% for the second time in 2019. Addressing price volatility is a key focus during ongoing electricity market reforms, which not only aim to improve system efficiency, but also to deliver sustainable investment and social benefits.

INDIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, India’s map indicates Critical Uncertainties with high impact around Extreme Weather Risks, Middle East Dynamics and Climate Framework. The Action Priorities section continues to focus on Energy Efficiency and Renewable Energies. India Growth continues to be a priority area.

CRITICAL UNCERTAINTIES

Middle East Dynamics are seen as having increased impact and uncertainty, given India's significant oil and gas import dependence. With the Middle East as a main oil and gas supplier, developments such as US sanctions on Iran, damage to Saudi Arabian oil facilities and other geopolitical risk factors in the Middle East concern Indian energy leaders. Diversifying the import basket has been used as a strategy in response to this uncertainty.

Climate Framework & Extreme Weather Risks are also seen with greater impact and uncertainty. It stems from the fact that while the country is on track to achieve its Paris commitments, there is growing concern that global emissions have been rising and the world is not on track to meeting its climate goals. As a result, the increasing risk of extreme weather occurrences is of concern to India.

Renewable Energies. Renewables capacity, excluding large hydro, currently account for over 23% of India's total installed capacity of over 365GW. India's Nationally Determined Contribution (NDC) aims at achieving about 40% non-fossil power capacity by 2030. While the share of renewables in India's energy mix is set to increase substantially, coal will continue to play a significant role.

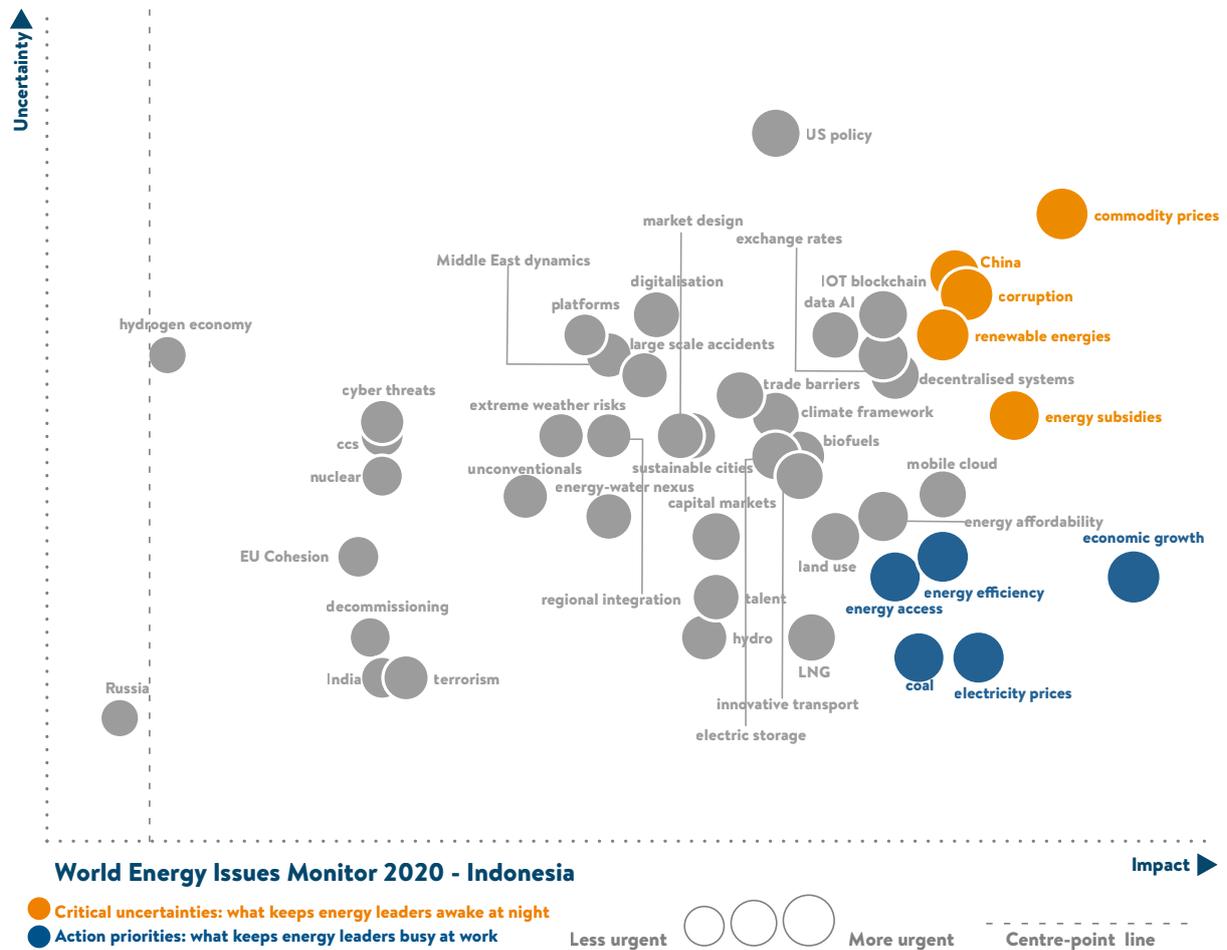
ACTION PRIORITIES

Energy Storage is a high impact issue for the country, given its potential to improve the transport sector's sustainability, reduce import dependence and enable integration of greater renewable capacity. Important government policies are implemented through the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles in India) scheme and the National Mission on Transformative Mobility and Battery Storage. Other strategies being pursued include the establishment of charging infrastructure for vehicles and the creation of giga-scale manufacturing capacities for batteries.

India Growth continues to be an Action Priority with high impact, as the country aims to be a US\$5 trillion economy in the next five years. India is expected to achieve the fastest energy consumption growth rate (BP Energy Outlook 2019) to fulfil economic growth objectives. In order to sustain a high growth rate, measures include boosting the manufacturing sector, foreign direct investments and generating employment for the Indian youth.

Energy Efficiency remains a key Action Priority. The PAT (Perform, Achieve and Trade) market-based trading scheme in its rolling cycles has been expanded further to encompass new industries and sectors. In addition, the Smart Meter National Programme (SMNP) aims to replace conventional meters with smart meters across the country, while the India Cooling Action Plan (ICAP) seeks to reduce cooling demand in different sectors

INDONESIA



NATIONAL OVERVIEW & CONTEXT:

A comparison of the 2019 and 2020 results illustrate a high degree of consistency of issues for Indonesia’s energy leaders with the dominant concerns being Commodity Prices, Electricity Prices and Economic Growth. Emerging issues relate to China and Coal that have a significant impact on the country’s trade balance and economic performance.

CRITICAL UNCERTAINTIES

Commodity Prices remain the top Critical Uncertainty. The fall in the prices of palm oil and coal, the country's main export commodities, has impacted the overall economy and led to delays in the much-needed infrastructure development. Declining exports revenues and high reliance on imported consumer goods have resulted in more volatility in the rupiah's exchange rate against major currencies.

China rises in uncertainty and impact, overtaking US Policy as an international relations concern. In the past five years, China has emerged as one of the biggest investors in Indonesia, with a special interest in infrastructure development. However, there have been some issues with the speed and quality of projects that need to be addressed. The other impact stems from China's reduction of coal imports directly impacting Indonesia as a supplier.

Renewable Energies are perceived as a Critical Uncertainty. Indonesia's National Energy Master Plan targets renewable energies to make up at least 23% of primary energy supply by 2025. In the electricity sector, wind and solar are expected to reach a total installed capacity target of 1.7GW by 2028 with a further potential 3.2GW for PV rooftop installations. A 30% bio-diesel (B30 biofuel) programme has also been designed for the transport sector.

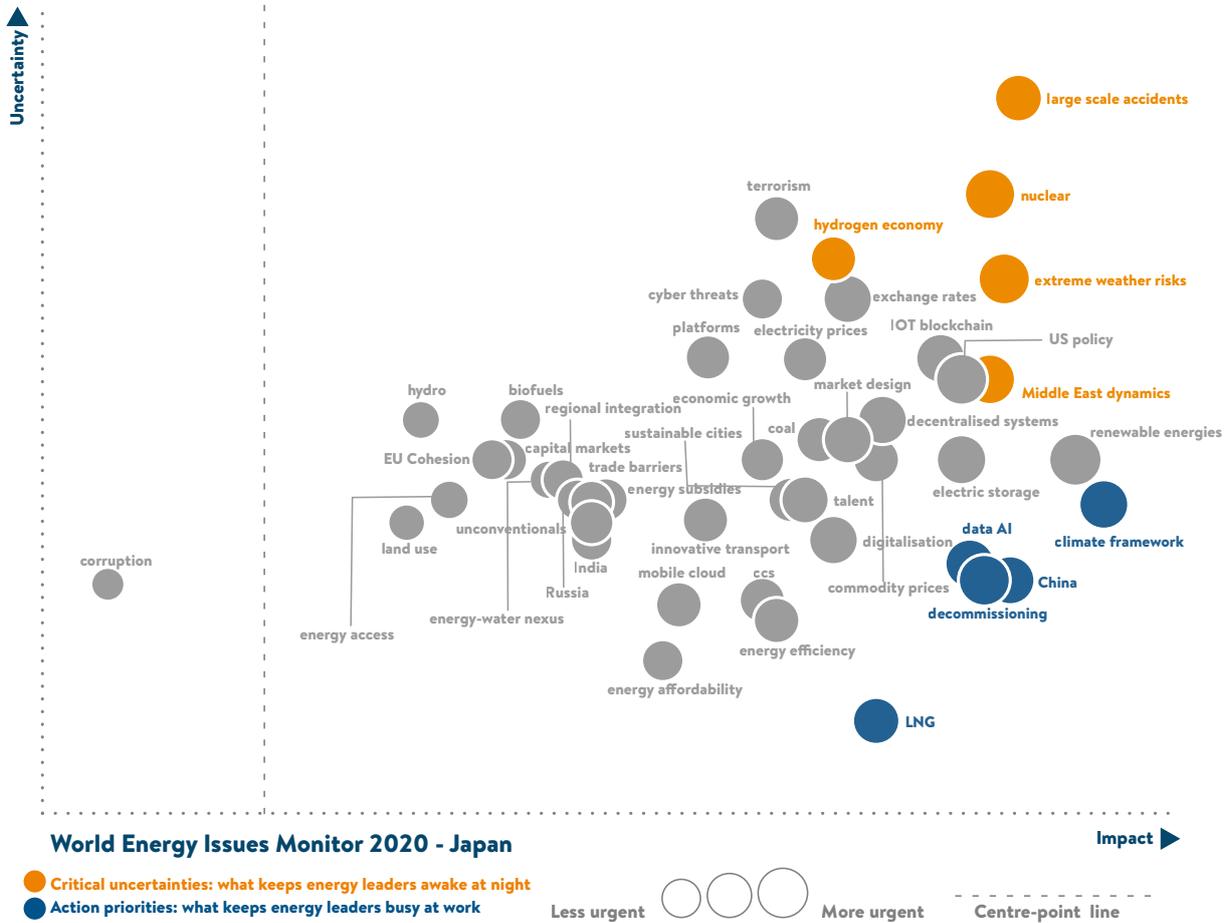
ACTION PRIORITIES

Economic Growth remains the predominant Action Priority. The World Bank and rating agencies note that the country's investment landscape has improved significantly over the last five years. The economy has been boosted by the Bank of Indonesia's decision to cut interest rates to 5% to support local businesses and stimulate economic growth.

Electricity Prices have the same perception as last year with low uncertainty and high impact. The recent decision of PLN, the national utility provider, to resume adjustable tariffs from 2020 onwards will impact end prices. Tariffs will be adjusted every three months based on the price of oil and coal, the inflation rate and the rupiah exchange rate for industrial users and other unsubsidised consumers.

Coal is seen with much less uncertainty and becomes an Action Priority. This is an expected adjustment, given the country's abundant coal reserves and rising demand for coal for electricity generation under the 35,000MW Programme. The electricity sector is the main coal consumer in Indonesia and relies upon coal for competitive electricity production costs. If managed with a sustainable approach such as Carbon Capture and Storage, coal could continue to be an important resource to enhance Indonesia's economic growth.

JAPAN



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Japan’s energy leaders continue to see a Critical Uncertainties landscape defined by issues such as Large-Scale Accidents, Nuclear and Extreme Weather Risks. At the same time, the Hydrogen Economy is identified with much higher impact, entering the Critical Uncertainties section. Action Priorities remain consistent, led by Climate Framework, Data AI, China and Decommissioning.

CRITICAL UNCERTAINTIES

Large-Scale Accidents remain the highest Critical Uncertainty, aligned with perceptions around extreme weather risks. In 2019, extensive areas of Japan were hit by a number of massive typhoons, which caused long-term blackouts near Tokyo and intensified concerns about the impacts of climate change. Japan has long been earthquake-prone and at risk of volcanic eruptions. In this context, the public and private sectors have started work on enhancing infrastructure resilience against these risks.

Nuclear also persists in the Uncertainties section. The regulation of nuclear power reactors has become more stringent since the Fukushima Daiichi nuclear plant accident. The NRA has taken a stricter line on restarting nuclear power plants but is criticised for an overdue safety review, leading to delays. Additionally, decommissioning has become a big issue as 24 reactors which have been in operation for over 40 years will be soon decommissioned.

Hydrogen Economy is seen with greater impact and becomes a Critical Uncertainty. Currently, there is a shared view that reduced LNG and coal should compensate for the loss of nuclear capacity. At the same time, there is awareness that the carbon economy is harmful in the long run. To address this issue, Japan's government has started to promote technological innovation in developing a hydrogen economy. In 2019, the world's first liquefied hydrogen carrier tanker was launched in Japan to transport grey hydrogen from Australia.

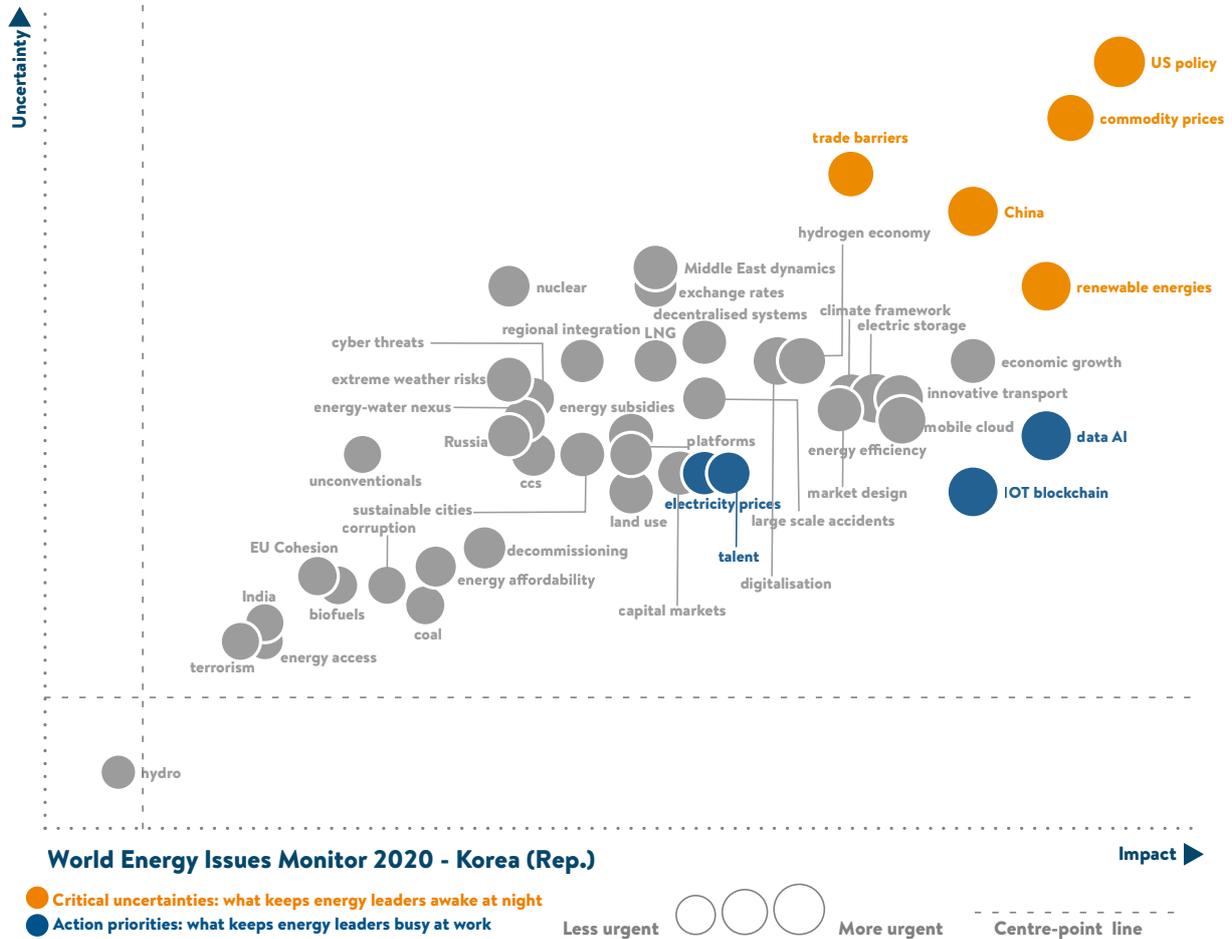
ACTION PRIORITIES

Climate Framework is seen as an issue of lower uncertainty and becomes an Action Priority. There is growing concern that the frequency and impact of extreme weather such as heavy rains and super typhoons due to climate change may increase further. In Japan, it is widely recognised that setting ambitious goals and pursuing swift action to implement the Paris agreement is essential.

China remains in the Action Priority space. As the world's largest market, China continues to develop at a fast pace and its growth rate has an impact on neighbouring countries' economies. Japan's energy leaders worry about recent trade conflicts between China and the United States that could negatively impact economies in the northeast Asian region.

Data AI also continues to be perceived as an Action Priority. Big Data and AI are seen as essential components of digitalisation in the energy sector and new businesses and services. Various attempts are being made in collaboration with IT companies, including start-ups. Experts say that cyber security should also be strengthened in the digitalisation era.

KOREA (REP.)



NATIONAL OVERVIEW & CONTEXT:

South Korea’s energy leaders reflect the priorities of an advanced economy, with Data Artificial Intelligence and IoT/Blockchain perceived as the main actionable issues. Uncertainties revolve around China and Trade, both related to concerns over US Policy and Commodity Prices due to continued dependence on imported energy.

CRITICAL UNCERTAINTIES

Commodity Prices are perceived as a Critical Uncertainty. South Korea is one of the five top importers of fossil fuels – LNG, coal, oil and refined products – much of it sourced from the Middle East. Uncertainties emerge from the almost full reliance on imports to meet demand. South Korea is also a maritime importer, which increases vulnerability to supply disruptions.

Trade Barriers is high on the list of Critical Uncertainties given heavy dependence on export markets, particularly within Asia. This ties into concerns over the US-China trade dispute and the impact on global economic growth. While US-China trade relations do not have a direct impact on the Korean energy sector, there is a rising uncertainty that in the event of a prolonged dispute the financial sector may be threatened.

Renewable Energies make up the third Critical Uncertainty. South Korea plans to raise the renewables share in the energy mix from 6% to 20% by 2030 and reduce its dependence on coal and nuclear, which currently account for 70% of total electricity production. Uncertainties revolve around the incentives offered to facilitate this transition, especially considering the higher costs of renewables development due to the country's rugged terrain and the fact that electricity prices are traditionally below market costs.

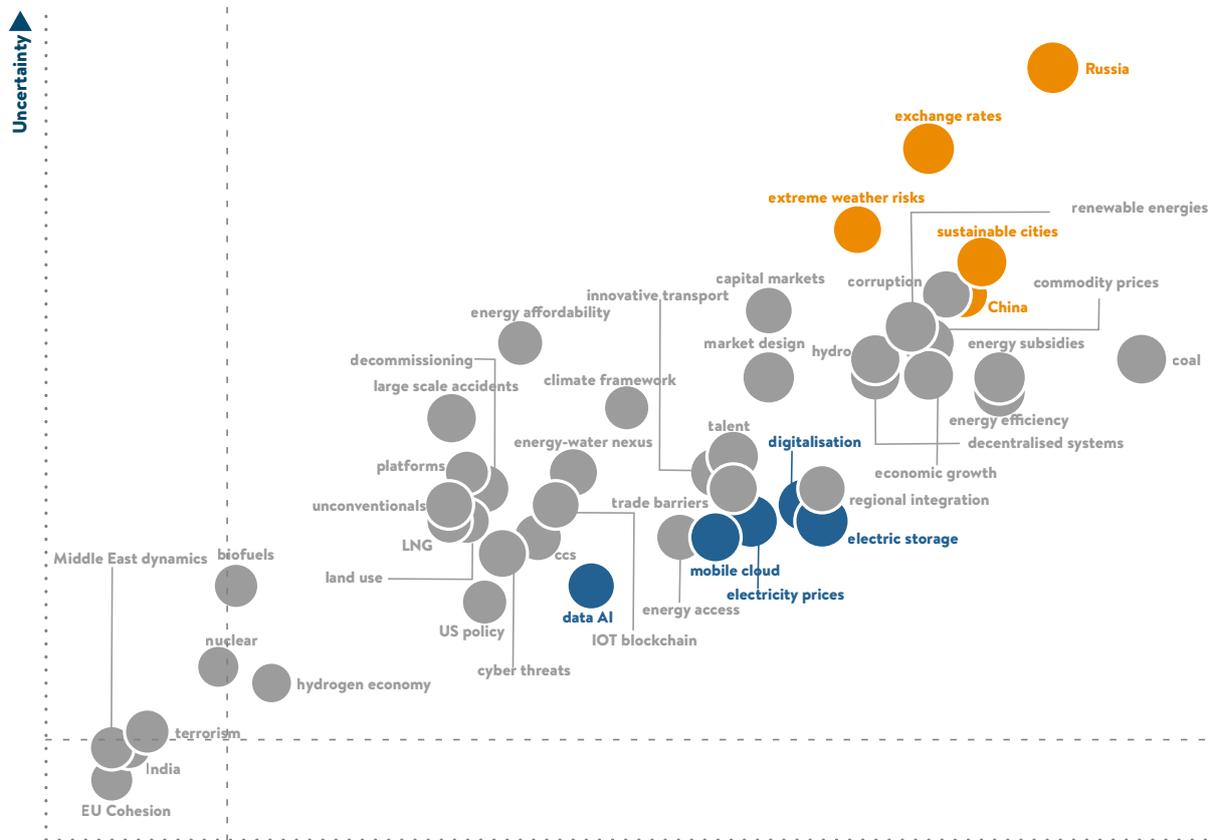
ACTION PRIORITIES

Data AI is perceived with high impact and low uncertainty. The Korean government and leading energy corporates run AI-based energy control service and systems with the primary aim of improving energy efficiency in buildings and houses. According to the third National Energy Plan, the government is also working on establishing big data platforms that provide value creating analysis on demand and market trends. It has committed to spend 4.7 trillion won (US\$3.9 billion) of its 2020 budget on innovative sectors including hydrogen and artificial intelligence.

IoT/Blockchain shares a similar place with Data AI as an Action Priority. The Korean government provides tax incentives for blockchain by including the technology in the R&D eligibility list for tax credits. It has also allocated US\$9 million to support the development of blockchain technology in the country. Korea's leading power suppliers are developing a government-led blockchain pilot project for REC transactions to improve transparency and efficiency for new renewable energy supply certificates.

Electricity Prices are also seen as an Action Priority. Retail prices in South Korea are far lower than the market average, which encourages high consumption. The country plans to reduce power generation from coal and nuclear and raise the share of natural gas and renewables such as solar and wind power. At the same time, new coal and nuclear based capacity are also under construction, which will lead to more competition.

MONGOLIA



World Energy Issues Monitor 2020 - Mongolia

Impact ▶

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Mongolia’s energy leaders continue to see Russia and Sustainable Cities as Critical Uncertainties while Exchange Rates and Extreme Weather Risks are increasingly perceived with higher uncertainty. Action Priorities centre on digitalisation and technology issues, breaking with 2019 which saw Hydro and Coal leading the Action Priorities section.

CRITICAL UNCERTAINTIES

Russia is increasingly perceived as an uncertainty. Mongolia's and Russia's energy sectors are strongly connected as the latter is a lead supplier of the former's fuel and power demand. In September 2019, Mongolia and Russia signed a permanent treaty on friendship and comprehensive strategic partnership. While relations are based on cooperation, uncertainties persist around the vulnerability associated with over-reliance on a single supplier.

Exchange Rates remain an uncertainty particularly with regard to crude oil import costs. Mongolia's crude oil import bill rose in 2019, prompting the government to introduce the Automatic Fuel Pricing Mechanisms to calculate fuel prices in line with border prices and foreign exchange rates.

Sustainable Cities remain a Critical Uncertainty. City air and soil pollution are a critical issue as they affect most Mongolian cities - nearly 45% of the country's population. Growing urbanisation further aggravates the issue. A ban on low-grade coal for domestic use has been introduced. In December, 2019 the Asian Development Bank (ADB) approved a 160 million US Dollar loan to support air quality improvements in Ulaanbaatar, the country's capital.

ACTION PRIORITIES

Electric Storage is perceived as the most actionable issue. Mongolia is working on developing a regulatory and business framework to integrate battery technology into the energy network. In September 2018, the ADB-supported Upscaling Renewable Energy Sector Project received a USD 14.6 million grant to develop a 40.5MW distributed renewable energy system in western Mongolia. The programme uses solar PV and wind power along with battery storage and energy management systems and is aimed at reducing import dependency and improving affordability and environmental sustainability.

Digitalisation is also identified as an Action Priority. The Ministry of Energy declared 2019 as "The Year of Smart Energy" and developed policy documents on smart energy systems. The Wide Area Monitoring Systems (WAMS) and Integrated metering system are due to be introduced in 2020.

Electricity Prices enter the Action Priority section with lower uncertainty. Mongolia has one of the cheapest electricity and heating tariffs in the region, which discourages investment in the energy sector. In 2019, the country increased the electricity tariff by 16% and the heat tariff by 10%. It is also working on amending its tariff methodology to make it more transparent and effective.

CRITICAL UNCERTAINTIES

Climate Framework remains the biggest uncertainty. New Zealand has passed its Zero-Carbon Bill into law, committing the country to net zero carbon by 2050. This sets a clear goal but highlights the need for an action plan. More work is underway with part of the Act being the reform of the New Zealand Emissions Trading Scheme (NZ ETS).

Innovative Transport is perceived with a high level of uncertainty. New Zealand's transport system is predominantly supplied by fossil fuels, raising concerns around environmental risks associated with climate change. Energy leaders are currently exploring the role that alternative fuels, such as electricity, green hydrogen and biofuels, could play in reducing emissions in the transport sector.

Market Design continues to be seen as uncertain, with an increased level of impact. New Zealand's government has completed its review of the electricity market and the Electricity Authority is tasked with delivering several recommendations. Multiple initiatives are underway, such as improving access to information and data, enabling new technologies and business models across the electricity sector and enhancing competition. Any changes should improve New Zealand's Energy Trilemma performance of balancing energy security, affordability and environmental sustainability.

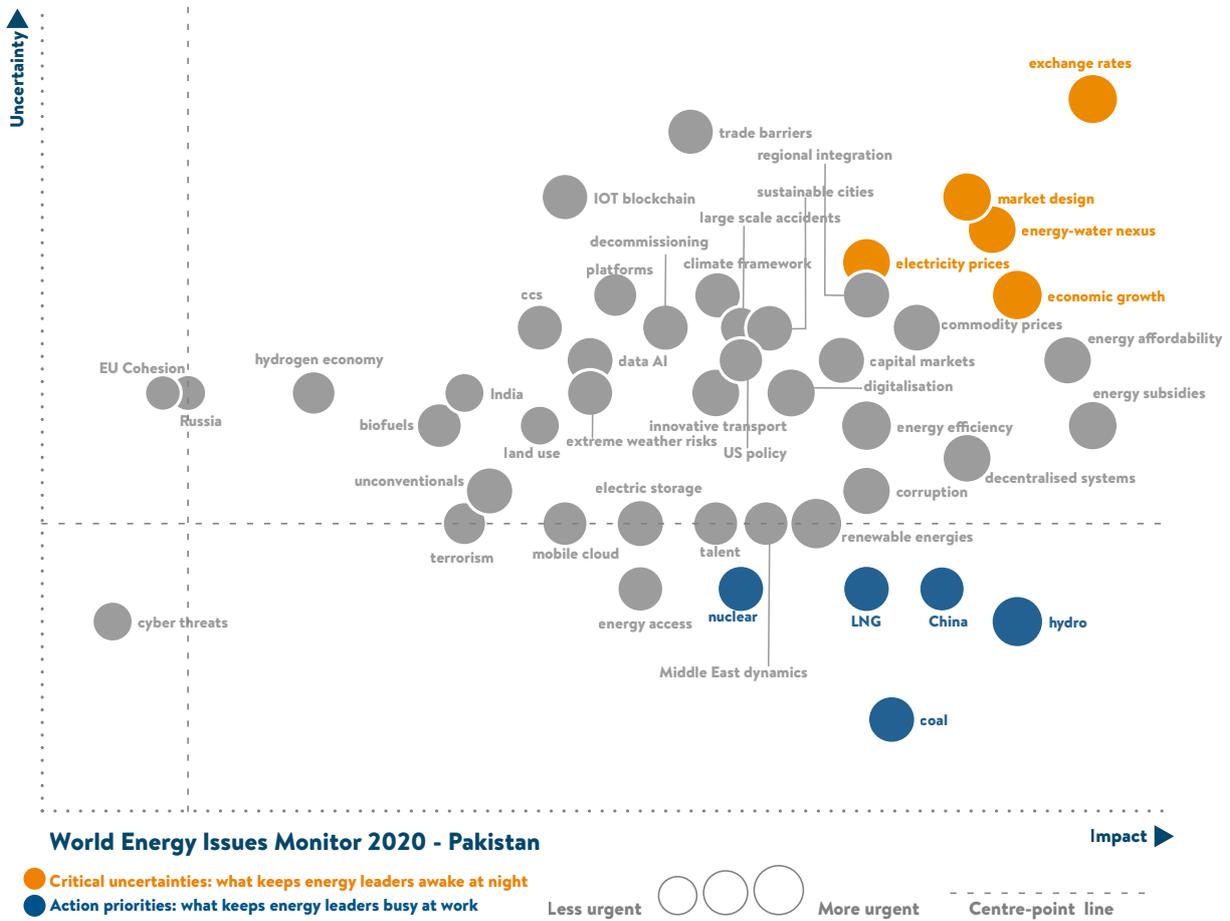
ACTION PRIORITIES

Renewable Energies are perceived to have the biggest impact and remain New Zealand's top Action Priority. Hydro, wind and geothermal sources provide for 40% of the energy mix and for 85% of the electricity mix. More than US\$650 million have been committed to new renewable generation for 2020, bolstering the government's aspiration for a 100% renewable future. This investment suggests a positive outlook for an increased share of renewable electricity.

Energy Efficiency remains an Action Priority. Energy cannot be thought of in isolation and must be linked into transport, infrastructure, water and a wider ecosystem. Current interventions for improved efficiency go towards addressing many of the Critical Uncertainties and Action Priorities identified for the country in 2020.

Talent becomes an Action Priority as business sees the increased impact this matter will have. Energy leaders seem increasingly concerned about the talent pipeline as the workforce ages, the economy continues to grow strongly, and immigration levels are tightened. These changes becomes particularly relevant as they come at a time when New Zealand has the lowest unemployment rate in twenty years

PAKISTAN



NATIONAL OVERVIEW & CONTEXT:

Pakistan’s energy leaders provide an overview of the country’s energy landscape where uncertainties are defined around economic and market design issues. Actions revolve around ensuring a varied resource mix and managing relations with China as a lead investor.

CRITICAL UNCERTAINTIES

Market Design is perceived as a Critical Uncertainty. The National Electric Power Regulatory Authority (NEPRA) Amendment Act of 2018 gave rise to a new set of challenges on issues of governance and regulation of the power sector. The Act sees a competitive power sector by 2023, creating retail and wholesale markets. It also unbundles the distribution and supply sides of the electric power businesses.

Economic Growth is seen with high uncertainty and high impact. Pakistan's acute energy deficit in past years has affected productivity while power shortages have curbed economic growth. Although the country has a surplus of installed power capacity, there are still issues relating to reliability and affordability that need to be resolved in order to allow the industry to make full use of available energy resources and enable growth.

Electricity Prices are also highlighted as a Critical Uncertainty. An expensive generation mix, PPA payment challenges, a high loss network and low recovery by distribution companies have resulted in skyrocketing electricity production costs in relation to retail prices. Meanwhile, tariffs for solar and wind power have fallen below US\$0.05/kWh, nearly half of the national average. Under the new government of Prime Minister Imran Khan, the draft Renewable Energy Policy proposes 20% renewables share by 2025 and 30% by 2030, in an effort to improve affordability and sustainability.

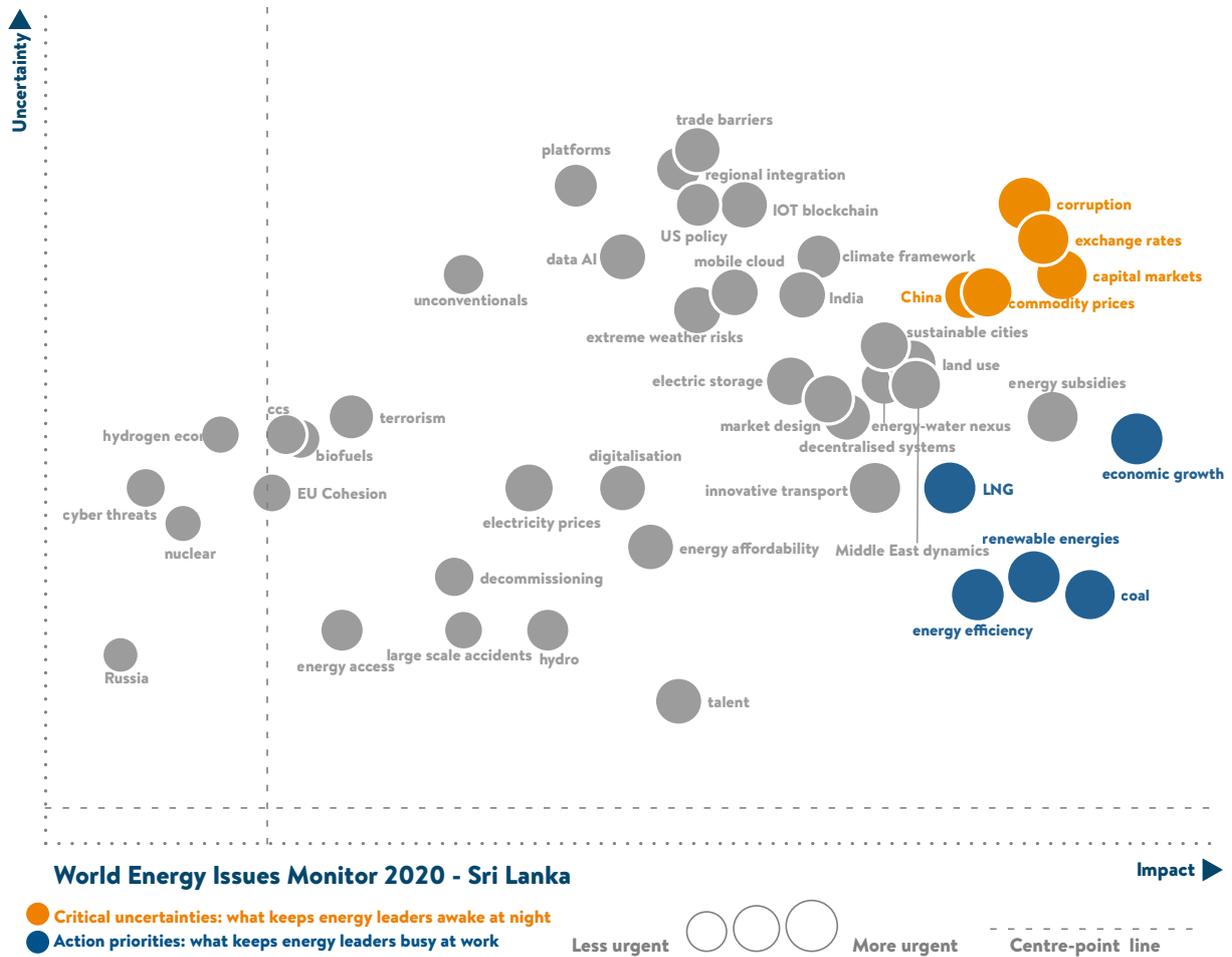
ACTION PRIORITIES

China is perceived as an Action Priority. Pakistan has benefited from the China-Pakistan Economic Corridor which provides funding for infrastructure projects. China is a big investor in generation capacity in the country, with hydro, coal and renewable energy projects. At the same time, the competitiveness of Chinese technologies encourages wider deployment of renewables.

Hydro is perceived with low uncertainty and high impact. Hydropower makes up 27% of Pakistan's energy mix. The country has potential to produce energy from renewables but has yet to develop the enabling policies to allow deployment on a large scale. Like other countries in southeast Asia, Pakistan is vulnerable to extreme climate phenomena and needs to find urgent solutions and design a safe and sustainable energy system. There are no immediate plans to significantly expand hydro capacity.

Nuclear and LNG are also seen as Action Priorities. Nuclear energy has a historical role in Pakistan's energy portfolio, with five operational reactors. Pakistan plans to expand its nuclear capacity as part of the effort to ease dependence on fossil fuel imports. In addition, it has two LNG terminals and plans to add five more receiving terminals, which will lead to higher imports in the future. Additional imports are planned to supply combined cycle power plants.

SRI LANKA



NATIONAL OVERVIEW & CONTEXT:

The 2020 Issues Monitor for Sri Lanka indicates challenges to the vision of achieving carbon neutrality and complete transition of the energy value chain by 2050. Subsidised energy prices and continued reliance on imported fossil fuels are a burden to the economy. As an island nation that is exposed to extreme climate phenomena, reducing the dependency on imported petroleum products and coal is an urgent Action Priority

CRITICAL UNCERTAINTIES

Capital Markets emerge with higher impact because of the country's need for external financial support to develop the domestic energy industry into a more secure and sustainable system. The country plans to reduce dependence on imported fuels and increase the share of cleaner energy sources by introducing LNG as well as solar and wind. However, these will need support from multilateral finance institutions and foreign and local banks

China, which is also identified as a Critical Uncertainty, has been a strong investment partner, providing loans for infrastructure projects, including power projects.

Commodity Prices persist as a Critical Uncertainty as the country moves toward increasing the share of renewables in the energy mix to reduce import dependence.

Energy Subsidies emerge with greater impact and reduced uncertainty. Electricity prices do not reflect costs, requiring direct and indirect subsidies. Cross-subsidies to finance electricity tariffs cannot be fully recovered from high-end users due to disparities in pricing and sales volumes in subsidised and surcharged categories. Solar PV distributed generators are not required to pay capacity costs, although they impose a demand on the grid at peak times. Pricing policy on petroleum products is not consistently implemented.

ACTION PRIORITIES

Economic Growth moves from Critical Uncertainty to Action Priority. Sri Lanka's economy has seen healthy growth since the end of the Civil War in 2009. However, this growth, coupled with urbanisation, has led to a rise in energy demand, and the economy has moved away from reliance on agriculture and manufacturing industry, to a more service-oriented system.

Coal remains an Action Priority. The lower cost of coal-generated electricity compared with renewable energy remains a challenge to decarbonisation. Since the country's economically viable major hydro potential has already been developed, wind and solar are the possible new alternatives. However, large capacity additions from intermittent renewables expose the technical limitations of the country's small isolated grid. Growing demand for energy is being met by increased fossil fuels imports, mainly oil and coal.

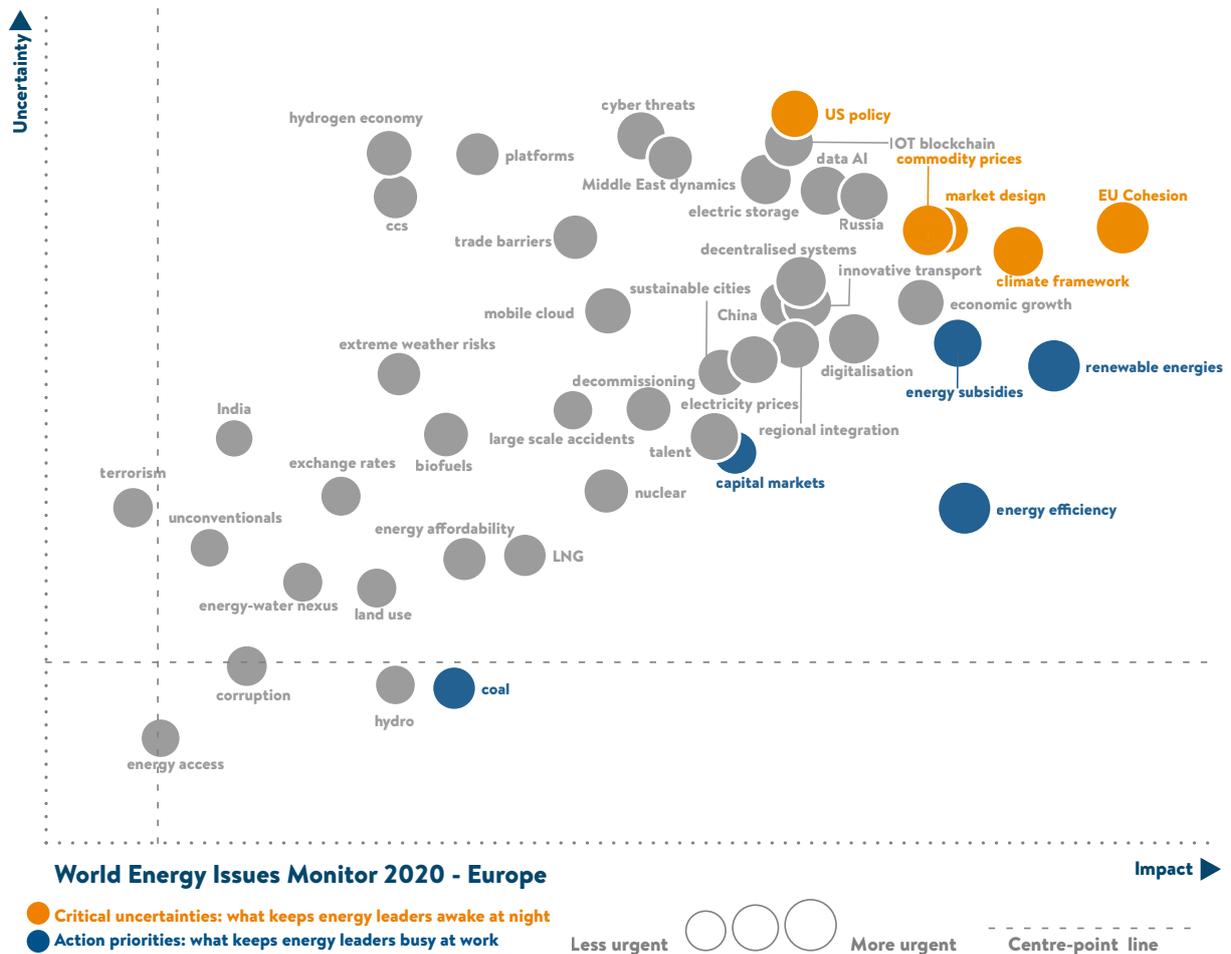
Renewable Energies persist as an Action Priority. The share of imported fossil fuels in power generation has increased, due to rising demand for electricity. Stepped-up deployment of renewable energy technologies would ease the burden on the treasury while making it easier to gradually ease energy subsidies. The Standardized Power Purchase Agreement (SPPA) for private investment in grid-connected small renewable power plants (less than 10MW) added 368 MW of new capacity, contributing to over 12% of total annual electricity generation in 2018

Assessing The Energy Agenda for Europe





ASSESSING THE ENERGY AGENDA FOR EUROPE



REGIONAL OVERVIEW & CONTEXT

Europe’s Critical Uncertainties revolve around EU cohesion, a changing energy mix and energy security concerns driven by commitments to the Climate Framework and EU decarbonisation policies. The main area of concern is the impact of a changed energy mix on existing market structures and on the reliability of energy infrastructure. Among security challenges is the ability to attract adequate investments and, for some countries, overreliance on a single supplier or on a single fuel source. Russia’s dominance as a supplier of natural gas to Europe remains a source of tension with some European countries as Moscow seeks to secure a greater share of the European market. Action Priorities remain consistent with last year’s efforts to decarbonise and enhance the efficiency of energy systems.

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CRITICAL UNCERTAINTIES

EU Cohesion continues as the most impactful Critical Uncertainty. Concerns emerge from different perspectives. Brexit and political evolutions in some countries raise increasing challenges to the EU dynamics with potential impacts on the way energy is dealt with. On the energy side, questions are building up regarding the efficient way to deal with diverse energy choices across Europe. Increasing tensions around Russian gas supplies also raise uncertainties, especially around their possible impact on regional energy trade. Meanwhile, gas and power interconnectors are being built to strengthen security of supply among EU members.

Climate Framework also remains in the uncertainties space while most countries in the region are committed to achieving net zero greenhouse gas emissions by 2050. Uncertainties revolve around building the ideal energy mix and implementing decarbonisation plans while ensuring energy security and economic growth, especially in countries like Poland where fossil fuels play an important role, or Belgium and Bulgaria which strongly rely on nuclear. Hydrogen emerges as a stronger candidate for decarbonisation of energy uses, with Germany and the UK leading efforts but uncertainty still remains high regarding its potential role.

Market Design remains consistent as a Critical Uncertainty. Concerns revolve around implementing an enabling regulatory framework to deliver an adequate level of investments and for clean energy technologies and energy mix diversification. Challenges include changes in the tariff structure, guaranteeing reliable capacities to the power markets, the role of long term contracts, the incorporation of auctions and feed-in tariffs.

ACTION PRIORITIES

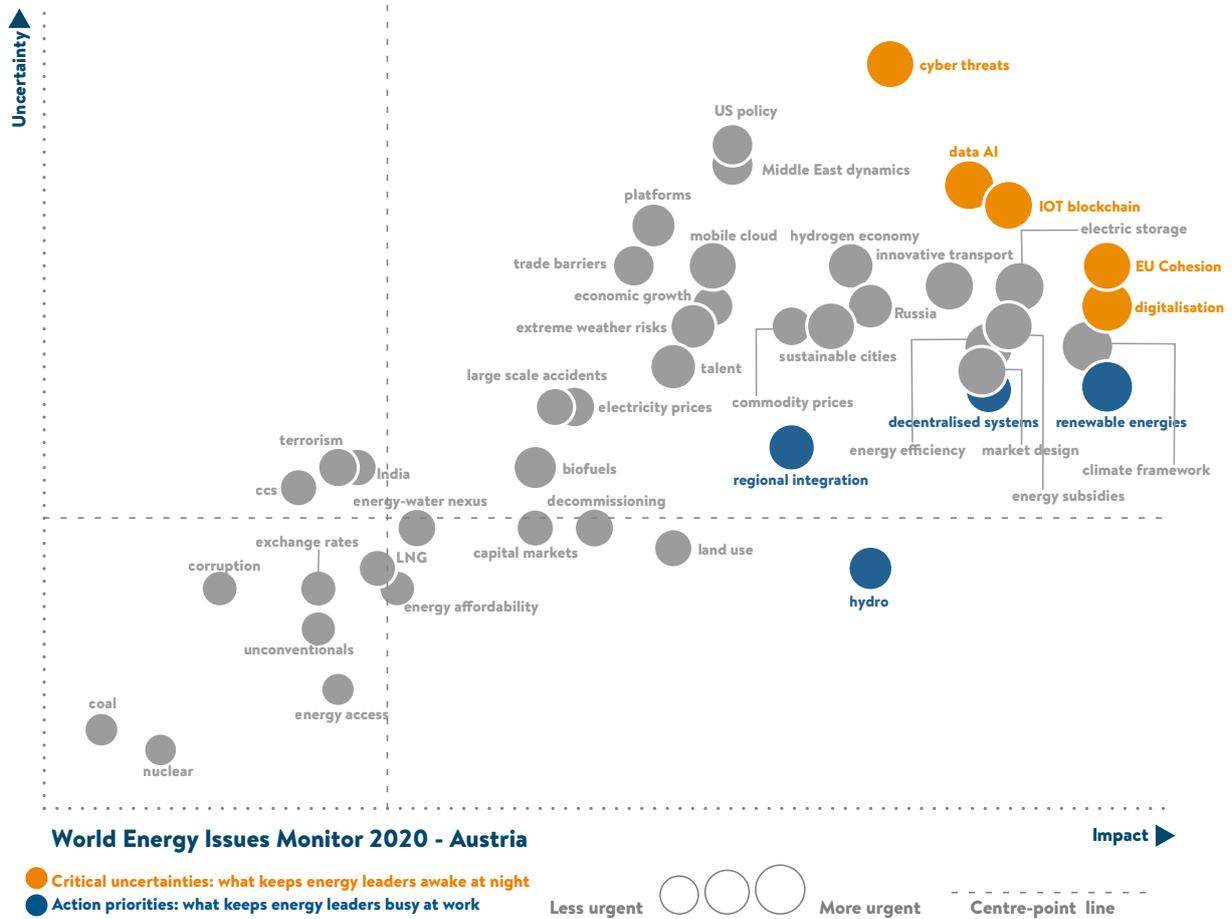
Energy Efficiency is once again seen as requiring further action. Curbing energy consumption is a priority in the effort to achieve climate and energy security objectives. The focus is on improving efficiency in buildings, with strong state, EU and donor support to upgrade buildings' infrastructure including lighting, insulation and heat Incentives being promoted across Europe include tax credits and competitive tenders though the effectiveness of these measures is still a subject of debate.

Renewable Energies maintain their high impact and low uncertainty position. In line with decarbonisation commitments, European governments are putting forward ambitious plans and incentives for private investments in wind, solar, as well as hydro and biofuels generation. The main challenges identified across the region for the renewables' integration process include market redesign, storage capacity, public acceptance and grid interconnections. Despite these efforts, it is likely that some large EU countries will miss their 2020 renewables targets.

Energy Subsidies remain high on the list of action priorities. Several European countries provide substantial subsidies to the energy sector (mostly fossil fuels). Germany's energy subsidies are Europe's largest. It allocates €27 billion a year in renewable energy subsidies and €9.5 billion for fossil fuels. The United Kingdom on average sets aside £10.5 billion a year for fossil fuel subsidies and about £7.10 billion a year for renewable subsidies. Reducing or eliminating subsidies is an action priority for a number of countries.



AUSTRIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Austrian energy leaders show heightened uncertainty around the innovation cluster and EU Cohesion, given the crucial importance of these issues to the country’s success towards Action Priority issues. These are consolidated around the transition to a greener energy system and the Climate and Energy Strategy, the recently developed integrated national energy and climate plan.

CRITICAL UNCERTAINTIES

EU Cohesion continues to be perceived as a Critical Uncertainty, signalling the impact of diverging views such as the development of nuclear power, which Austria strongly opposes. Priority measures to support stronger cohesion in the Energy Union include energy efficiency, intelligent networks, renewable energies, environmentally friendly urban transport and infrastructure, climate change and adaptation research, including resilient infrastructures, risk prevention and risk management.

Digitalisation is perceived with high uncertainty and impact. In Austria, 80% of metering points will be converted to new digital measuring devices by the end of 2020, and at least 95% of households will be equipped with smart meters by the end of 2022. This development will not only impact the energy suppliers' business models but will also enable a new dynamic between users and the entire energy system.

IoT/Blockchain and Data AI are also perceived as Critical Uncertainties. A recent development in IoT/Blockchain is a partnership between Power Ledger and a subsidiary of one of Austria's top five largest energy utilities, Energie Steiermark, to deploy a peer-to-peer energy trading network in and around Graz, Austria's second largest city.

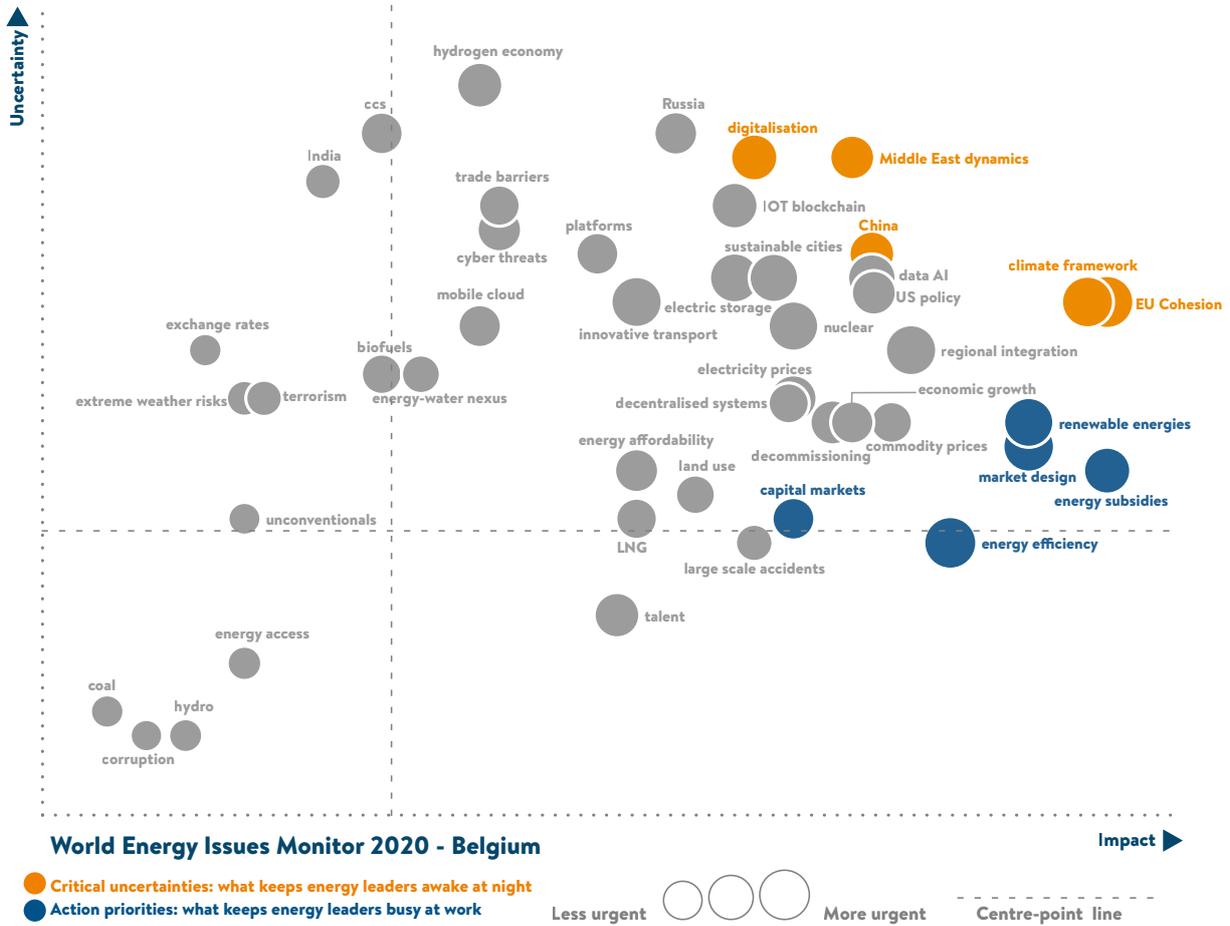
ACTION PRIORITIES

Renewable Energies continues to be seen as an Action Priority but with higher uncertainty. Within the framework of #mission2030, Austria's Climate and Energy Strategy, the country plans to increase the share of renewable energy in gross final energy consumption to 45-50% by 2030 with 100% of total electricity consumption being covered by renewables. Additional funding has been allocated as an amendment to the Green Electricity Act passed in October 2019, to secure the expansion of wind, small hydro, biomass and biogas power generation.

Decentralised Systems moves to the Action Priority section as increasing decentralisation requires new energy infrastructure. Investments in information technology, flexibility options and network infrastructure are top priorities. In addition to technical optimisation, the main focus is on legal and normative frameworks for feed-in and trading tariffs.

Hydro is seen with increased impact. Hydropower is the biggest source of electricity generation in Austria today against 61% in 2018. Currently, 21 hydropower projects with a total capacity of just over 700MW and annual electricity generation of just over 1TWh are under construction. Projects with a capacity of slightly more than 2,800MW and a production of around 3,200GWh are planned. In addition, installations with total generation capacity of 1,000MW and 330GWh are being considered by electricity utilities. However, implementation depends on whether it is possible to create solid regulatory conditions - for example through a new Renewable Energies Expansion Act

BELGIUM



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Belgium’s energy leaders continue to pay attention to Macroeconomic Risks such as Climate Framework and Energy Geopolitics such as EU Cohesion, Middle East Dynamics and China. The Policies and Business Environment are seen as less uncertain and join the Action Priority section together with Energy Technologies.

CRITICAL UNCERTAINTIES

EU Cohesion continues to be perceived as a Critical Uncertainty. The future of the EU amid continued uncertainty over a Brexit timetable is of particular concern to Belgium. A gas pipeline connects the UK and Belgium and an electricity interconnector was completed in December 2018. Still, uncertainty over Brexit led to the cancellation of the first capacity auction for the interconnection in March 2019.

Climate Framework is another Critical Uncertainty in view of the decision to phase out nuclear power by 2025. In 2018 nuclear energy accounted for 39% of Belgium's total net electricity production and will have to be replaced. The main contributors to GHG emissions in the industrial sector are electricity and heat production and oil refining. However, overall, GHG emissions in Belgium have declined as the economy has become less energy intensive (Integrated National Energy & Climate Plan 2021-2030).

Middle East Dynamics emerge with higher impact and become a Critical Uncertainty. Belgium relies heavily on imports for its energy needs. Petroleum products make up 52% of final energy consumption and OPEC alone provides 41.2% of Belgium's crude oil imports, according to official statistics. As oil still makes up a significant share of Belgium's energy mix, events in the Middle East influence oil price movements.

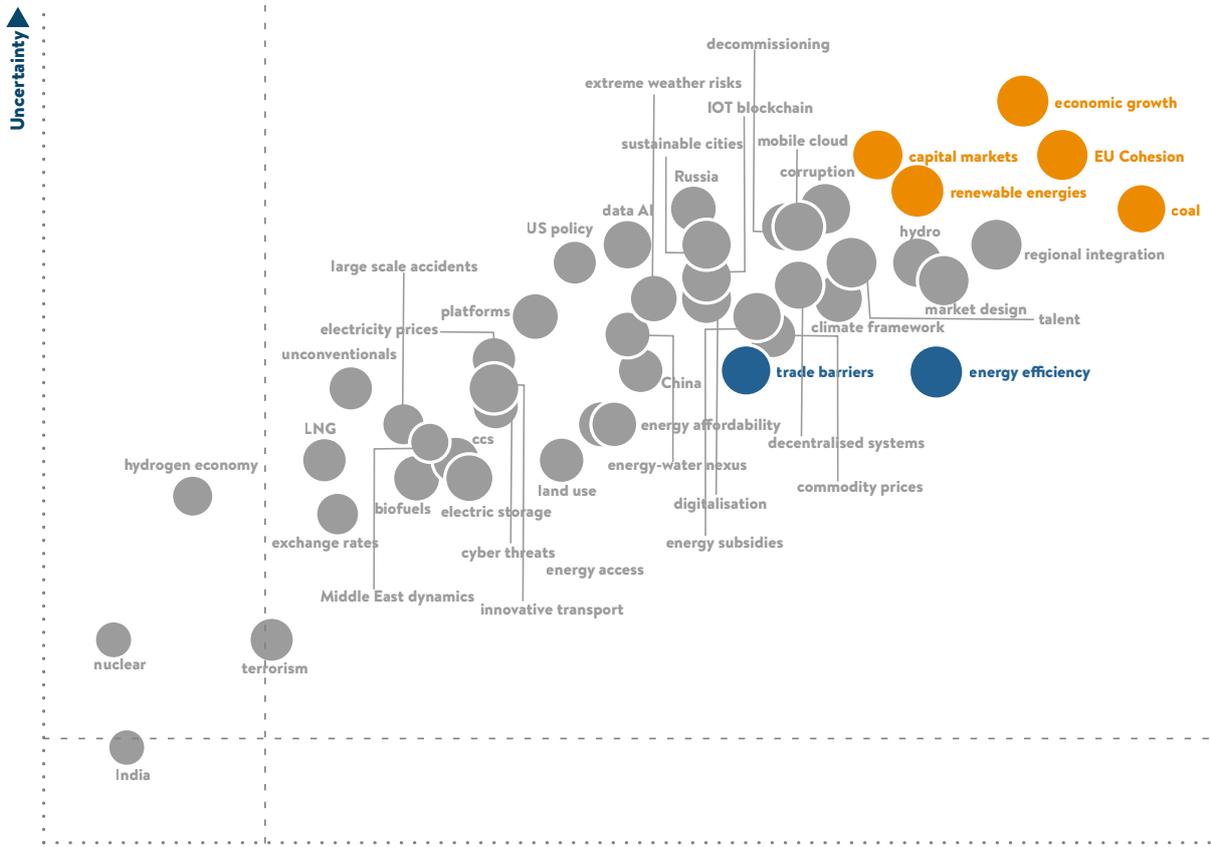
ACTION PRIORITIES

Market Design is seen with reduced uncertainty and becomes an Action Priority. As the deadline for phasing out nuclear power by 2025 looms, the shift requires increased market flexibility to diversify the energy mix and provide affordable and secure energy supply. Storage solutions, smart meters and demand management across the distribution network are being worked on within a regulatory framework. The option of importing hydrogen or methane is also being considered.

Renewable Energies continue to be seen as an Action Priority, as low carbon sources are being integrated as a diversification strategy as nuclear is phased out. Under Belgium's National Energy Plan, the share of renewables is set to rise to 18.4% by 2030, much of it from offshore wind and advanced biofuels. At the end of 2017, renewable energies accounted for 8.65% of the country's final energy consumption.

Energy Efficiency is seen with increased impact and becomes an Action Priority, in alignment with efforts to reduce dependence on imported fuels. Belgium is actively working on replacing low calorific gas supplies from the Netherlands and has developed a conversion plan to switch to high calorific gas.

BOSNIA & HERZEGOVINA



World Energy Issues Monitor 2020 - Bosnia and Herzegovina

Impact ►

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work



NATIONAL OVERVIEW & CONTEXT:

The perceptions of Bosnia and Herzegovina’s energy leaders on energy issues suggest a strong attention to Economic Growth, Regional Integration as well as the rebalancing of the energy mix as issues of crucial relevance. The Action Priority section is led by Energy Efficiency and Trade efforts to support Economic Growth.

CRITICAL UNCERTAINTIES

Economic Growth is perceived as the highest uncertainty. Recent years have seen higher GDP growth and the IMF expects further growth in coming years. At the same time, the country is challenged by a fiscal deficit and inflation. There has been a strong focus on developing building infrastructure as well as increasing the quality of funds for small and medium-sized enterprises in order to enhance productivity and create jobs.

EU Cohesion is another key concern. Uncertainty stems from the current progress in the planned replacement of three aging coal units with a single 450MW unit at the 715MW Tuzla Power plant. The EU has expressed opposition to the terms of the financing agreement for this project, prompting the activation of the Mediation and Dispute Resolution Centre of the Energy Community Secretariat in 2019. Meanwhile, the Environmental Impact Assessment has confirmed that the new block will meet all the requirements and conditions of modern technology and environmental protection according to EU and BiH's standards.

Coal is also perceived with high uncertainty and high impact. BiH's electricity mix relies for 60 percent on coal-fired generation, valuing the availability of coal as a national resource. While coal generation helps to ensure affordability of power supply, it also exacerbates the urgency of tackling high pollution levels.

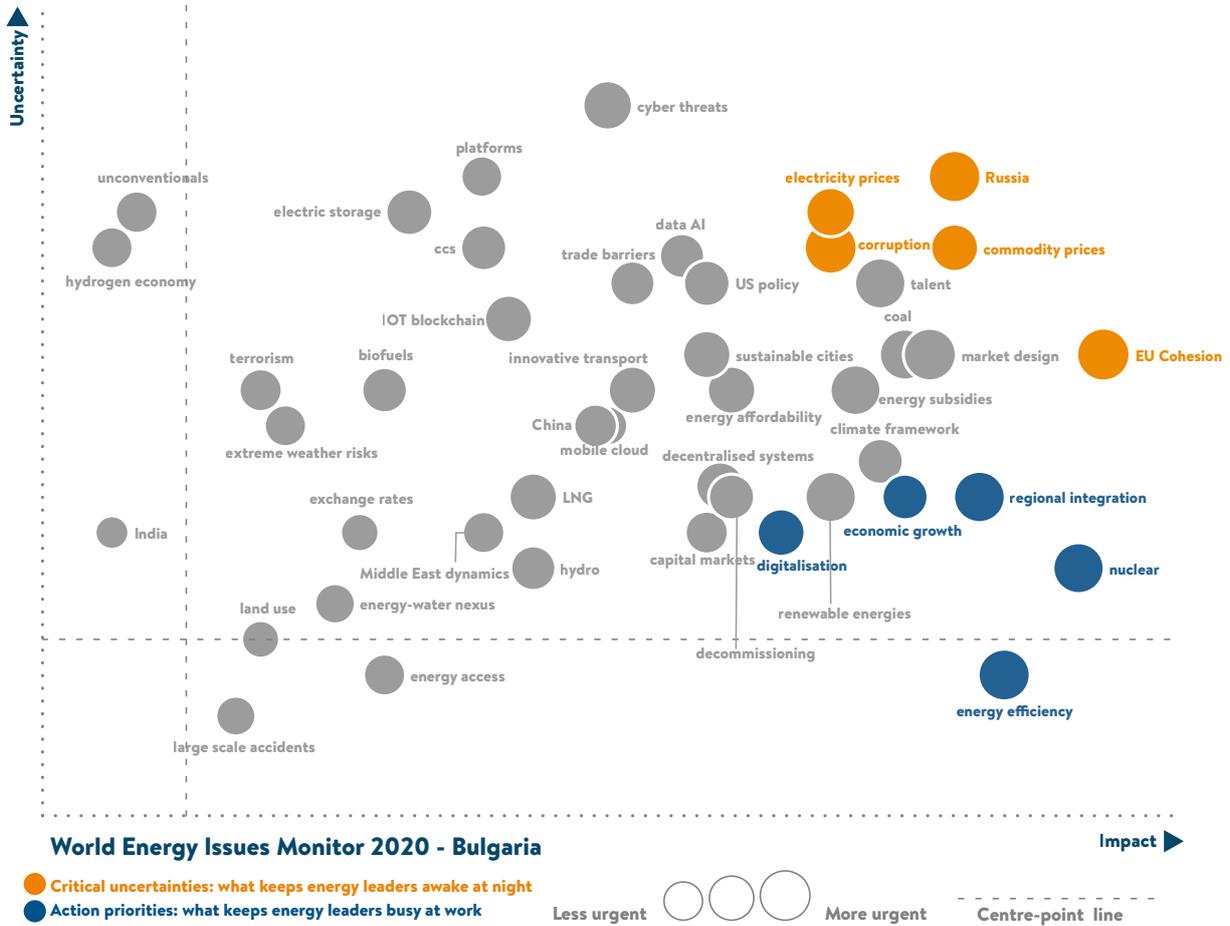
ACTION PRIORITIES

Market Design is perceived with moderate uncertainty and impact, reflecting the attention to the renewables target for the 2020-2030 period, currently subject to negotiations with the Energy Union. This approach feeds into BiH's efforts to align with the EU energy model requiring the adaptation of current laws to enable renewable sector development. Mandated changes include the incorporation of auctions to award large projects and feed-in tariffs to support smaller ones.

Energy Efficiency is fully in the Action Priorities section. The high impact attributed to this issue reflects awareness on the challenge of improving buildings efficiency, as the sector consumes over half of the country's total energy use. In recent years, the focus for action has been on improving insulation, upgrading heating systems and adapting lighting. Progress in this area was made possible thanks to multi-million grant supports from development institutions and green funds.

Trade Barriers are also seen as an Action Priority. In addition to conditions defined in the relevant energy legislation for doing business in this sector, Bosnia and Herzegovina has no barriers for trade in energy. The country is also a signatory to key international treaties/conventions (e.g. ECT, EnC, ICSID) which enable an easier and safer business environment.

BULGARIA



NATIONAL OVERVIEW & CONTEXT:

Bulgaria’s energy leaders identify an energy landscape where uncertainties are influenced by Geopolitical concerns around Russia and EU Cohesion and broadly defined around Macroeconomic Issues. Action Priorities revolve around Energy Vision and Technologies, with attention to Energy Policies and Business Environment.

CRITICAL UNCERTAINTIES

Russia is perceived with high uncertainty as the sole supplier of natural gas and nuclear fuel. The government has taken measures diversify its natural gas sources and routes by building interconnections with neighbouring countries and seeking alternative sources of nuclear fuel. The Greece-Bulgaria (IGB) gas pipeline and the Alexandroupolis LNG terminal will ensure real diversification and security of gas supply. The modernization of the existing national gas transmission network, the expansion of the Chiren underground gas storage facility and the liberalisation of the gas market will contribute significantly to the implementation of the Balkan gas distribution centre on Bulgarian territory. It will also improve security of gas supply in Southeast and Central Europe.

Commodity Prices are also perceived as a Critical Uncertainty. Efforts are focused on full energy market liberalisation, which will lead to competition that will benefit energy consumers. In order to guarantee a smooth and gradual transition, Bulgaria continues to promote measures for the active participation and protection of energy consumers.

EU Cohesion is identified with the highest impact among Critical Uncertainties. The most sensitive issue is the restriction on coal thermal power plants that account for over 43% of gross electricity production. Lignite coal is the only local energy resource and wider utilisation is expected though this will have to conform to EU climate policy requirements.

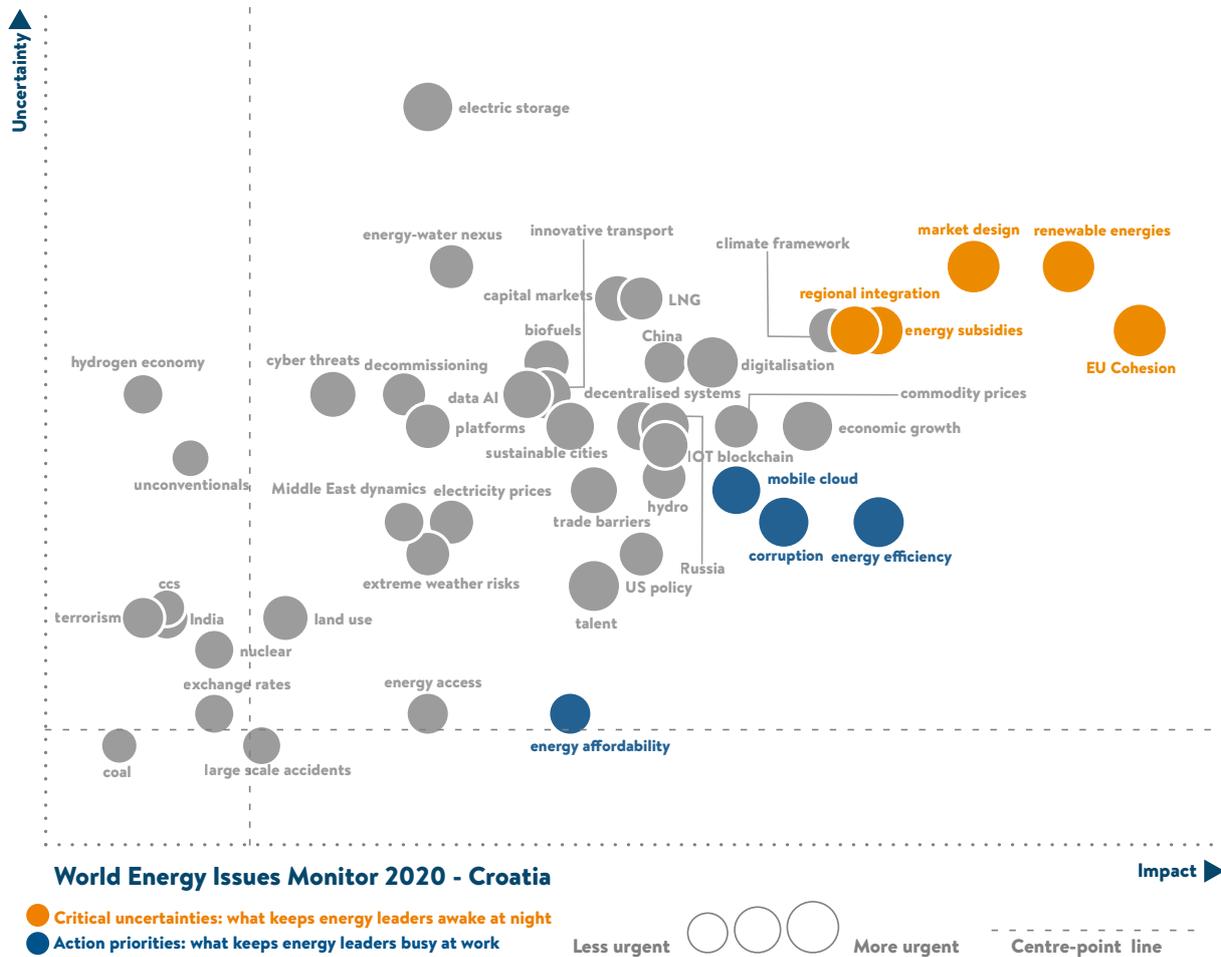
ACTION PRIORITIES

Energy Efficiency is perceived with low uncertainty and high impact, as this is one of the main priorities of the national energy policy. The government has introduced a number of measures to improve energy efficiency. These include improvement of buildings' efficiency, modernisation of electricity and gas distribution grids, rehabilitation of heat transmission networks as well as mechanisms for financial support. Regular energy audits are also planned.

Nuclear is seen as an Action Priority. For Bulgaria, nuclear energy plays an important role in ensuring national and regional energy security while providing affordable energy. This is a key element in the country's transition to a low carbon economy. Given Bulgaria's long-standing experience in the safe use of nuclear energy, the government is planning to build a new nuclear power plant at Belene in the north as part of its effort to expand the use of nuclear energy to provide clean, affordable and secure energy supply for the country and the region.

Regional Integration is also one of Bulgaria's Action Priorities. Bulgaria is actively working to enhance energy cooperation within the framework of international and bilateral initiatives and regional projects in order to build the necessary infrastructure to guarantee energy security and market integration

CROATIA



NATIONAL OVERVIEW & CONTEXT:

Croatia’s energy leaders’ uncertainties revolve around Market Design and Renewable Energies integration. EU Cohesion is perceived as having the highest impact. Actions issues are seen with a lower impact compared to uncertainties, and are defined by efforts towards Energy Efficiency and Mobile Cloud. Tackling corruption is another Action Priority.

CRITICAL UNCERTAINTIES

EU Cohesion is the Critical Uncertainty perceived with the highest impact. As the newest EU Member State, Croatia needs to make adjustments to its energy policies in order to comply with EU climate directives. Priority areas for improvement in order to meet EU standards include infrastructure enhancements and water and waste water management, among others.

Renewable Energies are also perceived as a Critical Uncertainty. Although Croatia has great renewables potential, investments have been stalled for some time. Revised investment plans are expected to raise the share of renewables, but the risks associated with projects have not been addressed. Like other EU countries, Croatia is working to design business models for renewable sources better suited to its market. These models will need to be incorporated into common energy-climate EU policy. The EU new Green Deal is expected to accelerate the process.

Market Design is seen as an issue of high uncertainty and high impact. The Croatian electricity system is connected to both EU and non-EU power networks, where different market rules apply. Finding regulations that are both attractive and appropriate is a challenge. In the future, the EU and Croatia's energy market activities are expected to be aligned.

ACTION PRIORITIES

Energy Efficiency leads the Action Priorities section. The regulatory framework appears to be attractive, but low income and the high share of the rental market hinders the potential for investments. The state has taken steps to retrofit buildings to enhance energy efficiency, having reached good results so far. However, more work is still needed to achieve the goal of retrofitting 3% of buildings annually, which is the EU and Croatian target. Reconstruction activities are also expected to increase in the near future.

Mobile Cloud is also identified as an Action Priority. Transport is a great challenge. In the last two years, EV charging stations have been installed and this will continue. The challenge is the affordability of electric vehicles. In 2019, the Croatian government adopted a national energy strategy to 2030, setting out goals for energy efficiency, renewables and modernisation of the electricity grid through continued deployment of more efficient technologies. In the transport sector, the number of EVs and Hydrogen cars is expected to rise after 2030.

Energy Affordability is perceived as a low uncertainty issue but with moderate impact. Energy is readily accessible in Croatia and is becoming more affordable as the cost of renewables has decreased. The current focus is on integrated households which are not yet connected to the national grid. Economic and social issues are a significant as some 20% of households struggle to pay their energy bills

CRITICAL UNCERTAINTIES

Nuclear energy is one of the possible options for the Czech Republic to meet its obligations to the EU carbon-neutrality target by 2050. Nuclear energy is regarded as a low emission technology which, together with renewables, can replace fossil fuels in the future. The extent, schedule and related requirements are currently being assessed by the government, along with discussions regarding the country's future energy mix.

Russia is also perceived as a Critical Uncertainty. Russia supplies nearly all of the country's gas needs under a contract that extends to 2035. At the same time, the government's draft energy policy submitted to the EU refers to the need to diversify its sources of energy by securing some gas on the spot market. The Czech Republic also imports crude oil from Russia and the Caspian region, while Russia supplies fuel for the country's two nuclear power plants.

Commodity Prices are another Critical Uncertainty. The Czech Republic depends heavily on imported crude oil and natural gas, which leaves it exposed to oil and gas price fluctuations. Coal is the dominant fuel in power generation and the prices of coal and end-use natural gas are set freely by the market. Further development of renewables and other sources of energy, including nuclear, will help to lessen the country's exposure to oil price fluctuations.

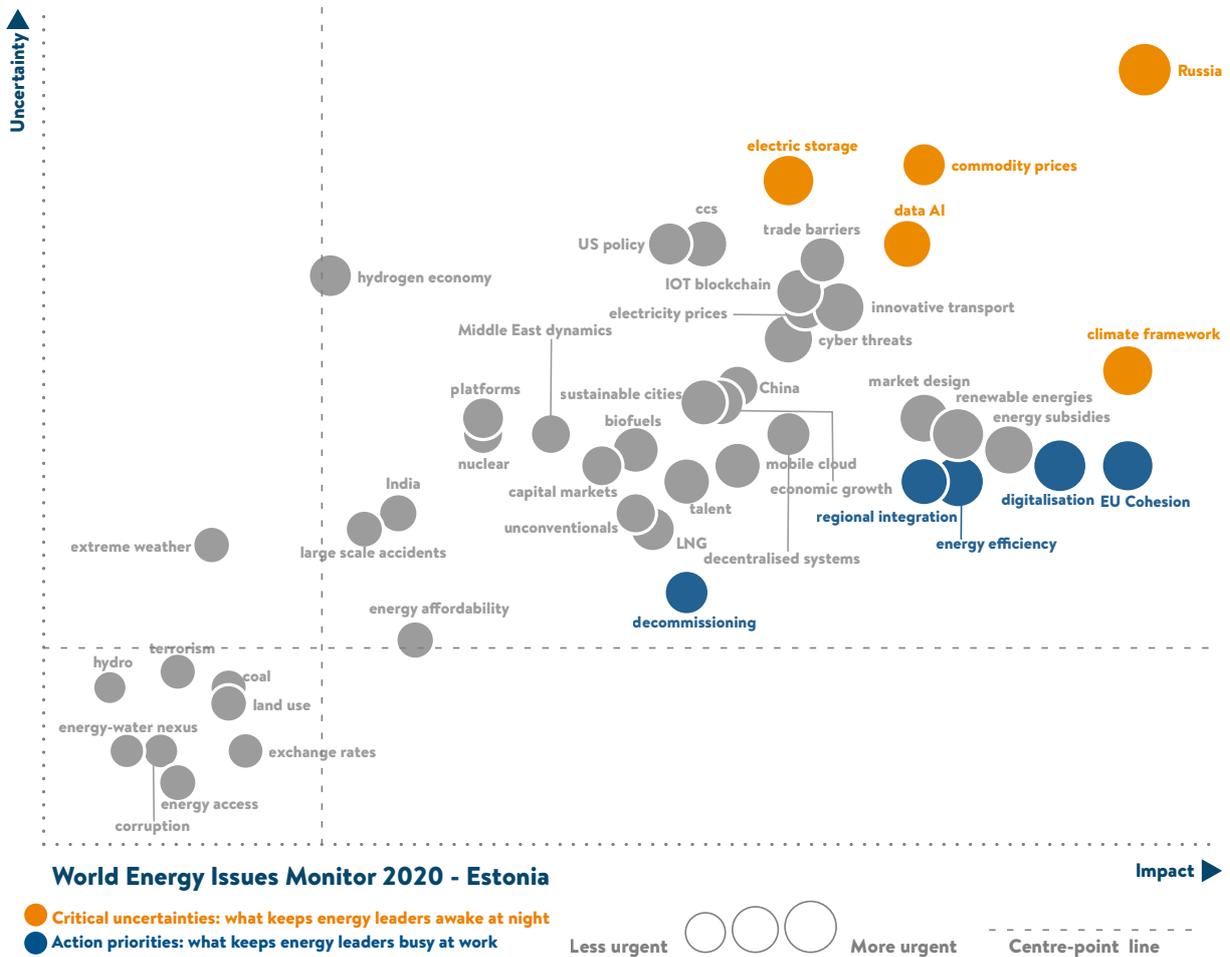
ACTION PRIORITIES

Energy Efficiency is another area that can provide support in mitigating the risk of dependence on imported fuel by curbing overall energy consumption. The government is also planning to introduce alternatives to fossil fuels in the transport sector and further electrification of railways and urban public transport. Fuel consumption for heating and hot water has fallen due to increased use of efficient gas boilers, according to the Czech Republic's Draft National Energy and Climate Plan.

Talent is also seen as an Action Priority. The Czech Draft Energy Plan has identified a significant gap between job supply and demand. A shortage of qualified labour may hinder production growth and impact the economy and exports. In the medium and long terms, the government wants to ensure that graduates acquire the skills needed for a digitalised and automated economy.

Sustainable Cities is the third Action Priority. Building sustainable cities and improving the quality of life in urban centres while preserving the environment and promoting growth are critical challenges is a priority for the country (OECD: Sustainable Urban Development in the Czech Republic). The government has taken steps to develop a more sustainable urban environment: in Prague, a clean energy programme provides subsidies to replace heating systems using solid fuel with environmentally-friendly renewable sources

ESTONIA



NATIONAL OVERVIEW & CONTEXT:

Comparing the results of 2019 and 2020, Estonia’s energy leaders attribute less impact to Critical Uncertainties such as IoT/Blockchain, Data AI and Electricity Prices. The main source of uncertainty continues to be Russia, followed by Climate Framework. Action Priorities continue to be led by EU Cohesion, Digitalisation and Energy Efficiency, while Renewables are seen with slightly higher uncertainty.

CRITICAL UNCERTAINTIES

Russia's identification as a major Critical Uncertainty reflects its domination as a power producer in the Baltic region. Planned decoupling from Russian power networks in 2025, when synchronisation with the continental European power grid is due to be completed, is an additional element of uncertainty. Priority is being given to discussions on the new EU legal framework to address the carbon leakage from electricity imports from Russia. Uncertainty emerges as trade relations are revised to adjust import dependence against the need to build new capacity.

Climate Framework is seen with greater impact, despite Estonia's initial hesitation to follow deadlines contained in the EU climate strategy. After additional internal consultations and research, the country has agreed to support the strategy. At the time of this survey, the agreement which aims at making the European Union the first climate-neutral region by 2050 was pending approval at the EU December Summit.

Commodity Prices are seen with greater impact. Production and sales of oil and shale oil face increasing quality requirements, highlighting the need for investments. The profitability of these investments will depend largely on future oil prices. In addition, implications of the increased CO₂ price of EU ETS has had a strong impact on the competitiveness of local oil-shale power plants, especially in comparison with Russian producers.

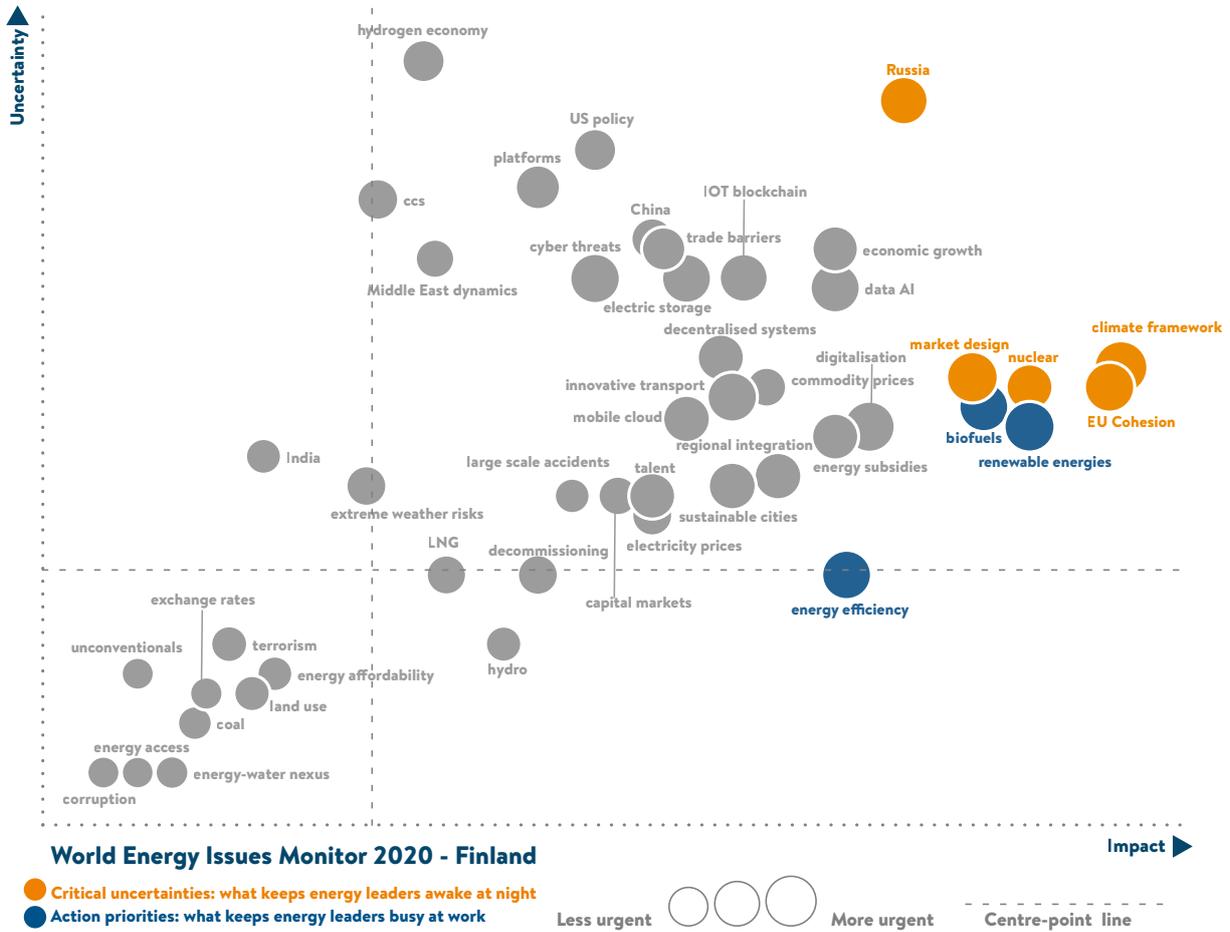
ACTION PRIORITIES

EU Cohesion remains at the forefront of Action Priorities, as Estonia strives to achieve carbon-neutrality within the Energy Union. The EU 2020 budget has allocated considerable support to climate change mitigation, electricity grid synchronisation with Central Europe and gas grid connection with Finland.

Digitalisation is seen with greater impact and lower uncertainty. Estonia is the first EU country to achieve remote-reading capabilities of electricity consumption, storing and making data accessible to every customer through a central data hub. Remote reading capabilities are also gaining momentum in the gas and heating sectors. Several innovative digital and AI solutions have been introduced to track infrastructure deterioration or to optimise grid operations and planning.

Energy Efficiency continues to be perceived as an Action Priority, with a special focus on efficiency in the building sector. The EU-funded Renovation Loan Programme provides guidance and financial assistance to improve the energy efficiency of private homes and buildings. Digitalisation and innovation are also thriving as key assets for enhanced energy efficiency in the country.

FINLAND



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Finland’s energy leaders perceive certain impactful issues with much higher uncertainty. These are clearly defined around the country’s energy mix and energy security concerns. While efforts are being made to increase domestic energy production, dependence on imports is a matter of concern.

CRITICAL UNCERTAINTIES

Russia remains the top Critical Uncertainty for Finland's energy leaders. The activation of an additional gas pipeline connection between Estonia and Finland (scheduled for early 2020), together with the existing connection to the Lithuanian LNG terminal are expected to lessen full dependence on direct Russian gas imports. Delays affecting the sixth nuclear power plant project, partly commissioned by Russian companies, may also be driving high uncertainty.

Nuclear grows in uncertainty and impact. In addition to the Olkiluoto nuclear power plant project, which is now 10 years behind schedule, nuclear has garnered more attention, especially with construction of the world's first underground nuclear waste disposal facility. The plant is being built on Olkiluoto island as a solution to the accumulation of nuclear waste in Finland. Discussions about the possibility of building small nuclear reactors are also on-going.

EU Cohesion is perceived with greater uncertainty as Finland approaches the end of its EU Council presidency and as it remains tied to on-going lobbying to keep forestry a national competence. The majority of Finland's renewable energy is based on biomass. The country's resistance to the EU position on the use of biomass highlights the importance of forestry for the state economy.

ACTION PRIORITIES

Climate Framework becomes a Critical Uncertainty. Priority issues to Finland's Presidency of the EU Council include consolidation of the Union's long-term climate strategy and reaching a common understanding on an emissions reduction roadmap. The Finnish government has set very ambitious climate targets (e.g. carbon neutrality by 2035 and a coal ban by 2029). However, actual measures to reach those targets are still unclear.

Renewable Energies remain an Action Priority but with much higher uncertainty. According to Statistics Finland, the amount of electricity produced from fossil fuels and peat grew by 14% in 2018, while the share of renewable energy in the mix fell. This is attributed to a weak Nordic hydro output year, requiring substitution with fossil fuels and peat for power production. Still, the share of wind power has been steadily higher than coal power since the winter of 2018-2019.

Biofuels are perceived as an Action Priority, similarly to last year. Finnish companies are at the forefront of biofuel technologies. The sector is stimulated by government initiatives such as a legislation passed in 2019 aimed at increasing the share of biofuels for road traffic to 30% by 2029.

CRITICAL UNCERTAINTIES

Climate Framework continues to lead the Critical Uncertainties section. In November 2019, a new law focused on energy and climate change raised the target of reducing fossil fuel consumption from 30% to 40% of its 2012 levels by 2030. The law also supports hydrogen and solar panel deployments to achieve a 33% share of renewables in the energy mix by 2033.

Renewable Energies are an important Critical Uncertainty. In early 2019, France was among eight countries to be given formal notice by the EU for hydropower policies that run contrary to EU rules. Considering the importance of hydro for overall storage capacity and electricity supply in the country (around 10%), as well as their association with energy security in the public debate, renewable energies are increasingly perceived as uncertain.

Middle East Dynamics move higher up the gradient of uncertainty, reflecting France's dependence on imports to meet its oil and gas requirements. This is true even though liquid fuels make up a relatively small percentage of the country's primary energy consumption. Saudi Arabia and Russia are the two main suppliers of crude oil. Yet, French companies have oil and gas assets in several Middle Eastern countries, including Iraq.

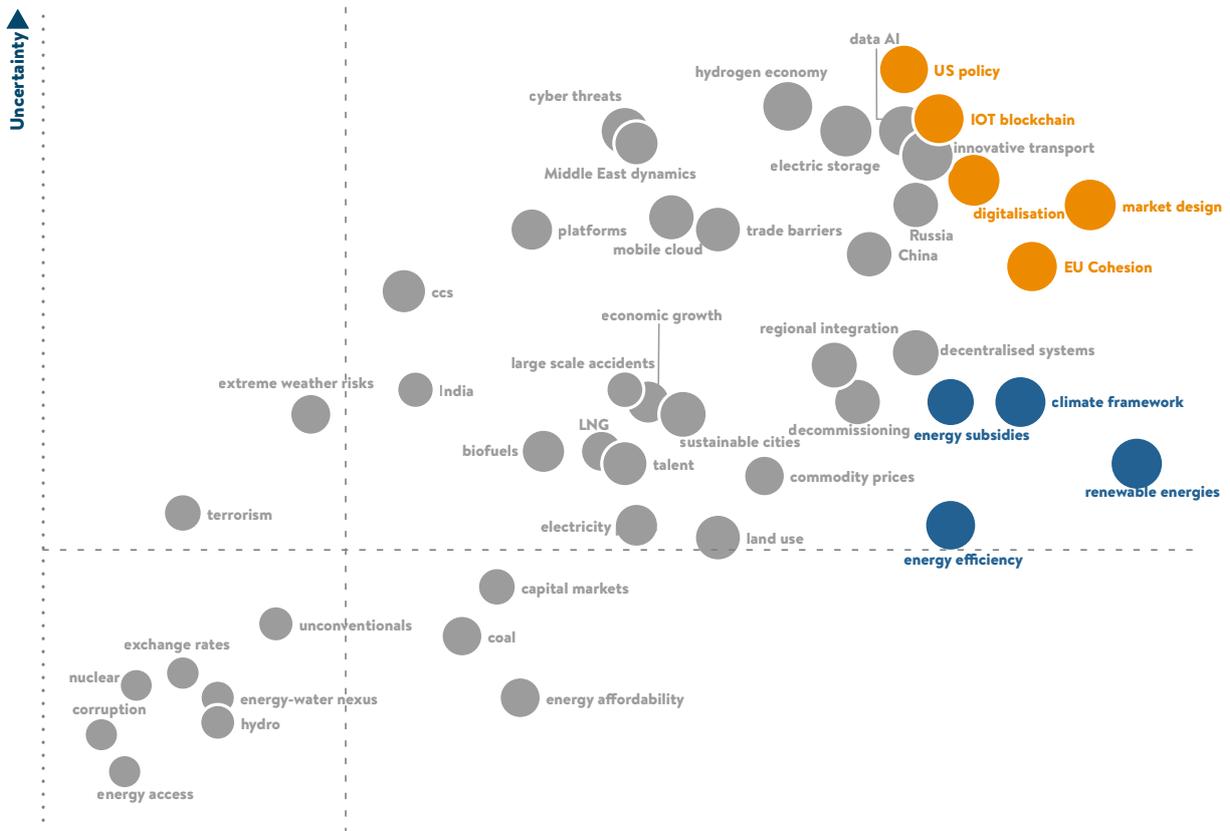
ACTION PRIORITIES

Energy Affordability is also seen as an issue of greater impact and enters the Action Priorities section. Low-income households benefit from state assistance to pay their energy bills. Still, public confidence in the energy sector has fallen from 75% in 2015 to 60% in 2019, as reported in a recent French Energy Ombudsman survey. The government's plan to raise fuel prices as part of its environmental policy has led to massive protests throughout the country, prompting a withdrawal of the proposed price increase.

Energy Efficiency persists as an Action Priority, although its impact is seen as lower than in previous surveys. The role of cities is also identified as an Action Priority, showing the integration of local authorities in the energy transition.

Certain technologies are also emerging as uncertainties, albeit with limited impact. Carbon Capture and Storage (CCS) and **Hydrogen Economy** are seen as highly uncertain, but still with limited impact. The long-term strategy includes wider use of CCS by 2050 as part of the effort to curb carbon emissions. It also sees a higher penetration of hydrogen in transport for which financial incentives will be offered. France intends to decarbonise industrial production of hydrogen to limit emissions by 10% by 2023

GERMANY



World Energy Issues Monitor 2020 - Germany

Impact ►

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work



NATIONAL OVERVIEW & CONTEXT

This year's snapshot of Germany's energy landscape shows adjustments in perceptions around the impact and urgency of issues, as they shift between the Uncertainty and the Action areas. In all cases, the integration of intermittent renewables leads priorities and concerns for both public and private sectors.

CRITICAL UNCERTAINTIES

EU Cohesion ceases to be an Action Priority for Germany and becomes a Critical Uncertainty. Brexit and rising nationalism are perceived as risks for enhanced European cooperation. Nonetheless, the new European Commission has said that it will focus on negotiating a New Green Deal aiming to establish Europe as the first zero emission continent. Its purpose is to generate prosperity by exporting innovative technology, expert knowledge and best practice examples.

Digitalisation also ceases to be an Action Priority to become a Critical Uncertainty. Information and communication technologies are critically needed to enable Germany's Energiewende which strongly relies on the integration of intermittent renewables. As the share of these resources continue on an upward trend, business and policy strategies are still to be defined for incorporating digital technologies in the most cost-efficient way and enabling the role of the energy 'prosumer.'

US Policy is seen as a higher impact issue, reflecting not only opposing levels of urgency attributed by both countries to address the climate challenge, but also tensions around the Gazprom Nord Stream 2 gas pipeline project connecting Russia to Germany. Other issues which have an impact on the energy sector are US Sanctions on European goods, its geopolitical role in the Middle East, trade protectionism and persistently failing trade negotiations with China.

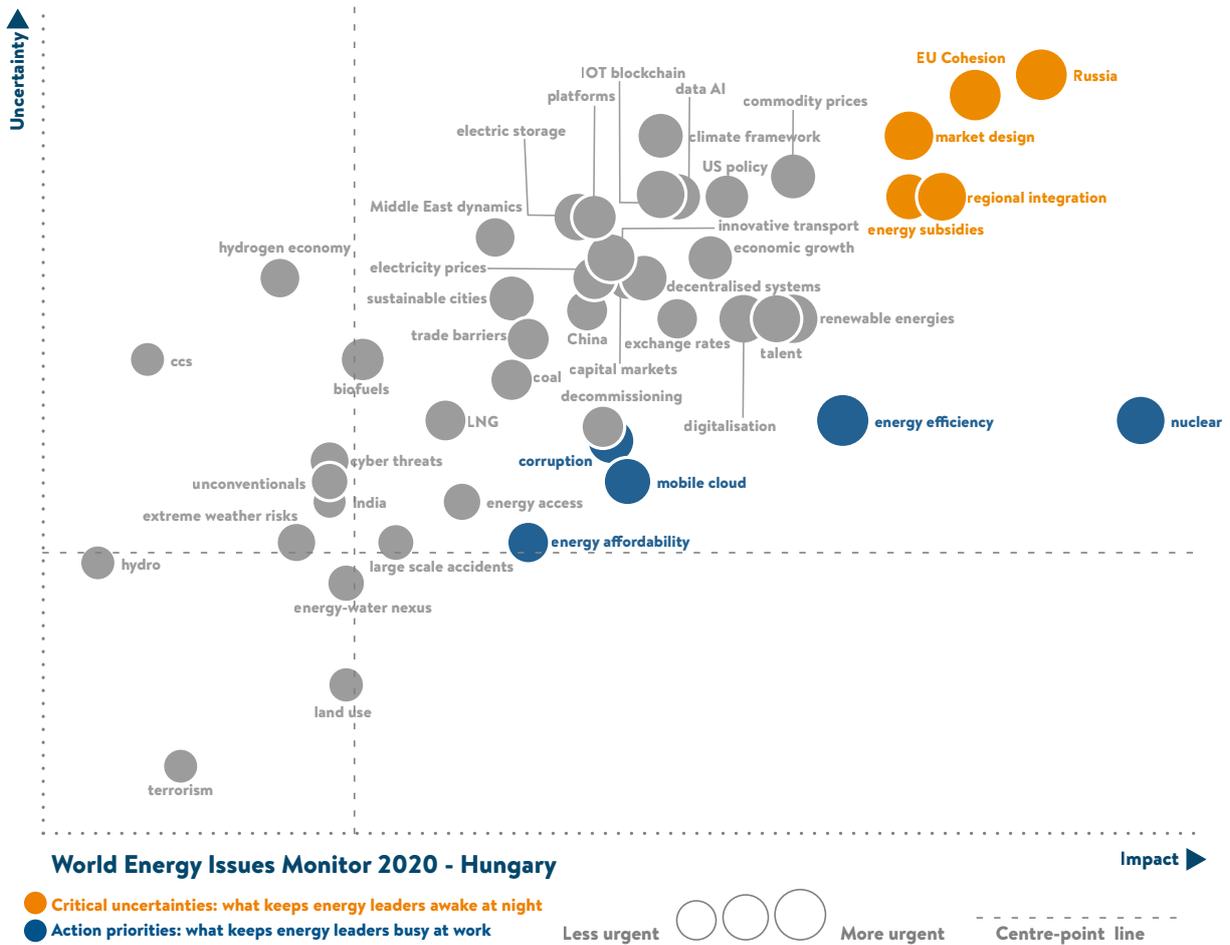
ACTION PRIORITIES

Energy Efficiency is perceived with a smaller impact but still as an Action Priority. Germany has an energy efficiency target of reducing energy consumption by 20% by 2020 and by 50% by 2050 compared to 2008 levels. Although the near-term objectives are unlikely to be met, reforms are being discussed to accelerate progress, as tax support for efficiency in buildings.

Climate Framework becomes an Action Priority thanks to reduced uncertainty around this issue. The Germany Coal Commission proposed a gradual phase out of over 42GW of coal-fired power plants until 2038. The new climate protection package, the most prominent political action plan in autumn 2019, establishes over 60 measures on how different sectors including transport, agriculture, and industry could lower their respective CO₂ emissions. Measures include a price on CO₂ for fossil fuels in a national emission trading system.

Energy Subsidies are perceived with low uncertainty and greater impact, becoming an Action Priority. Germany is under pressure to align its economic objectives with its climate targets, and this has led to the stimulation of an increasingly competitive energy market. Since 2016, feed-in-tariffs for renewable generation have been gradually replaced by competitive tenders. However, investments in new energy generation capacities are on hold under the current market design. In particular, the expansion of onshore wind energy has nearly stopped.

HUNGARY



NATIONAL OVERVIEW & CONTEXT

Hungary’s energy leaders’ Critical Uncertainties concern its close energy relationship with Russia, EU Cohesion as well as the need for a new energy Market Design to manage aging nuclear power stations and accommodate intermittent supplies. Action Priorities relate to Nuclear power, its role in the energy sector, as well as the need to adopt Energy Efficiency as a tool to manage energy security and affordability.

CRITICAL UNCERTAINTIES

Russia is perceived with high uncertainty and high impact. Given Hungary's dependence on imports for 62% of its energy consumption, diversifying sources of supply is a priority target. Russia currently provides for 82% of Hungary natural gas needs and is the country's biggest oil supplier. In 2018, Hungary awarded Russia's Rosatom a contract to build a 2.4GW nuclear power plant to replace the old 2GW nuclear plant which will be demolished in 2032-36. This project aims at generating electricity without CO₂ emissions and securing power supply.

EU Cohesion is also perceived as a Critical Uncertainty. Hungary seeks more active participation in the EU single internal market and is investing in new interconnectors with its central European neighbours as part of its energy security efforts. Gas interconnectors have been built with Slovakia, Croatia and Romania to increase the security of supply and to diversify import resources. This is a response to uncertainties regarding the planned closure of the gas pipeline crossing Ukraine.

Market Design is another Critical Uncertainty as Hungary implements a national energy strategy aimed at promoting investment in decentralised energy systems. The power system is likely to remain centralised for a long time. Still, taking into account the increasing number of micro scale power generation (solar rooftops), decentralised energy systems also have good growth prospects in the country.

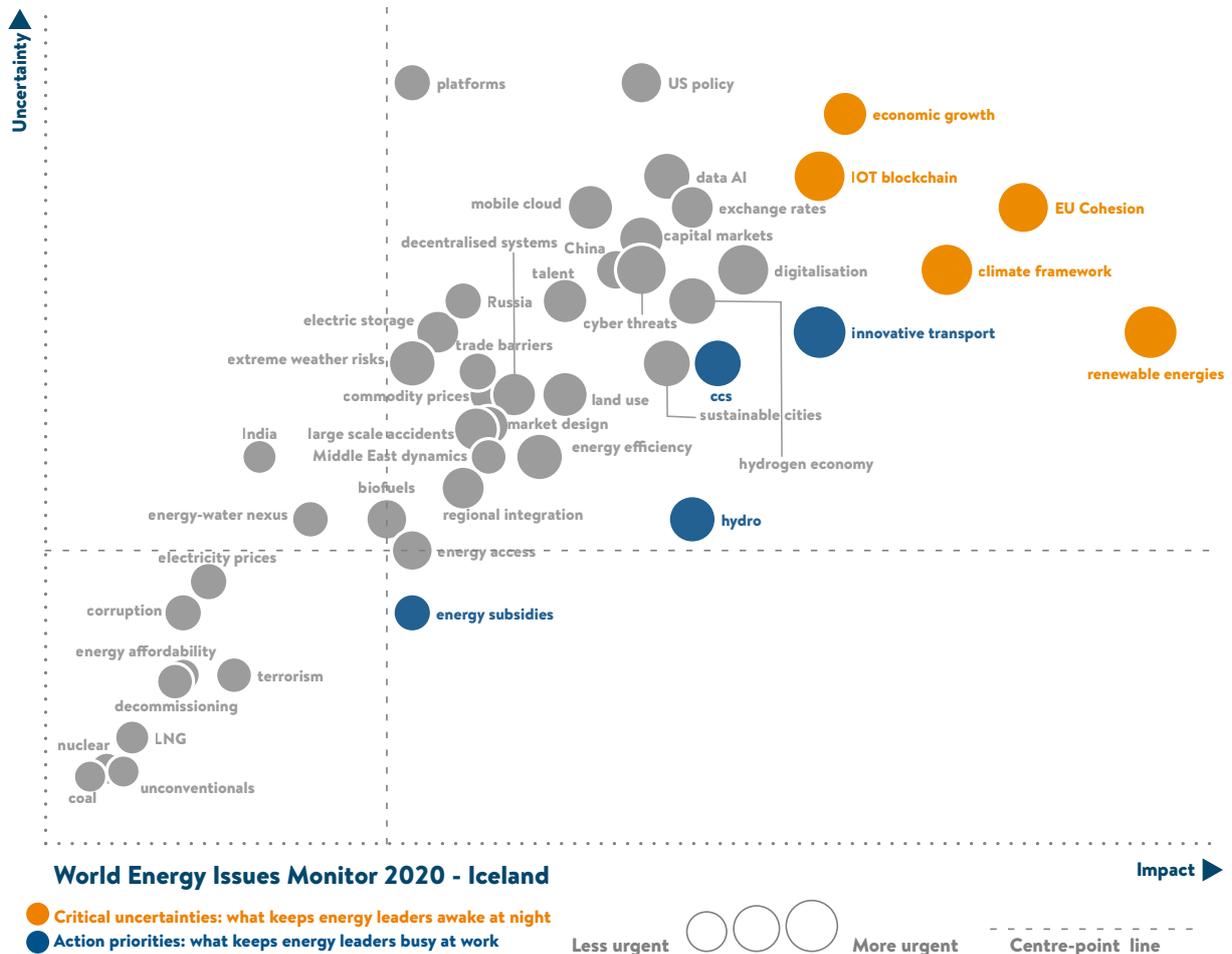
ACTION PRIORITIES

Nuclear appears as the main Action Priority. The country has four nuclear reactors that provide nearly half of its power capacity. This comes at affordable prices since the infrastructure costs have already been amortised. These plants will continue to be operative for the next ten years. Additionally, the Hungarian Nuclear Authority has invested in updating reactors which are reaching the end of their life cycles.

Energy Efficiency is an Action Priority enshrined in the National Energy Strategy 2030. It states that the Hungarian energy sector can promote long-term competitiveness through active participation in the EU single internal energy market. This policy also endorses the utilisation of renewable energy, the improvement of energy efficiency and management of domestic supplies and resources. Finally, it considers geothermal and biomass potential as a valuable and strategic national resource.

Energy Affordability is an Action Priority tied to government subsidies and reliance on imports. The price of electricity and natural gas is regulated by the Hungarian Energy Office for Households and Small Business Owners. For all other consumers, the prices are regulated by the market. Rising energy prices have been cited by the IMF as exerting inflationary pressure on the Hungarian economy, as it imports 62% of its energy needs.

ICELAND



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Iceland’s energy leaders see higher uncertainty around issues that were previously perceived as Action Priorities. These include Economic Growth, Climate Framework and Renewable Energies. Issues in the Actions section appear with lower impact but continue to be focused on energy technologies.

CRITICAL UNCERTAINTIES

Economic Growth is perceived as the most pressing of uncertainties due to slower growth, which declined from 4.8% in 2018 to 0.2% in 2019. Strong appreciation of the krona since 2015 and high real exchange rate have affected the competitiveness of the domestic industry and services. The collapse of the second biggest airline company, WOW, in early 2019 also impacted Iceland's tourism industry. It is now predicted that the turnaround in 2020 will be slower than previously forecast, with an estimated GDP growth of 1.7%.

Climate Framework moves from the actions to the Critical Uncertainties section, reflecting the country's high vulnerability to global warming (which has already led to the melting of several glaciers in its territory). The government is currently executing Iceland's first fully funded action plan aiming at carbon neutrality by 2040. Measures range from an increase in reforestation to a ban on new registration of fossil fuel cars by 2030. Iceland has also agreed to cooperate with the EU and Norway to reduce greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels.

Renewable Energies are also seen as more uncertain. Iceland generates 100% of its electricity and heat from renewable sources, around 73% of which comes from hydro. Uncertainty may reflect the ongoing national debate regarding wind, hydro and geothermal projects in the country, often more focused on nature conservation issues and less on national economic and social issues, such as the drafting of a renewables master plan.

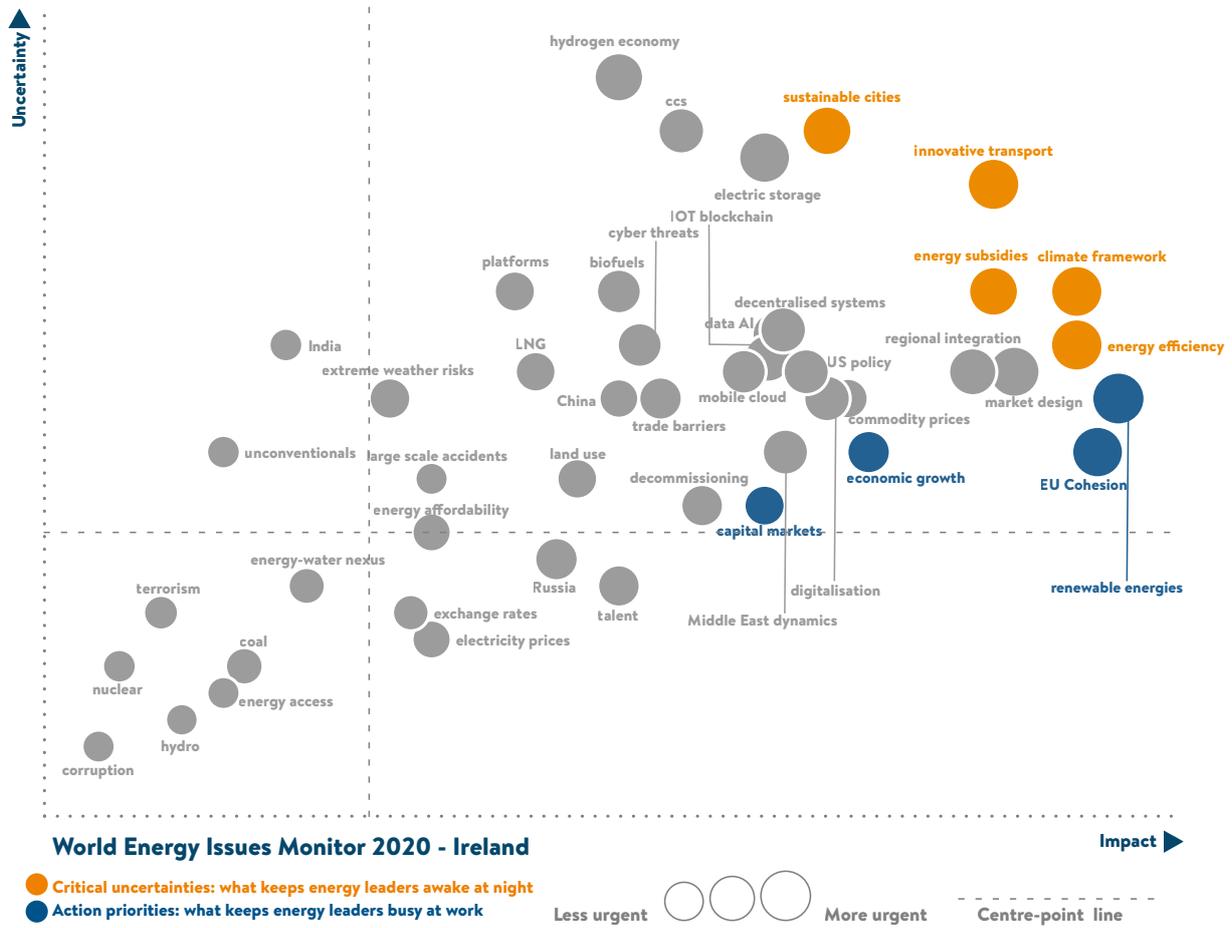
ACTION PRIORITIES

Innovative Transport remains an Action Priority and relates to increased impact around the Hydrogen Economy issue. In 2019, Iceland invested in infrastructure for alternative fuels at traditional petrol stations, as well as a network of EV charging stations. Stations in the Reykjavik region will be supplying hydrogen and methane as a fuel. Currently, a number of buses are running on hydrogen in a pilot study. Fishing fleets are also piloting hydrogen as an alternative fuel.

CCS enters the Action Priorities section. The CarbFix2 project initiated in 2006 is demonstrating the feasibility of CCS to reduce atmospheric CO₂ levels using the Hellisheidi power plant in Iceland as a testing ground. The pilot has already verified that over 95% of CO₂ captured and injected can be turned into rock in the subsurface in less than two years. In 2018, the technology was shown effective in reducing emissions from the power plant by over 40%. The Carbon Recycling International project to produce methanol from carbon dioxide and hydrogen is another example of a successful decarbonisation effort.

Hydro also enters the Action Priorities section with a greater impact, as a preliminary construction permit for a new hydropower plant in the Westfjords region has been approved. However, environmental groups have filed a complaint with the Environmental and Natural Resources Complaints Board, contesting the project on the grounds that it does not conform with environmental protection laws. Currently there are several small hydro projects (up to 10MW) in planning and construction phases. The Master Plan for big hydro, geothermal and wind is also in place, and projects are expected to deliver their impact assessment at the beginning of 2020

IRELAND



NATIONAL OVERVIEW & CONTEXT:

Ireland’s energy leaders shape an Uncertainties landscape led by decarbonisation-related issues. Oil is the dominant fuel in the country’s energy mix, used in the heating and transport sectors [SEAI 2018]. Decarbonisation of the energy mix is an Action Priority as is the decoupling of economic growth and greenhouse gas emissions from what is still a fossil-fuel based energy mix. EU cohesion in the post-Brexit era is closely related to energy security and economic growth prospects.

CRITICAL UNCERTAINTIES

Innovative Transport is perceived as an issue of high uncertainty and high impact. Transport accounted for 42% of final energy consumption in 2018, according to the Sustainable Energy Authority of Ireland. Ireland is aiming for a 10% share of renewables in final energy consumption by 2020, as established by the EU Renewable Energy Directive. Concerns revolve around the fact that low carbon fuels such as CNG and electric vehicles have not had the support or penetration expected, forcing a reliance on biofuels to reach targets.

Climate Framework appears as a Critical Uncertainty, reflecting concerns over Ireland's ability to meet the EU emissions target by 2020, as well as increased public pressure to act on the Climate Emergency. In 2017, the Irish government committed to a significant reduction in CO₂ emissions (a minimum of 80% reduction from the 1990 value) across all sectors by 2050. In 2019, it launched a Climate Action Plan to 2030, which would be consistent with the net zero target for 2050.

Energy Subsidies are closely related to the Climate Framework issue. The revised Renewable Energy Directive (RED II), when implemented, will provide support to renewable energy projects. This policy can enable Ireland to broaden the renewable electricity technology mix, enhance energy security and sustainability while ensuring cost effectiveness. Other concerns are the Infrastructural interconnection with the UK and Europe, reliance on imported fossil fuels as well as the recent implementation of annual increases in the carbon tax to 2030.

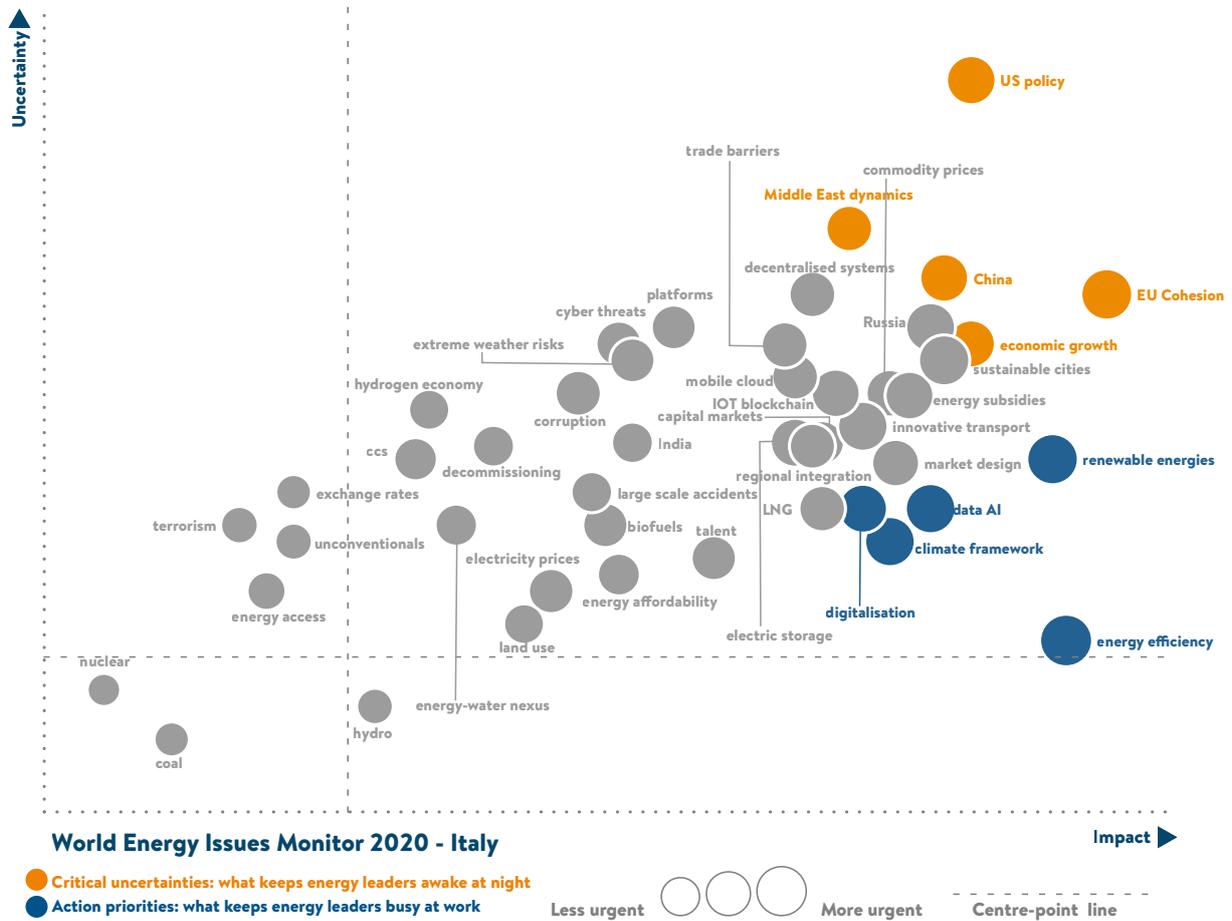
ACTION PRIORITIES

EU Cohesion is perceived as a high impact and low uncertainty issue. The issue of the border with Northern Ireland post-Brexit and the implications for trade and energy with its closest trading partner are a major concern since Ireland imports a large percentage of its oil products and natural gas through the UK.

Renewable Energies appear as another Action Priority. Ireland has made much progress in expanding renewables deployment. Overall, 30.1% of electricity was generated from renewable energy in 2017 which avoided €278m worth of fossil fuel imports [SEAI 2018]. The government's Climate Action Plan (launched in 2019) sets out the goal of achieving a 70% share of renewable energy in 2030, though this will have to be accompanied by storage solutions. Cutting greenhouse gas emissions from what is still an energy system heavily dependent on fossil fuels is another challenge. Offshore wind projects are only starting to be developed and CCS and Hydrogen still need development.

Economic Growth is a lower Action Priority but is still relevant in terms of its impact on energy use and greenhouse emissions. Ireland has had difficulty separating economic growth from greenhouse emissions. Carbon-related emissions declined during the 2008 economic downturn but rose again as the economy improved. Ireland has abundant natural wind resources and has the potential to lead offshore renewable energy deployment and become a net exporter of electricity

ITALY



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Energy Geopolitics lead the uncertainties section for Italy’s energy leaders, with main concerns revolving around EU Cohesion, US Policy and China, together with Sustainable Cities evolution. Meanwhile, digitalisation and technology issues move completely into the Action Priorities section, led by Energy Efficiency, Renewable Energies and Market Design.

CRITICAL UNCERTAINTIES

US Policy continues to represent a very significant Critical Uncertainty. Developments on tariffs and international trade dynamics have added a higher degree of uncertainty. The most relevant energy issue in the relationship with the US involves natural gas. The US is negotiating LNG supply agreements with a number of European countries, including Italy, which can help to lessen dependence on a single supplier. Domestic US policy on export licences is being monitored closely to assess the expected growth of export volumes.

EU Cohesion is perceived as an issue of higher uncertainty. The main focus has been on the Clean Energy for all Europeans package which was completed in 2019. Setting new rules for renewable energy, energy efficiency, emission reductions, energy infrastructures and the production of National Energy and Climate Plans, the package poses challenges especially regarding the coordination of energy policies among EU member states. Regulation and permitting procedures require improvements for development of energy assets needed to reach the 2030 and 2050 EU decarbonisation goals.

Sustainable Cities are also seen with increased uncertainty. Cities play a growing role in the country's economic, infrastructure and social development. Balancing energy equity, sustainable mobility as well as the reduction of local pollutants will be required in designing sustainable cities. Italian energy institutions are engaged in this process in urban areas. However, the biggest challenge remains identifying new flexible resilience tools to effectively convert existing urban infrastructure, buildings and transport networks into smarter and more sustainable systems.

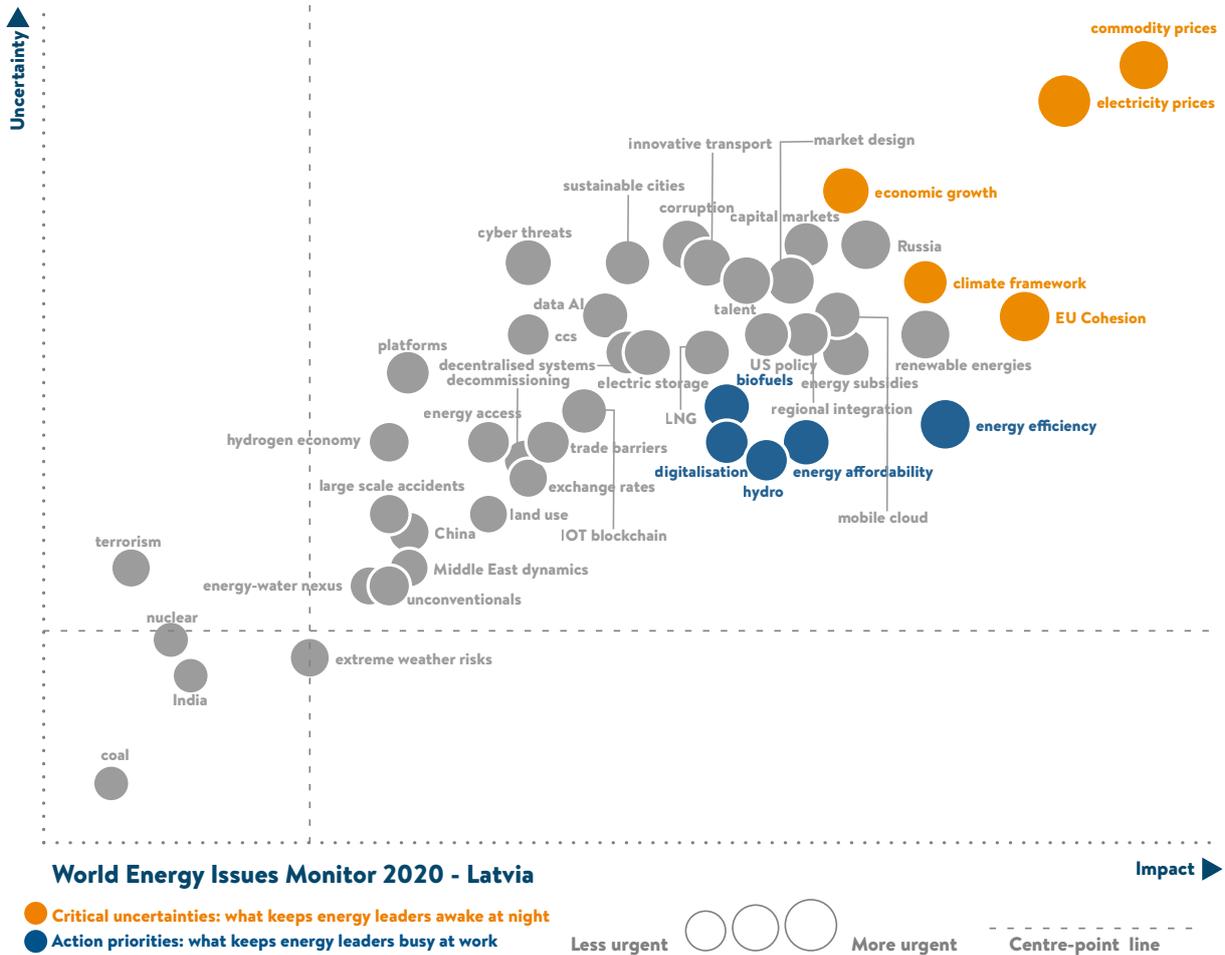
ACTION PRIORITIES

Energy Efficiency remains the leading Action Priority to achieve the three interconnected objectives of competitiveness, security and energy efficiency. Policies and practices in efficiency can meet these objectives without placing additional financial burdens on households and businesses. The 2019 budget law provides tax deductions (IRPEF and IRES) for investments in energy efficiency measures, particularly for the redevelopment of buildings in line with European guidelines.

Renewable Energies emerge with higher impact and become an Action Priority. The price reduction of photovoltaic panels and wind turbines has boosted investments in these technologies over the year. In the January-September 2019 period, renewable sources met 36.1% of the country's electricity demand. Together, solar and wind power covered 14.5% of national electricity demand.

Market Design is also identified as an Action Priority. The need for timely adaptation of the energy market is necessary to support technological evolution and enable renewables growth together with flexibility and security of supply. The newly launched Capacity Market and the advancement of PPAs for renewable plants are among the most significant developments. System operators will be heavily involved in this process, as their investments depend on signals that the market will be able to offer

LATVIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Latvia’s energy leaders reframe their uncertainties landscape with stronger attention to macroeconomic issues such as Commodity and Electricity Prices and are less concerned with geopolitical issues such as Russia and EU Cohesion. Actions continue to focus on energy technologies, but they are now perceived with reduced impact.

CRITICAL UNCERTAINTIES

Commodity and Electricity Prices lead the uncertainties section. The Increase in CO₂ prices have sharply raised electricity prices in Latvia due to its dependence on power imports. Fluctuations in gas prices have also influenced heating prices. Concerns about changes in neighbouring markets keep this issue high on the agenda.

Climate Framework is seen with greater impact and becomes a Critical Uncertainty. Latvia's objective to achieve climate neutrality by 2050 has set a target that challenges the whole sector. The country has historically had low CO₂ emissions per capita, and further reductions require substantial efforts.

EU Cohesion continues to be perceived as a Critical Uncertainty but to a lesser extent. The development of Latvian energy policy is strongly influenced by EU directives and common objectives and the country has set a clear path to achieve these goals via enabling policies, an investment framework and incentives.

ACTION PRIORITIES

Energy Efficiency leads the Actions section with greater impact. Higher energy prices have improved the financial attractiveness of efficiency investments. Raising energy efficiency in the industrial sector is closely linked to the implementation of the EU sustainable development strategy and to creating a balance between economic growth and cleaner production.

Digitalisation is seen with reduced uncertainty and becomes an Action Priority. Although digitalisation is not specifically regulated at the state level, technology developments require a policy and regulatory framework that can enable the development of new solutions to optimise processes and reduce expenditure.

Hydro persists as an Action Priority. As Latvia's main source of electricity generation, hydro is very well placed in the regional power market and continues to benefit the country. The ability of the Daugava HPPs to generate electricity depends on water inflow from the Daugava River. During the flooding period, it is possible to cover the demand for electricity and trade the excess on the Nord Pool exchange. Outside the flooding season, it is possible to accumulate water and generate electricity when demand and prices on the exchange are higher

CRITICAL UNCERTAINTIES

Russia retains its position as the leading Critical Uncertainty. Perspectives are influenced by Denmark's approval for construction of the Nord Stream 2 gas pipeline, an alternative route for the delivery of Russian gas to Europe. Lithuania has expressed opposition to the project because of concerns over the competitiveness of the gas market and security of supply in the region. There is additional concern over the impact of disconnecting from the IPS/UPS and synchronisation with Continental Europe. Also pending is the definition of trading terms and conditions with third countries after the inauguration of the Astravets nuclear power plant.

EU Cohesion continues to be seen with high impact and uncertainty. Lithuania's strategic projects in the energy sector are highly dependent on EU support. These projects are i) synchronisation of the Baltic States electricity network with Continental Europe and ii) gas interconnection between Lithuania and Poland (GIPL).

Data AI also persists as a Critical Uncertainty. In April 2019, the Ministry of Economy and Innovation published the 'Lithuanian Artificial Intelligence Strategy: A Vision of the Future' report providing policy recommendations to modernize and expand the current AI ecosystem in Lithuania and ensure that the nation is ready for a future with AI. The report identified energy as a key economic sector that would benefit most from the adoption of artificial intelligence systems.

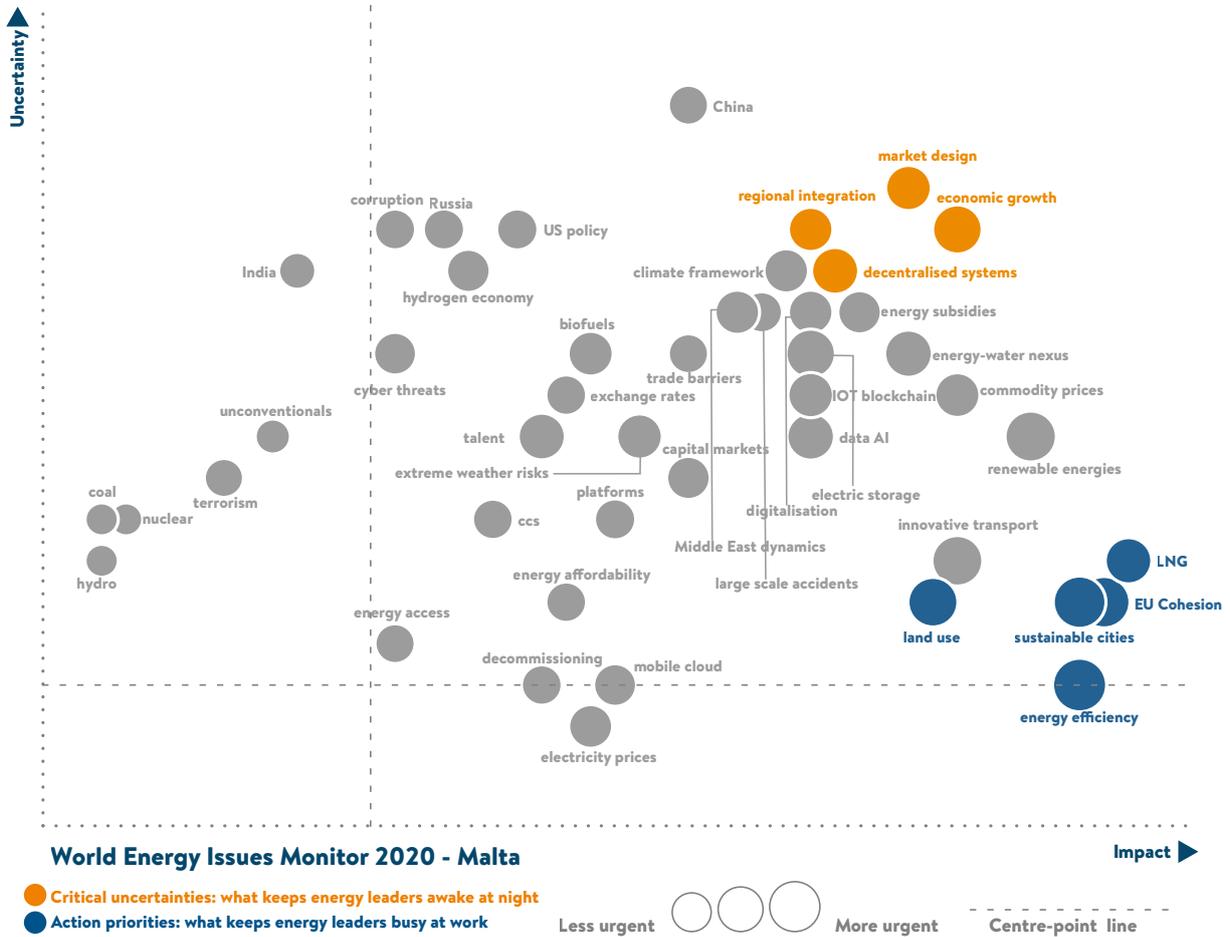
ACTION PRIORITIES

Renewable Energies are expected to constitute a major part of domestic energy production and total final energy consumption, reducing the dependence on fossil fuel imports and increasing local electricity generating capacities. Lithuania is one of the 11 EU members to have a renewables share greater than 20% of total production. The country is also among the few EU members to have already met its 2020 renewable targets. In addition to climate adaptation, a plan for energy independence by 2050 positions renewables as a crucial source of energy diversification and security.

LNG remains an Action Priority. Legislative amendments adopted in December 2018 paved the way for Lithuania to buy out the floating Klaipeda LNG terminal, "Independence", or similar vessels by the end of 2024. It will also enable continued LNG imports until at least 2044. The first phase of the plan will be implemented in 2020. The LNG terminal operator in 2019 refinanced the lease of the FSRU currently in operation, spreading out the costs until 2044, thereby reducing the LNG terminal charge for consumers from 2020 onwards.

Large Scale Accidents become an Action Priority. This survey took place as Belarus prepared to launch its new nuclear power plant. As its neighbour Lithuania has serious reservation about the project's safety and is waiting for the completion of a pending cross-border environmental impact assessment. The principal concern is that in an event of a large-scale accident, the Lithuanian capital, as well as a third of the country's population, could face tragic consequences

MALTA



NATIONAL OVERVIEW & CONTEXT:

Malta’s energy leaders profile an energy landscape where Energy Policy and Business Environment issues are defined as Critical Uncertainties. Action Priority issues revolve mainly around Energy Vision and Technology along with a focus on EU Cohesion.

CRITICAL UNCERTAINTIES

Market Design is perceived with high uncertainty and high impact. Malta's market design reflects its size, with limited liquidity and typically high relative costs. The perception of "uncertainty" is most likely associated with the fact that Malta's electricity market offers limited scope for competition, unlike other EU countries. This was acknowledged in the recent revamp of the EU electricity market design.

Economic Growth is also identified as a Critical Uncertainty. The 'European Commission Malta Report 2019' states that while the country's economy continues to grow, balancing this growth with long term sustainable development remains a challenge. Risks include infrastructure bottlenecks, lack of natural resources, a skilled workforce, among others.

Decentralised Systems is a third Critical Uncertainty for Malta's energy leaders. In 2018, grant schemes for residential solar water heaters were increased from €400 to €700 per installation, and those for photovoltaic panels were extended as well. PV installations in non-residential premises continued to be supported through either a feed-in tariff or premium guarantees for 20 years. Uncertainty is most likely attributable to the physical and infrastructural limitations for further development of decentralised systems. These include physical space, shading and grid integration capabilities of further intermittent renewable energy sources.

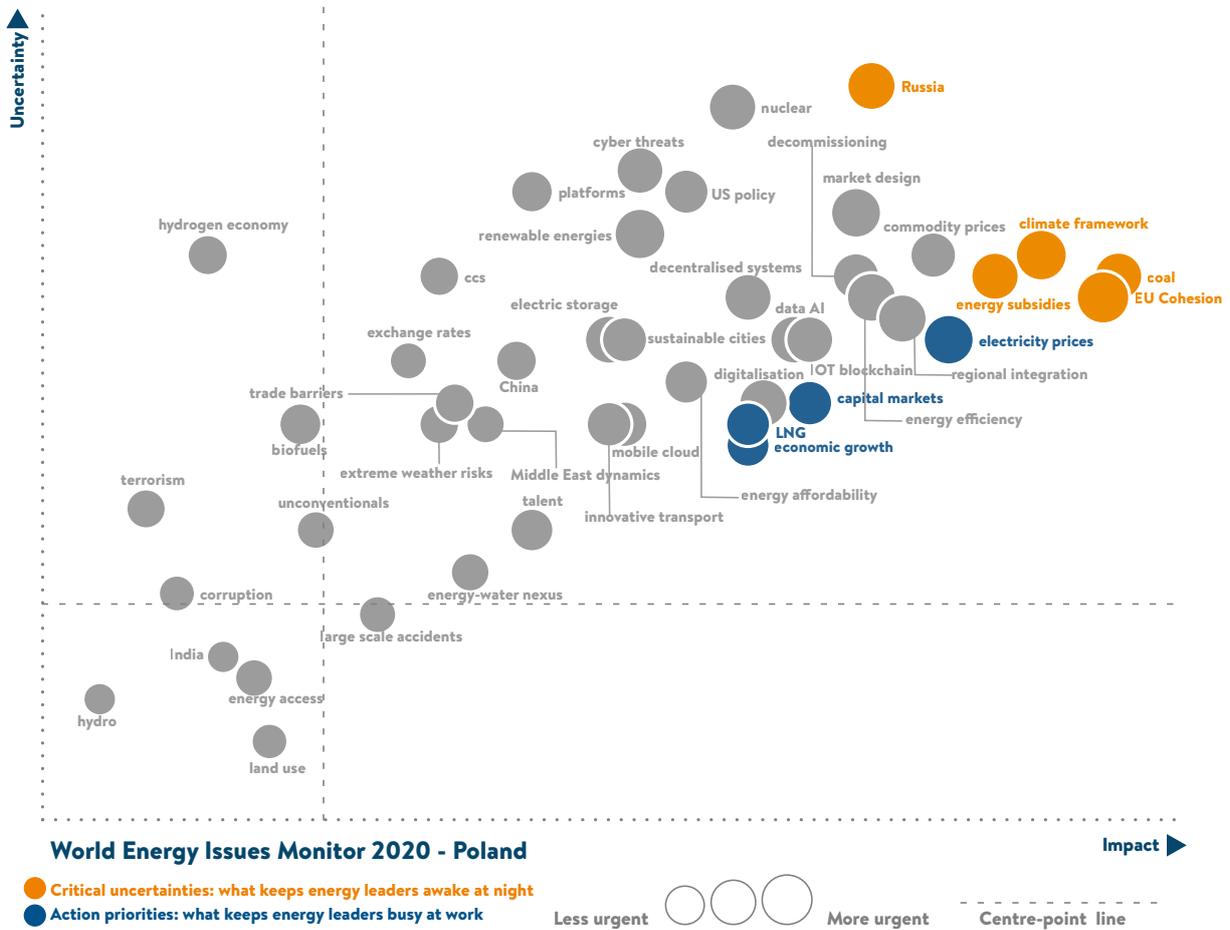
ACTION PRIORITIES

Energy Efficiency is perceived with the lowest uncertainty among Action Priorities. In 2018, Malta's Roof Insulation and Double-Glazing Subsidy Scheme was extended from 15% to 50% of the total cost. In addition, industry can benefit from tax credits of up to 50%, depending on the amount invested in energy efficiency. This programme is part of an effort to encourage energy efficiency upgrades for households and industry/services sectors, notwithstanding the fact that Maltese households are amongst the lowest energy consumers in the EU.

EU Cohesion is perceived with low uncertainty and high impact. Malta is praised in its Energy Union country profile as an example of the share of renewable energy in transport fuel consumption. It is also channelling EU Cohesion funds towards the upgrade of transport infrastructure, energy efficiency and renewable energy in public, commercial and residential buildings. This performance has, for years, enabled continued EU funding to support job creation, business competitiveness, economic growth and sustainable development in the country.

LNG/Natural Gas is also among Malta's Action Priorities. After a significant investment in an LNG facility to supply the country's power plants, Malta is also actively pursuing a €400 million pipeline interconnection project linking the country to the European gas grid to reinforce its security of supply. Malta is seeking EU funding to support this project

POLAND



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Poland’s energy leaders continue to define Critical

Uncertainties around Macroeconomic and Geopolitical issues. Overall, issues are perceived with a higher level of uncertainty. The Action Priorities section focuses on electricity prices and the cost of adapting to a new Market Design, LNG supplies and Economic Growth.

CRITICAL UNCERTAINTIES

Russia continues to be seen with high uncertainty as Poland seeks to ease reliance on Russia as its main source of oil and gas imports. Poland wants to further develop the exploitation of its natural resources and find alternative suppliers of oil and gas. State gas company PGNiG has confirmed its intention not to extend a gas contract with Russia's Gazprom from 2022, when the Baltic Pipe Project to transport North Sea gas to Poland is due to be completed. PGNiG has signed agreements to import US LNG as part of this strategy.

Coal moves into the Critical Uncertainties zone from its previous position as an Action Priority. Poland relies on coal for up to 80% of its electricity generation. However, its long-term plans see less reliance on coal and a higher share of renewable energy. The country has set an objective for renewables – mostly wind and solar PV – to make up 20% of the energy mix by 2030.

Climate Framework also emerges as a Critical Uncertainty in this year's survey. This ties in to the prevalence of coal in the energy mix and the challenges for the country to align with the EU net zero emissions target. The country is currently focusing on a diversification strategy by securing additional natural gas and introducing energy efficiency measures. It is also considering nuclear power options. It is targeting a CO₂ emissions reduction of 30% by 2030 from 1990 levels.

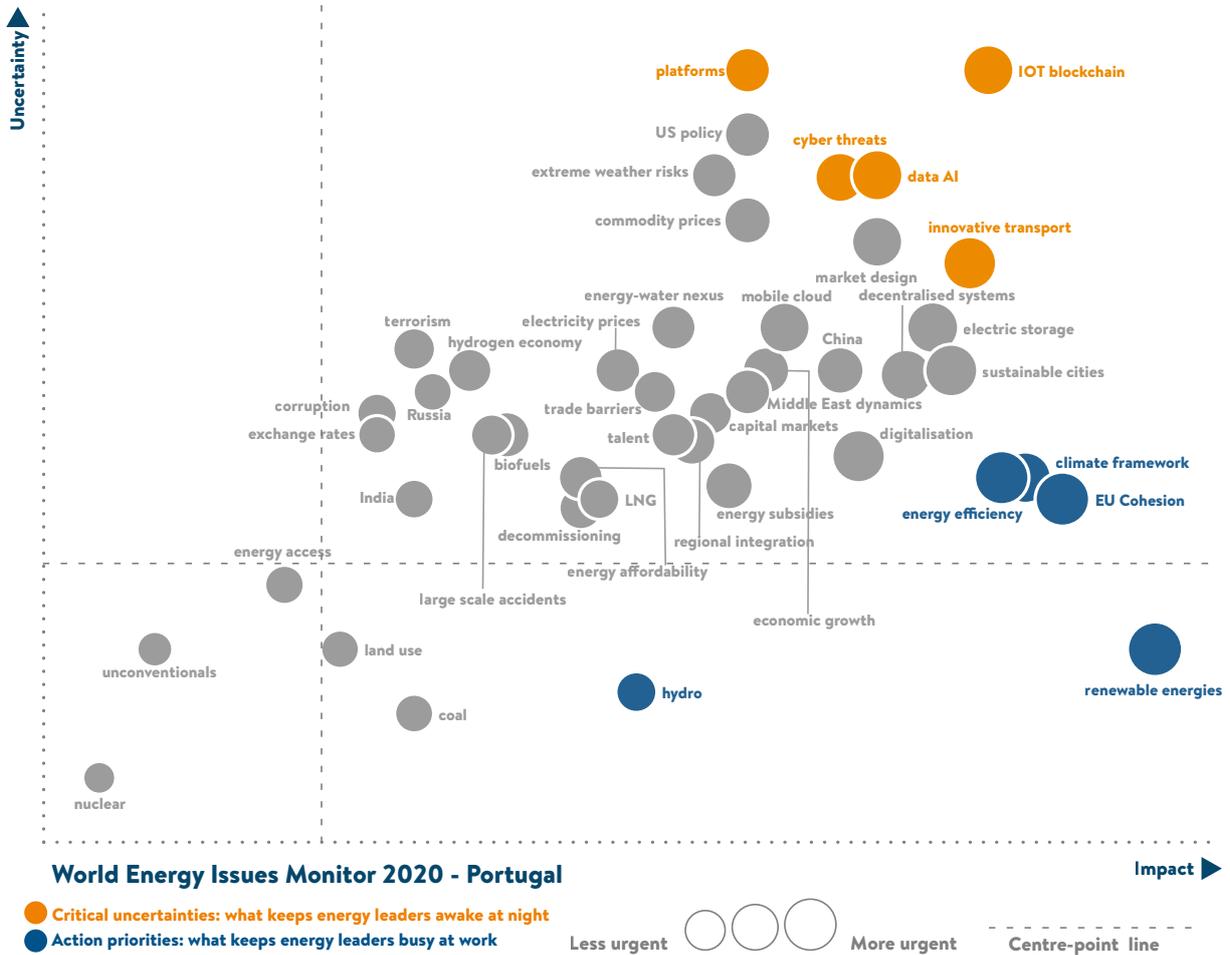
ACTION PRIORITIES

Electricity Prices are perceived with reduced uncertainty and become an Action Priority, as Poland diversifies its energy mix. A higher level of natural gas imports, increased deployment of renewable energy and the introduction of nuclear power in coming decades will have an impact on the levelized cost of electricity. Electricity prices for households are regulated by tariffs. However, wholesale prices have increased. The Polish Government has adopted a policy to increase the share of renewable energy sources, which may decrease the marginal cost of production.

LNG is perceived with increased impact, becoming an Action Priority. Diversification of gas supply sources is a key priority for Poland. In addition to signing agreements for new LNG supplies from the US, the country is also working to expand capacity at its LNG receiving terminal. PGNiG is hoping to produce more natural gas domestically and has increased its overseas activities through upstream oil and gas investments.

Economic Growth is perceived as an Action Priority. Poland's need to offset emissions from its coal-based energy system comes at a cost, in the form of emissions allowances purchase in compliance with EU directives. The draft National Energy Plan 2021-2030 sets investment needs at an annual 3% of GDP for the modernisation of the energy sector. A final plan would cover investment needs for energy efficiency and other carbon mitigation measures. In this time horizon, further GDP growth can be expected

PORTUGAL



NATIONAL OVERVIEW & CONTEXT:

There is little change in this year’s action priorities for Portugal compared to 2019, with a continued focus on decarbonisation processes and less uncertainty around EU Cohesion. Critical Uncertainties revolve around digitalisation and innovation issues.

CRITICAL UNCERTAINTIES

IoT/Blockchain stands alone as a top Critical Uncertainty in this year's report. Portugal is implementing digital solutions to empower customers, in particular in the residential sector with the installation of intelligent meters. For this reason, IoT and blockchain are expected to have a strong impact, although not yet in the short term.

Innovative Transport moves from Action Priority to Critical Uncertainty. This is likely in response to the shift to electric vehicles and low/zero carbon fuels, which is proceeding at a slower pace than expected. Portugal plans to use electromobility and low carbon fuels to decarbonise its transport sector, making use of the high share of renewable electricity already achieved. Its Roadmap for Emissions Neutrality aims for GHG reductions of 50% by 2030, 84% by 2040 and 98.5% by 2050.

Cyber Threats have moved into the Critical Uncertainty section, in alignment with other advanced economies. Digitalisation and AI applications are moving at a rapid pace in the transition to more decarbonised and decentralised energy systems. Portugal is in the process of digitalising its small and medium businesses, which have a big role in the economy but are more vulnerable to cyber threats than their large counterparts, which are leading the transition.

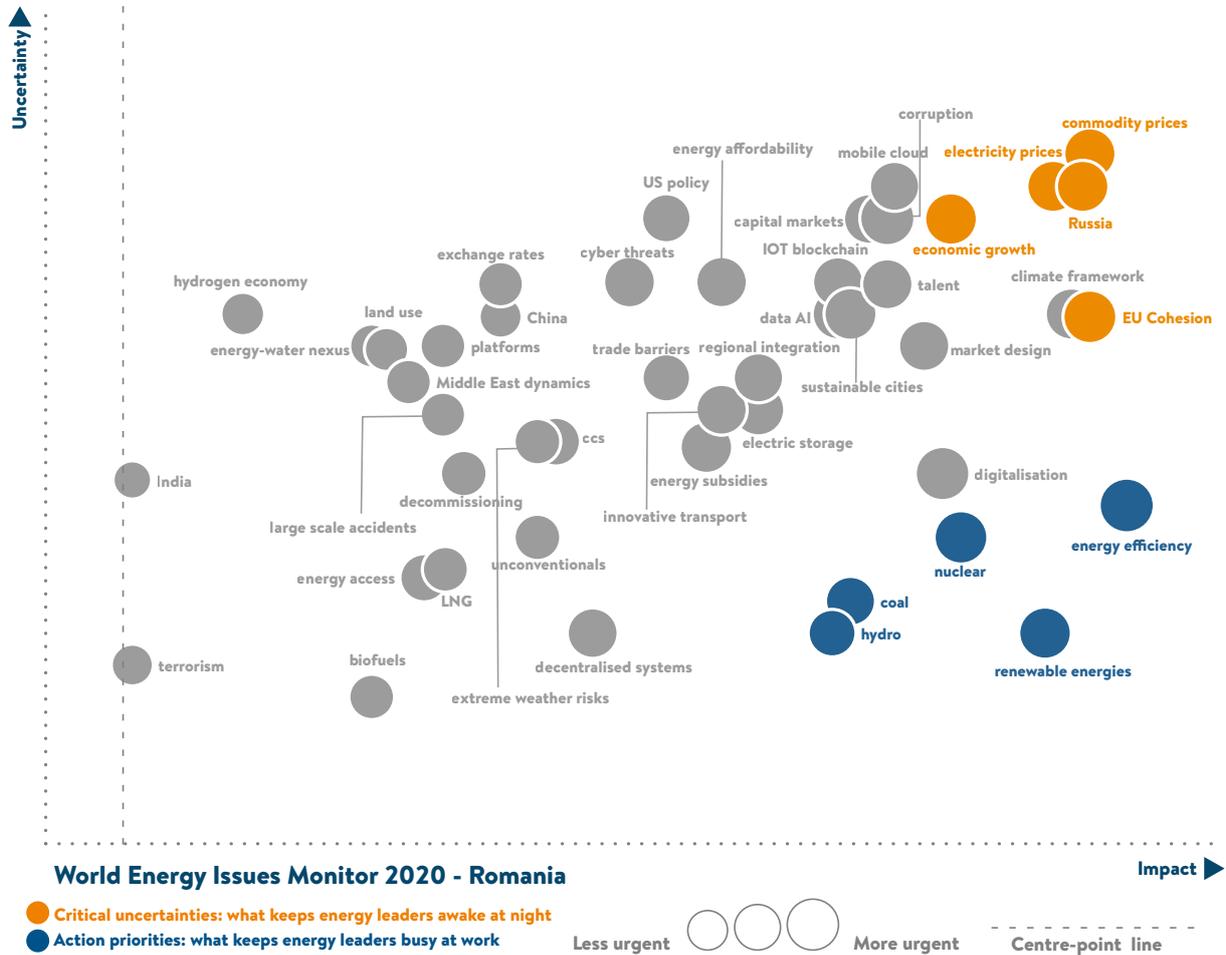
ACTION PRIORITIES

Energy Efficiency has moved down the scale of Action Priorities and is lumped with EU Cohesion and Climate Framework. Portugal introduced incentives designed to improve efficiency in several sectors as part of its National Energy Efficiency Action Plan. This resulted in energy savings of the equivalent of 303 tonnes of oil per year since 2016, according to the IEA. Uncertainty around this issue must be understood in relation to the advancements achieved thus far. As the simplest measures have already been successfully implemented, Portugal is now faced with measures which are much more difficult to implement extensively, such as buildings' insulation.

EU Cohesion has moved up the scale of Action Priorities amid uncertainties as to when the UK will exit the European Union and on what terms. This will have implications for the Portuguese economy in general and may reduce the budget of programs with impact on the energy sector.

Renewable Energies remain stable as an Action Priority as new generation capacity is being awarded, particularly in solar generation. In 2018, Portugal produced 46% of its electricity from renewables, including biomass, hydro-power, wind and solar energies. Portugal's integration in the Iberian Electricity Market means that it cannot participate in the European market and fully deploy its renewable generation potential. This is due to its geographic location and the lack of enough storage capacity and regional grid interconnections.

ROMANIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, the concerns of Romania’s energy leaders regarding energy prices follow increased uncertainty around supranational issues such as EU Cohesion and Climate Framework. The Action Priorities section suggests greater certainty regarding energy technology issues.

CRITICAL UNCERTAINTIES

Commodity Prices are perceived as highly uncertain following an Emergency Ordinance issued in December 2018 imposing a price cap on natural gas sales from domestic production to eligible suppliers and final consumers. The law also imposed a 2% turnover tax on all licence holders. Uncertainty revolves around the risk of delayed offshore gas projects due to less favourable business conditions. The consequent decline in production could lead to increased import dependence, with Russia being the sole supplier. Discussions are ongoing to amend the law and reduce price risks.

EU Cohesion becomes a Critical Uncertainty. The Romanian presidency succeeded in adopting the amendments to the Natural Gas Market Directive, which will ensure a unitary and transparent legal framework for gas interconnections in alignment with the Energy Union's principles. In addition, the new liberal Government suggests further adjustments to align with EU frameworks. This position is challenged by weak Parliament endorsement, which may hinder significant legal and regulatory framework changes.

Climate Framework is also perceived as an issue of higher uncertainty. Romania must reduce its greenhouse gas emissions until 2050 and to comply with the EU long-term decarbonisation goals and the Paris Agreement. The country's biggest challenge concerns transport, which is currently the largest GHG emitter. The new government and the opposition are struggling to agree on a strategy to tackle transport emissions, raising uncertainty around the possibility of progress on this issue.

ACTION PRIORITIES

Energy Efficiency is seen with greater impact. Challenges to achieve efficiency targets involve stabilising the regulatory framework and enforcing compliance towards energy performance standards. Recent initiatives in the field include the National Program for thermal rehabilitation of residential buildings and Energy Efficiency measures that apply to industrial companies and public entities. By March 2020, Romania must implement an EU Directive on the energy performance of buildings. This directive requires the installation of EV charging stations and systems for automation and control of energy consumption. Electricity distribution grids must develop infrastructure to provide EV charging solutions.

Nuclear is perceived with far less uncertainty. In May 2019 the Romanian National Nuclear Company, Nuclearelectrica, signed a memorandum of understanding and China General Nuclear (CGN) for completion of two units at the Cernavoda Nuclear Power Plant. The main issue to be addressed is to find the ideal share of nuclear to be incorporated in the Romanian electricity market, with considerations to EU regulations.

Coal enters the Action Priorities section as this historically important source of electricity is being challenged on environmental grounds

CRITICAL UNCERTAINTIES

US Policy: US sanctions and punitive measures imposed by a number of other Western countries remain a Critical Uncertainty. Tensions between Washington and Moscow persist both in strategic and tactical areas, including the Nord Stream 2 Gas Pipeline. The US is looking to increase its LNG exports to Europe and Asian countries while facing competition from Russian companies.

Capital Markets are another Critical Uncertainty. US and EU sanctions represent a key concern for the stable operation of capital markets in Russia. Other concerns revolve around weather changes and the consequent unpredictability of gas and oil demand during summer and winter, which leads to important price fluctuations. Given the importance of the oil industry to Russia's economy, a reduction in prices translates into significant falls in foreign currency availability.

Exchange Rates rise to high uncertainty amidst reduced international trade following US sanctions in response to the Ukrainian crisis. Expected interest rate cuts by the Russian Central Bank also raise uncertainty around the rouble's purchasing power. Moscow is exploring currency settlements in euros and roubles for its energy exports to maintain international transactions, ensure currency stability and contain inflation.

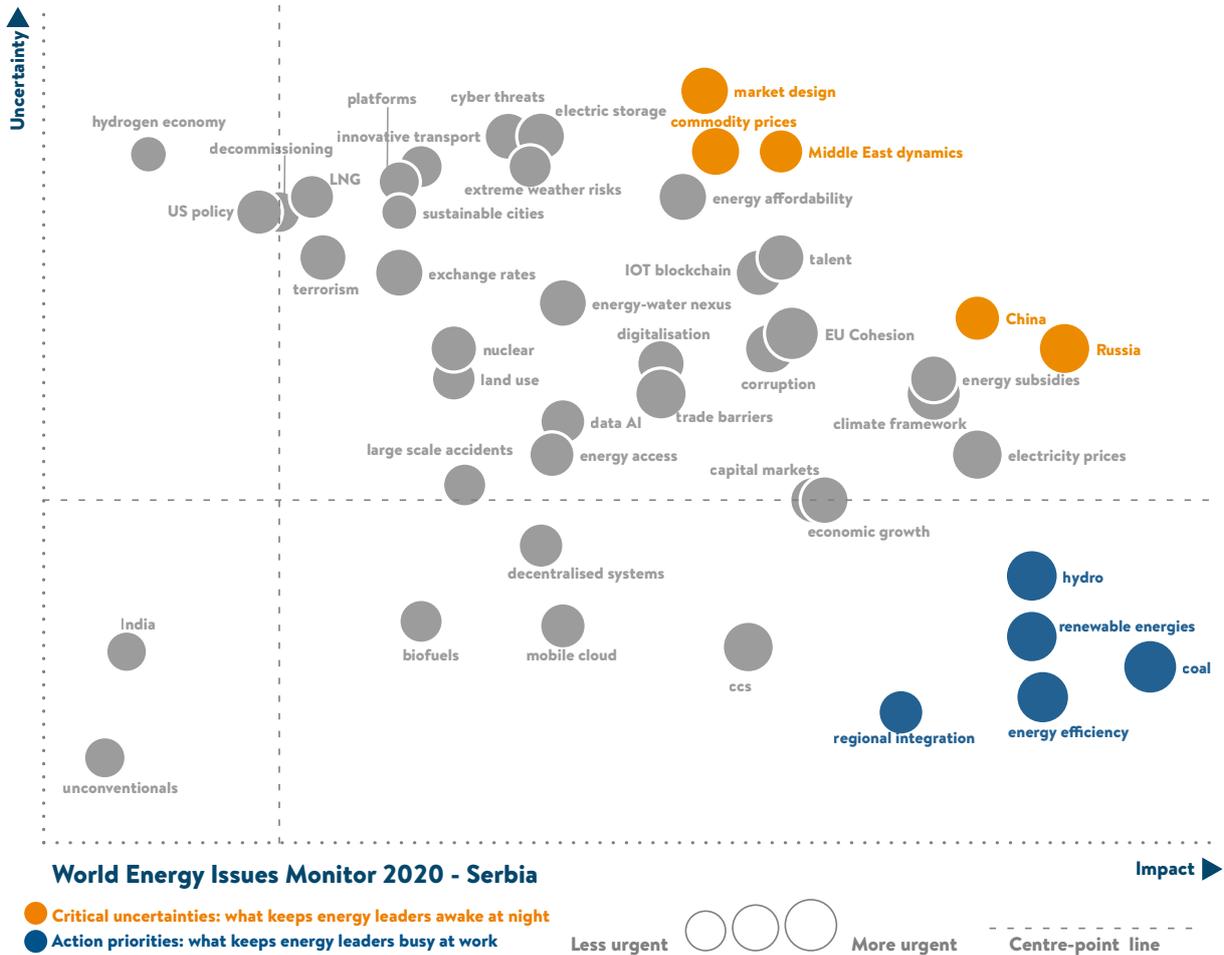
ACTION PRIORITIES

Commodity Prices are seen with less uncertainty and enter the Action Priorities section. Interestingly, this issue is closely positioned with Capital Markets, highlighting a coherence between concern and action on the role of oil and gas in the country's economy. A key movement in this space is Rosneft's full currency switch of contracts from US dollars to euros, in a move to shield transactions from sanctions.

Economic Growth is also perceived with less uncertainty, even following the temporary halt in oil exports via the Druzhba (Friendship) pipeline and economic slowdown in the EU. Counterbalancing these challenges are the strengthening of the local trade market, the consequent increase in domestic consumption, as well as economic stimulus measures by the state. Renewable sources have become a new and fast-growing sector in Russia's energy sector. With the Government's support, companies have doubled renewables generating capacity each year. Efficiency of solar modules made in Russia exceed 23%, which places them in a leading position globally in terms of efficiency. Russia has already started to export its solar modules to European and Asian countries.

Nuclear remains an Action Priority for one of the world's leading nuclear energy producers. In September 2019, Russia's first floating nuclear power plant Akademik Lomonosov was docked in the arctic town of Pevek to replace capacities of outdated coal and nuclear power plants and supply electricity to 50,000 consumers. Russian state-run nuclear energy company Rosatom sees this as a pilot project with plans for use of similar designs in Russia, Europe and developing countries in Asia and Africa

SERBIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Serbia’s energy leaders have shifted their perception of the Critical Uncertainties landscape from a focus on digitalisation and decarbonisation, to a focus on Market Design and related Geopolitical issues including Russia, China and Middle East Dynamics. Action Priorities remain consistent with last year’s results, with strong attention to energy technologies. Interestingly, Regional Integration is perceived with much less uncertainty, moving from Critical Uncertainty to Action Priority.

CRITICAL UNCERTAINTIES

Russia leads the uncertainties landscape. Serbia retains close ties with Russia, which is the country's sole provider of natural gas via Ukraine. As the extension of the Russia-Ukraine agreement on gas transport to Europe is still uncertain, and the fate of "Turkish Stream" gas pipeline is uncertain due to pressures from the EU and the US, there is uncertainty on how to ensure gas supply to an ever-growing number of consumers in Serbia.

China and other large investors in Serbia's energy intensive industries appear to be another Critical Uncertainty. This may reflect related concerns around the weight of carbon-intensive projects supported by foreign investments and their impact on the country's ability to achieve a planned 27% share of renewable energy sources in the final energy consumption by 2020.

Middle East Dynamics is also identified as a Critical Uncertainty with respect to the region's significant impact on oil prices on the global market. As it is heavily dependent on oil imports, the Serbian economy is sensitive to any potential increase in oil prices. Gas sales prices to Serbia are linked to oil prices.

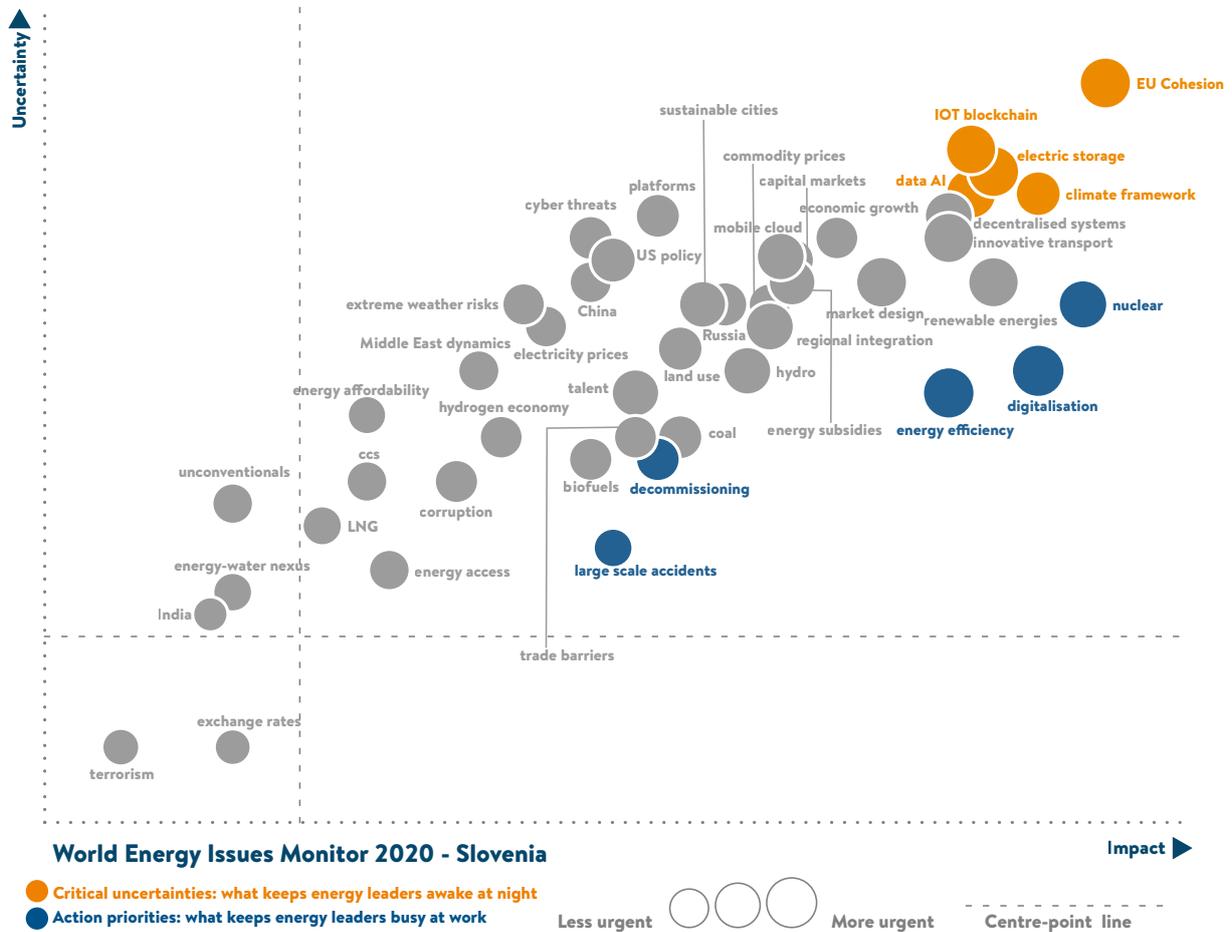
ACTION PRIORITIES

Coal is seen with increased Impact and remains an Action Priority. Electricity produced from domestic lignite accounts for about 70% of over-all electricity production and is being tackled both by EU environmental protection standards and by new proposals of the Law on climate change and of the Strategy and Action Plan on the decarbonisation of the Serbian economy. The proposed plan includes measures aimed at much higher emission reductions than the original NDC target of 9.8% by 2030 compared to 1990 levels.

Energy Efficiency and **Renewables** are perceived as Action Priorities. Serbia has adopted a legal framework to encourage the use of renewables and highly efficient cogeneration by subsidising the price of electricity, attracting considerable private investments. It has also created a fund to subsidise energy efficiency measures. The Energy Efficiency plan for the residential sector aims to achieve savings of 15-25% per household while reducing CO₂ emissions. The EBRD recently provided a €2.5 million loan to assist upgrades of 40 old buildings in the country.

Regional Integration enters the Action Priorities section with low uncertainty. Access to the European Union is a key policy objective for Serbia. This will allow political and economic integration within the bloc and increase regional cooperation in the Western Balkans. Another Serbian policy objective is to diversify its sources of energy supply by exploring additional gas pipeline options with Romania and Bulgaria

SLOVENIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Slovenia’s energy leaders define a Critical Uncertainties landscape which continues to be focused on EU Cohesion, but that also looks at technology and digitalisation issues in relation to climate concerns. Action Priorities stay consistent with last year’s perceptions, defined by Energy Efficiency, Renewables, Nuclear and Digitalisation.

CRITICAL UNCERTAINTIES

EU Cohesion remains the biggest Critical Uncertainty. Concerns revolve around securing economic growth at the regional and national levels. The European Commission's New Green Deal is expected to bring challenges, especially to smaller economies, as it impacts energy systems' flexibility and adaptability. Tracking new European technologies, innovations and their implementation, together with an active cooperation with regional projects, will be crucial in the development of the country's energy sector.

IoT Blockchain and Data AI enter the uncertainties space with higher perceived impact. Blockchain methodologies are extremely convenient and are welcome in complex energy and connected processes. While these digitalisation tools are developed and well defined, their acceptance among consumers needs to be accomplished in order to enable large scale adoption.

Climate Framework is also identified as a Critical Uncertainty with higher impact, as the country progresses slowly towards the objective of reaching net-zero emissions by 2050. Uncertainty emerges as the government and other sector stakeholders struggle to align on the priorities and national strategies to reach tangible carbon adaptation targets. In these debates, the emphasis on environmental requirements prevails. In 2018, the Slovenian government prepared an action plan for the closure of the domestic lignite mine, Velenje.

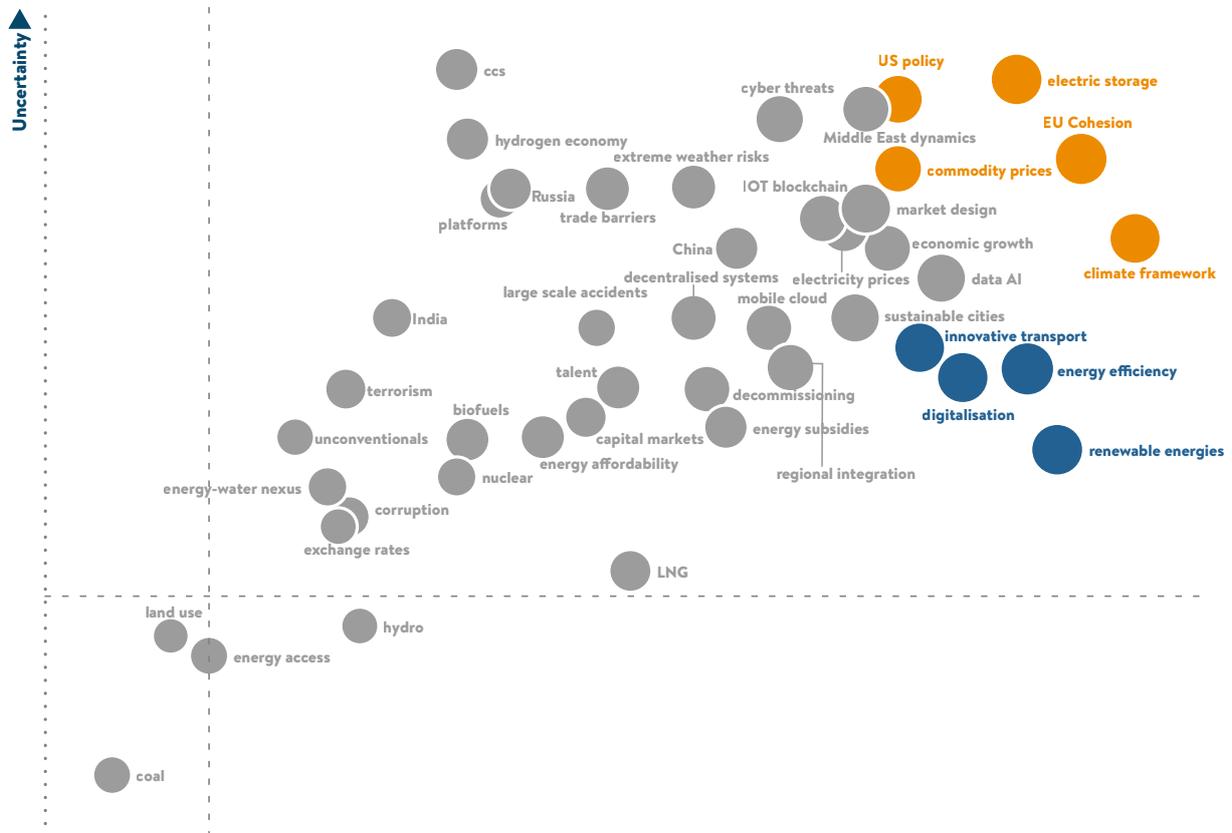
ACTION PRIORITIES

Nuclear leads the Action Priorities section and is strongly correlated with energy security as well as with environmental impact; long-term radioactive waste treatment is not managed as of yet. At present, the Krško nuclear power plant (NEK), which is equally owned by Slovenia and Croatia, covers about 40% of Slovenia's electricity production. In 2016, the two countries agreed to extend NEK's lifespan by 20 years, to 2043. Meanwhile, the government is discussing the possibility of building a second nuclear power plant with the aim of improving energy security, sustainability and affordability.

Digitalisation remains an Action Priority and is perceived with greater impact. Digital solutions are being supported to allow for renewables integration and efficiency improvement targets. Among numerous advanced smart grids, a pilot smart grid project was started in October 2018 and will run until March 2021 to prevent power outages, enhance grid performance and improve grid management.

Energy Efficiency continues to be perceived with low uncertainty and high impact and is aligned with digitalisation as an Action Priority. The draft of the Energy Concept from March 2018 sets goals for greater energy efficiency, including a gradual reduction of energy consumption, the development and commercialisation of renewable technologies and the growth of energy storage. The strategy has been re-defined as Slovenia's Climate & Clean Energy programme

SPAIN



World Energy Issues Monitor 2020 - Spain

Impact ►

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, the perspectives of Spain’s energy leaders remain fairly consistent, with the Critical Uncertainties landscape being led by policy concerns and the Action Priorities area being defined by the roll-out of decarbonisation and decentralisation technologies.

CRITICAL UNCERTAINTIES

Electric Storage is seen with higher impact, reflecting distributed generation, mobility and the evolving technical characteristics of a greater share of renewable energies integration in the energy mix. The TSO is currently focused on providing greater security of supply and enhanced efficiency. The proposal of the Integrated National Energy and Climate Plan (NECP) includes an objective of around 6GW of additional storage capacity (hydraulic pumping and batteries) to be created by 2030. Other types of storage technologies and the future role of hydrogen are also the subject of increasing uncertainties.

EU Cohesion persists as a Critical Uncertainty, being a key issue for Europe's on-going energy policy reformulation process. The reform's focus on interconnections is expected to impact the development of Spain's gas and electricity transmission grid, raising the need for additional infrastructure investment. The Iberian Peninsula would benefit further from the EU internal energy market with a stringer connection with continental Europe.

Climate Framework emerges with higher uncertainty in the aftermath of several initiatives: the Climate Change and Energy Transition bill, the National Integrated Energy and Climate Plan 2021-2030 and the Just Transition Strategy presented by the government. Uncertainty revolves around the need for investments, the vulnerability of certain sectors, industrial competitiveness and the specific measures that will be used to implement these plans.

ACTION PRIORITIES

Renewable Energies continue to be perceived as an Action Priority given the ambitious target of a 74% renewables share in final electricity consumption and a 42% share in total energy consumption by 2030. These targets have raised investors' interest in renewable projects in the country, as shown by the high number of applications for project permits. Current challenges include implementing measures to prevent project speculation and saturation, reducing the length of authorisation processes and clarifying remuneration, among others.

Energy Efficiency remains an Action Priority but with higher uncertainty. With the measures included in the NECP, Spain seeks to improve its energy efficiency by 39.6% by 2030. A Royal Decree was issued in April 2019 to encourage collective self-consumption and simplify the compensation mechanism for self-produced energy. To reach the efficiency goal, measures in ten different areas are under consideration, including building renovation and a model shift in transport.

Digitalisation also remains an Action Priority, reflecting Spain's global leadership with smart electricity meters installed in nearly 100% of homes. Spain plays an important role in smart city development throughout Europe as one of the 31-member countries of the European Innovation Partnership for Smart Cities and Communities. New challenges include cybersecurity, privacy, and the need for additional regulatory and policy measure

CRITICAL UNCERTAINTIES

Innovative Transport continues to be perceived as a Critical Uncertainty as decarbonisation efforts focus around this sector. Sweden is currently offering tax incentives to encourage the use of biofuels and for low emission cars in the transport sector, which accounts for roughly half of energy-related CO₂ emissions in the country. Sweden has one of the highest shares of EVs in new car sales globally. It has also introduced the world's biggest pilot projects including electrified roads for commercial traffic, among other related innovations. At the same time there is a challenge to find common solutions to extensive transport volumes between nations.

IoT/**Blockchain** is perceived with higher uncertainty. The Swedish power company, Vattenfall, introduced a pilot project in 2016 to test potential applications of blockchain and to build a peer-to-peer trading system in the wholesale energy market using the technology. There is still uncertainty as to whether this technology will disrupt the current business model.

Decentralised Systems become a Critical Uncertainty in this year's survey. The Swedish government is looking into ways to facilitate the operations of small-scale electricity producers and stimulate distributed generation. There is internal political discussion under way to assess the benefit of incentives such as white certificates for energy efficiency. Electricity storage has been exempt from taxation and special incentives have been introduced for solar cells. Uncertainties regard how the decentralised system will affect the whole electricity market.

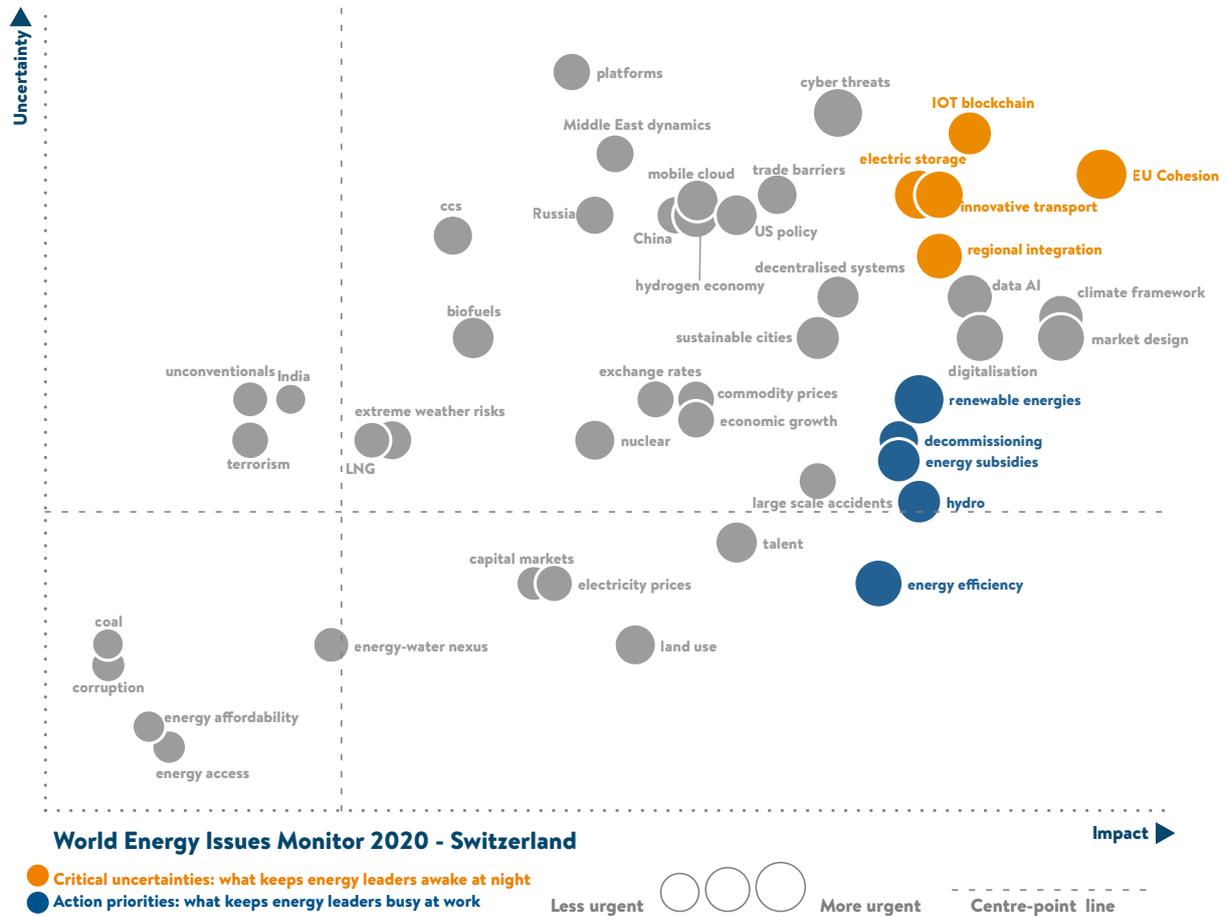
ACTION PRIORITIES

Renewable Energies remain an Action Priority, as Sweden progresses towards its zero-carbon target by 2045. The electricity sector has been decarbonised mainly through the deployment of hydro and nuclear power. Wind power capacity has been expanding rapidly with production rising from 0.5TWh to 17.5TWh between 2000 and 2017. Further expansion is planned, and offshore wind is also being considered. Sweden is exploring the possible use of large-scale hydrogen in the steel industry

Biofuels are also an Action Priority as Sweden uses bioenergy for district heating, taking advantage of the country's naturally available resources. Biofuels have been introduced through tax exemptions. Since 1 July 2018, the share of biofuels in gasoline and diesel is determined by the emission reduction obligation scheme. The government is also promoting the use of biofuels in aviation. Demand for biofuels in the transport sector is expected to rise.

EU Cohesion continues to be seen as an Action Priority. The economies of the UK and Sweden have been closely interlinked through flourishing trade and R&D relations with shared visions of EU trade and climate policies. As a small export-dependent country, free trade is essential for Sweden. EU views on the use of biomass and waste-to-energy are a tough challenge for the country. These must be handled in EU negotiations as these resources are essential for the Swedish energy system

SWITZERLAND



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, the concerns of Switzerland energy leaders are still impacted by interactions with the European energy market as well as digitalisation issues. In the Action Priorities section, Hydro and Energy Efficiency emerge with higher impact, while the overall green transition agenda is perceived with greater confidence.

CRITICAL UNCERTAINTIES

EU Cohesion leads the Critical Uncertainties section, reflecting perceptions on Switzerland's participation in the European single energy market. At present, Switzerland is excluded from EU legislation on power grids and network codes. A much-needed electricity agreement with the EU cannot be negotiated at the current stage as it depends on concluding a comprehensive accord between Switzerland and the EU on the framework for their interactions.

IoT/Blockchain is seen with greater impact. Emerging Swiss start-ups are driving changes in this space as they develop blockchain solutions for greater energy efficiency, building on the momentum created with the National Energy Strategy 2050 around greater sustainability of the national energy system. Solutions include blockchain-enabled electricity meters and transactional power grids aimed at reducing network and grid operation costs.

Cyber Threats continue to be signalled as a critical uncertainty despite the robustness of Switzerland's power supply and energy infrastructure. Sources of uncertainty include the possible risks of 5G network integration as the country is one of the technology's early adopters. In addition, the interconnectivity of Swiss and EU power systems also extends potential sources of concern beyond the national jurisdiction.

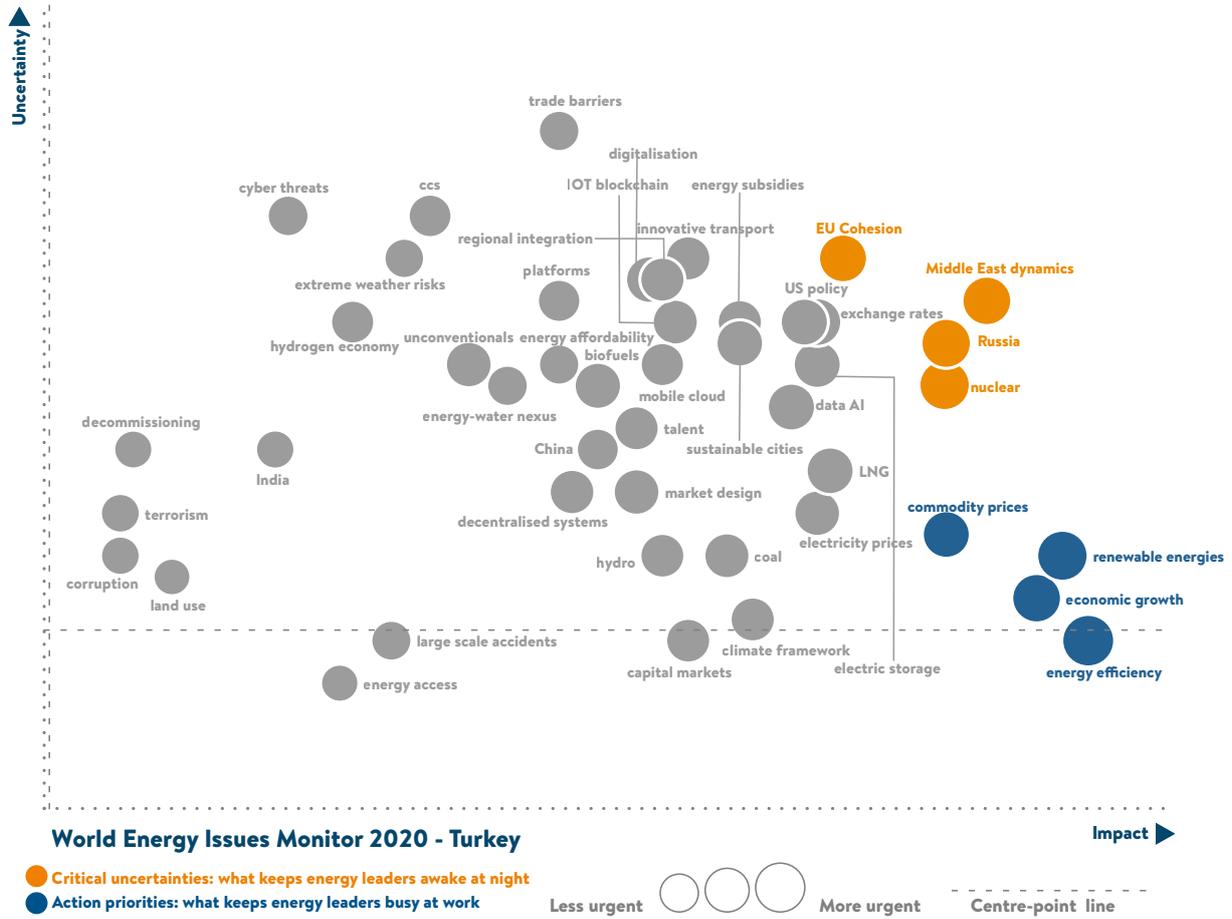
ACTION PRIORITIES

Energy Subsidies fall slightly in the uncertainty section. Subsidies are a key instrument included in the National Energy Strategy 2050 built around three central pillars: phasing out the use of nuclear energy, promoting renewable energies and boosting energy efficiency.

Hydro is seen with higher impact as the role of this energy source is bound to increase beyond the current 60% share in total domestic electricity supply. The country has an indicative target of 37.4TWh hydropower production per year by 2035. This increase supports Switzerland's gradual moves to completely phase out nuclear generation. Recent developments include the upscaling of existing storage infrastructure and the construction of two large pumped storage facilities.

Energy Efficiency: according to the Swiss Federal Office of Energy, more than 40% of energy consumption and about a third of CO₂ emissions are attributable to the building industry. Improving efficiency in buildings is therefore seen as a priority to achieve enhanced energy efficiency, security and sustainability at the country level. Government initiatives to reduce energy consumption in the buildings sector include the Building Programme, tax incentives for building renovation and competitive tenders

TURKEY



NATIONAL OVERVIEW & CONTEXT:

Turkey’s Action Priorities for 2020 are in line with the global trend toward renewable energies and energy efficiency; economic growth is a central issue in how fast the country transitions to scaling renewable energies and energy efficiency mechanisms that can effectively reduce demand while maintaining growth. Critical Uncertainties are Russia, EU Cohesion and Middle East Dynamics.

CRITICAL UNCERTAINTIES

Middle East Dynamics has increased dramatically in impact, becoming the leading Critical Uncertainty. Turkey's location makes it impossible for the country to avoid the impact of events in the Middle East. Regional instability, in particular in neighbouring countries, is also a cause of uncertainty.

Russia is another critical uncertainty most likely due to the country's involvement in the Syrian conflict on the political front. Another area of uncertainty concerns the Turkstream pipeline, planned to carry Russian gas directly to Turkey upon completion. The project has a strategic importance for Turkey as it will help to enhance gas security by eliminating third party related transit risks (such as the Russia – Ukraine dispute). For this reason, Turkey remains focused on ensuring that the TurkStream pipeline becomes operational.

Nuclear is perceived as a Critical Uncertainty as Turkey currently does not have any nuclear power plant and as the first of such facilities is expected to come online in 2023. The government has announced its intentions to build three more nuclear power plants with four reactors, each to reach capacity of 100GW by 2030.

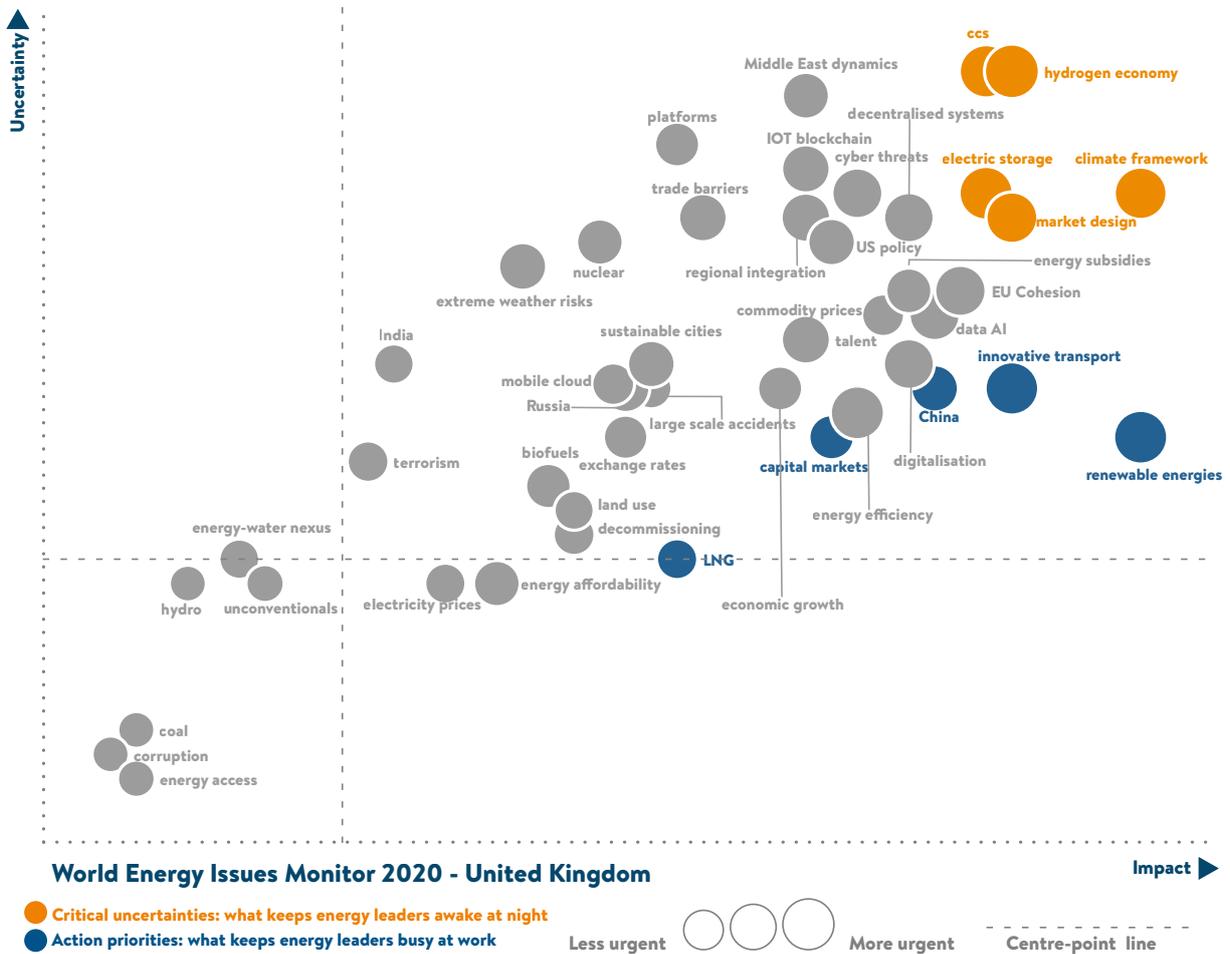
ACTION PRIORITIES

Energy Efficiency: Turkey's 2018 National Energy Efficiency Action Plan outlined a road for efficiency improvements in industry, construction and other sectors. In late 2019, the Ministry of Energy announced public and private investment commitments of US\$10 billion in energy efficiency over the next 10 years. These are expected to generate US\$30 billion savings until 2033.

Economic Growth is seen with low uncertainty as recession forecasts by the World Bank and rating agencies have been revised. New reports indicate a recovery and up to 5% growth in coming years. These revisions cite an improving current account balance, continued economic growth and falling inflation. Gradual improvement in domestic demand and net exports are also expected given reliance on fiscal stimulus and on evidence of previously achieved positive exports revenue.

Renewable Energies' positive outlook is based on the achievement of 46% electricity generated from renewable resources during the first 10 months of 2019, reaching the country's objective of producing two-thirds of electricity from local and renewable resources. The Ministry of Energy has set more ambitious targets for the years to come. Private sector engagement is seen as a key enabler of this change

UNITED KINGDOM



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, UK energy leaders have redefined uncertainties to focus around the Hydrogen Economy, Climate Framework and Market Design, with lower uncertainty and impact attributed to issues as EU Cohesion (following Brexit) and IoT/Blockchain. The Action Priorities are shaped around the issues of Renewables, China and Capital Markets.

CRITICAL UNCERTAINTIES

Hydrogen Economy rises in impact and becomes the highest Critical Uncertainty. The development of low cost, low carbon hydrogen for use in industry, buildings and transport, along with decarbonising the gas network will be critical to meet the UK's 2050 net zero emissions target. The government has recognised the importance of hydrogen, especially to decarbonise hard to abate sectors, and has announced a £390m hydrogen technology fund to support low carbon industrial use.

Climate Framework is seen as having an increased impact. Under a new law from June 2019, the UK committed to achieving net zero greenhouse gas emissions by 2050. Transition towards a net zero emissions economy will require a whole system's approach and ramping up policies on climate to enable fundamental changes in all sectors. This critical uncertainty overlaps with the Hydrogen Economy issue, as the UK will need to develop and implement decarbonisation plans in all sectors of the economy.

Market Design remains a Critical Uncertainty. The 2013 Electricity Market Reform introduced several mechanisms to incentivise investment in secure, low-carbon electricity and improve energy affordability, but neither technological nor regulatory transitions are fully completed.

ACTION PRIORITIES

Renewable Energies continue to lead the Actions Priorities section. In 2019, renewable sources overtook fossil fuels in providing electricity to UK homes and businesses, with an increased share in the electricity mix of 40%. According to the government, the rise in renewable output results from the increased capacity with new offshore windfarms. Despite this, renewables deployment is still off track against the UK's CO₂ targets and will require further action, especially for a net zero target by 2050.

China is seen with reduced uncertainty and higher impact. This partly stems from Chinese investment in UK energy infrastructure, most notably nuclear power. CGN, China's leading nuclear energy company, is a minority shareholder in Hinkley Point C (under construction) and is due to be the majority shareholder in the proposed Bradwell nuclear power station.

Capital Markets remains an Action Priority. Given the scale of investment needed to fund the energy transition, not only in the UK but globally, institutional investors are likely to play a crucial part. Examples in energy markets are the ESG finance and green bonds issued by companies to finance their transition to cleaner fuels and more sustainable behaviour. At the same time, capital markets in the UK are increasingly being encouraged by regulators and other parties such as the European Commission and London Stock Exchange, to invest in "green" assets.

Assessing The Energy Agenda for Latin America & the Caribbean





CRITICAL UNCERTAINTIES

US Policy emerges as an issue of higher uncertainty in the region and relates to the US-China trade dispute and concerns over the impact of these dynamics on investments. The US and China are the biggest sources of foreign direct investment in the Latin American and Caribbean energy sector. Trade between the U.S. and the region has been growing rapidly, led by Mexico, with oil and gas making up a large proportion of these exchanges. China has invested heavily in renewable and non-renewable energy infrastructure in recent years.

Economic Growth is a concern across the region with the IMF reporting a slowdown in growth in 2019 to 0.2% from 1% in 2018. It attributed this to sluggish global economic growth, weak commodity prices and volatile capital flows. Although growth is expected to pick up in 2020, downside risks persist because of policy uncertainty in some countries and the spill over effect of financial turmoil in Argentina and an economic slowdown in Venezuela, where oil production has fallen sharply because of internal political tensions and U.S. sanctions. Reducing high public debt in some countries is a priority.

Commodity Prices also appear as a Critical Uncertainty for a region that is a major exporter of raw materials and commodities. Oil exporting countries like Venezuela, Ecuador and Mexico are exposed to oil price volatility and weaker oil prices have slowed investment in infrastructure needed to maintain their positions as exporters. The trade dispute between the United States and China has worsened the situation as goods from the region face increasing tariffs from both countries.

ACTION PRIORITIES

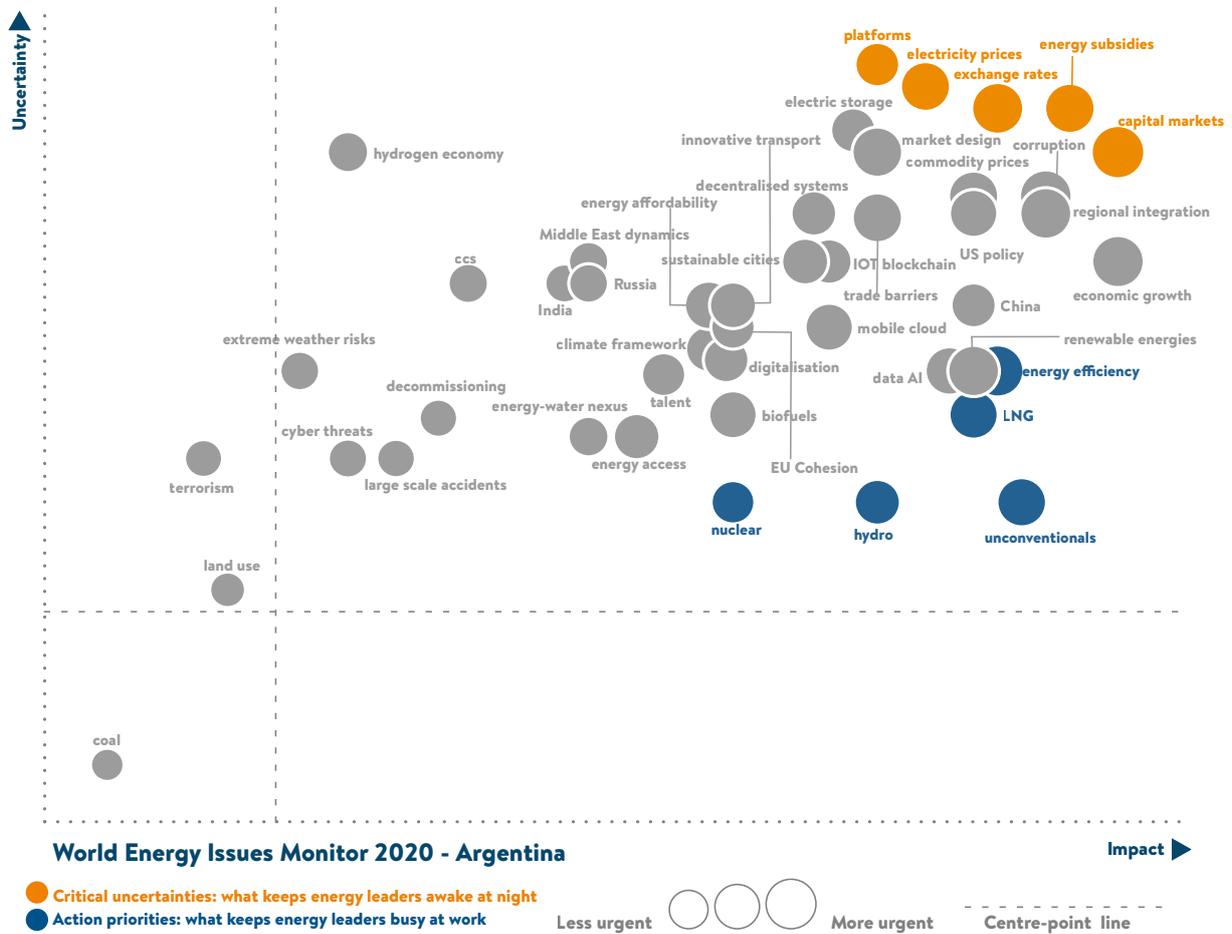
Energy Efficiency is closely associated with sustainability efforts. Appliance labelling programmes and building efficiency standards are being implemented. However, energy subsidies remain in place in several countries and complicate the effort to curb energy consumption and adds to the fiscal burden of oil-importing countries. Energy efficiency measures are seen as part of an energy security strategy to reduce import dependence and increase sector resiliency.

Renewable Energies remain an Action Priority. Several countries in the region use renewables as their main source of energy and this is set to increase in coming years. The region has significant wind and solar potential that can help to relieve reliance on large hydro and biofuels/ biomass during droughts and other extreme weather events. The Brazilian Government has taken a step towards expanding the share of renewables by giving the go-ahead for the start of commercial operations from the Sobrado 1 photovoltaic (PV) plant and the Tamandua Mirim 2 and Acaua wind farms (which have a combined capacity of 83.88 MW).

Digitalisation is seen as an action priority for both public and private sector stakeholders throughout the region. In 2018, Chile introduced blockchain technology to provide real-time information on price, costs, compliance and pollution data as part of transparency measures. In Panama, drones with advanced data and image processing software are being used to improve network stability. However, progress in digitalisation is hindered by the slow pace of regulatory reforms.



ARGENTINA



NATIONAL OVERVIEW & CONTEXT:

Comparing the results of 2019 and 2020, Argentina’s energy leaders continue to perceive issues surrounding the nation’s economic balance as uncertainties. Action Priorities continue to be led by the developments in the Vaca Muerta shale basin and by energy efficiency improvements used as instruments to strengthen the financial sustainability of the sector.

CRITICAL UNCERTAINTIES

Capital Markets emerge as the biggest Critical Uncertainty. Perceptions this year are influenced by the fixing of a set dollar exchange rate below the market rate for oil contracts, which raises uncertainty around the cost of project funding.

Energy Subsidies move to the Critical Uncertainties section. In March 2019 the Energy Secretariat announced that US\$100 million would be allocated to subsidies to compensate gas companies hit by domestic price increases. The move raises total government spending on energy subsidies to at least 2.25% above budget. In September, additional subsidies were announced to compensate oil companies and sustain business activities affected by the fuel price freeze. Even with the subsidy, however, the price per barrel remained below the international price.

Economic Growth is seen with lower uncertainty and higher impact, possibly reflecting a diversity of expectations towards the incoming administration of president-elect Alberto Fernández and its approach to economic reform. At the same time, it is worth noting the position of China as a leading investor in energy infrastructure in Argentina. Chinese-backed projects such as the Caucharí Solar Park complex, currently the largest solar park in Latin America, are examples of China's growing influence as a financier of new projects that contribute to growth.

ACTION PRIORITIES

Energy Efficiency remains an Action Priority for the fifth consecutive year. Recent measures include the adoption of an Energy Efficiency Label by five Argentine provinces as part of a national programme to evaluate energy requirements for heating, cooling, water heating and lighting. The label is designed as an additional decision-making tool for real estate investments and ultimately influence the value of properties with sustainability standards.

Unconventionals persist as the leading Action Priority. Independent producer Vista Oil & Gas raised US\$100 million in July 2019 on the New York Stock Exchange, after becoming the first company to export shale oil from Vaca Muerta. This has raised prospects for profitability of what is considered to be the most promising shale oil and gas basin outside the US. In 2019, around US\$350 million worth of investments were made in the Vaca Muerta basin.

LNG moves to the Action Priorities space as the state-run oil company, YPF SA, shipped its first commercial LNG cargo from a new floating facility. This milestone, together with the developments in the Vaca Muerta basin and the prospects of increased domestic gas production, will boost Argentina's chance of capitalising on its LNG export potential.

CRITICAL UNCERTAINTIES

Economic Growth remains a leading Critical Uncertainty. As a developing nation, Brazil's energy consumption is closely tied to economic growth. Brazil's Energy Research Company (EPE) bases its analyses on a GDP growth forecast of 2.7% for 2020, indicating continuous growth in energy demand. This prospect raises concerns on the readiness of the country's electricity infrastructure to respond to greater demand given the 2001 power crisis that is still on the minds of energy leaders.

Sustainable Cities are perceived as having substantially higher impact. Access to essential public services and urban pollution persist as sustainability challenges for Brazilian urban centres. At the same time, examples of sustainability practices exist such as the expansion of bicycle lanes in Brasília, São Paulo and Rio de Janeiro, selective garbage collection across the country or the construction of fast-charging EV highways between the states of São Paulo and Rio de Janeiro.

Electricity Prices are also seen with increased impact but moderate uncertainty, possibly helped by regulatory changes introducing hourly spot prices (PLD), which become official in January 2020 by the System Operator (ONS) and in January 2021 by the Market Operator (CCEE). Discussions are also being held to adjust the pricing mechanism from a cost-based to an offer-based (loose pool) structure.

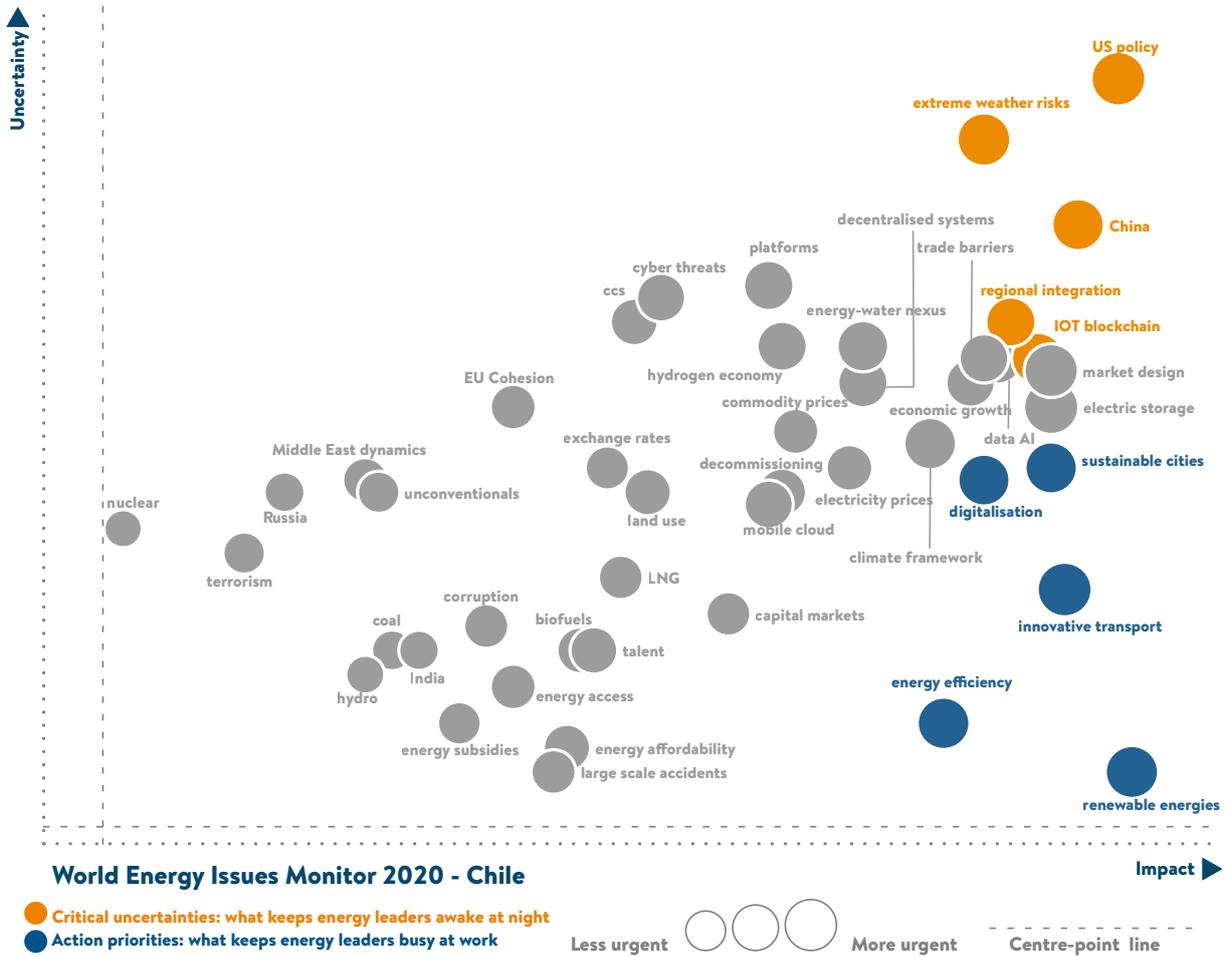
ACTION PRIORITIES

Corruption becomes an Action Priority, following corruption and money laundering investigations associated with the construction of the Belo Monte hydroelectric power plant. More recently, the regulator ANEEL came under investigation by the federal police (Operação Elétron). In addition, the revision of Annex "C" on the Financial Bases and Rendering Electricity Services of the Brazil-Paraguay Itaipú hydroelectric dam raises further concerns about the fairness and economic impacts of the agreement.

Energy Efficiency remains an Action Priority. Recently implemented measures include the Brazilian Labelling Program (PBE) which provides information on the energy efficiency of electrical appliances. In addition, the National Electric Energy Conservation Program (Procel) provides a label to indicate the best levels of energy efficiency within multiple categories (ceiling fans, washing machines, refrigerators).

Renewable Energies continue to be seen with the highest impact and the lowest uncertainty. The Brazilian government has committed to reducing greenhouse gas emissions to 43% below 2005 levels by 2030. They plan to achieve the target by reducing the use of petroleum products and increasing the use of renewable sources, which should reach almost 20% of the mix by 2027. Brazil is also the world's largest producer of ethanol biofuel that is a source of significant export revenues

CHILE



NATIONAL OVERVIEW & CONTEXT

Comparing the results of 2019 and 2020, Chile’s energy leaders have identified Critical Uncertainties around geopolitical and environmental issues which aren’t fully dependent on domestic intervention, but that already have a substantial impact on the country’s energy sector. Action Priorities revolve around policy and technology innovations that are enabling progress on digitalisation of energy systems and on city and transport sustainability.

CRITICAL UNCERTAINTIES

US Policy is perceived as having increased uncertainty and impact, reflecting concerns on the influence of the US-China trade war on the price of copper, Chile's main export. The US is also Chile's main fossil fuels trade partner, and a leading infrastructure and innovation investor. This heightened uncertainty signals the emergence of critical investment concerns for energy leaders.

China is also perceived with greater uncertainty. Another leading trade and innovation partner, China plays a crucial role in Chile's electricity grid modernisation and in the development of the EV industry. Any consequences of strained US-China trade relations are expected to have an impact on Chile's economy.

Extreme Weather Risks are perceived with greater impact. Chile is expected to be among the most affected by climate change as a consequence of melting glaciers, desertification and water scarcity. Around the time of collection of this survey (Oct 2019), the country was facing the worst drought in its history and an estimated 10,000 animals reportedly died due to lack of water.

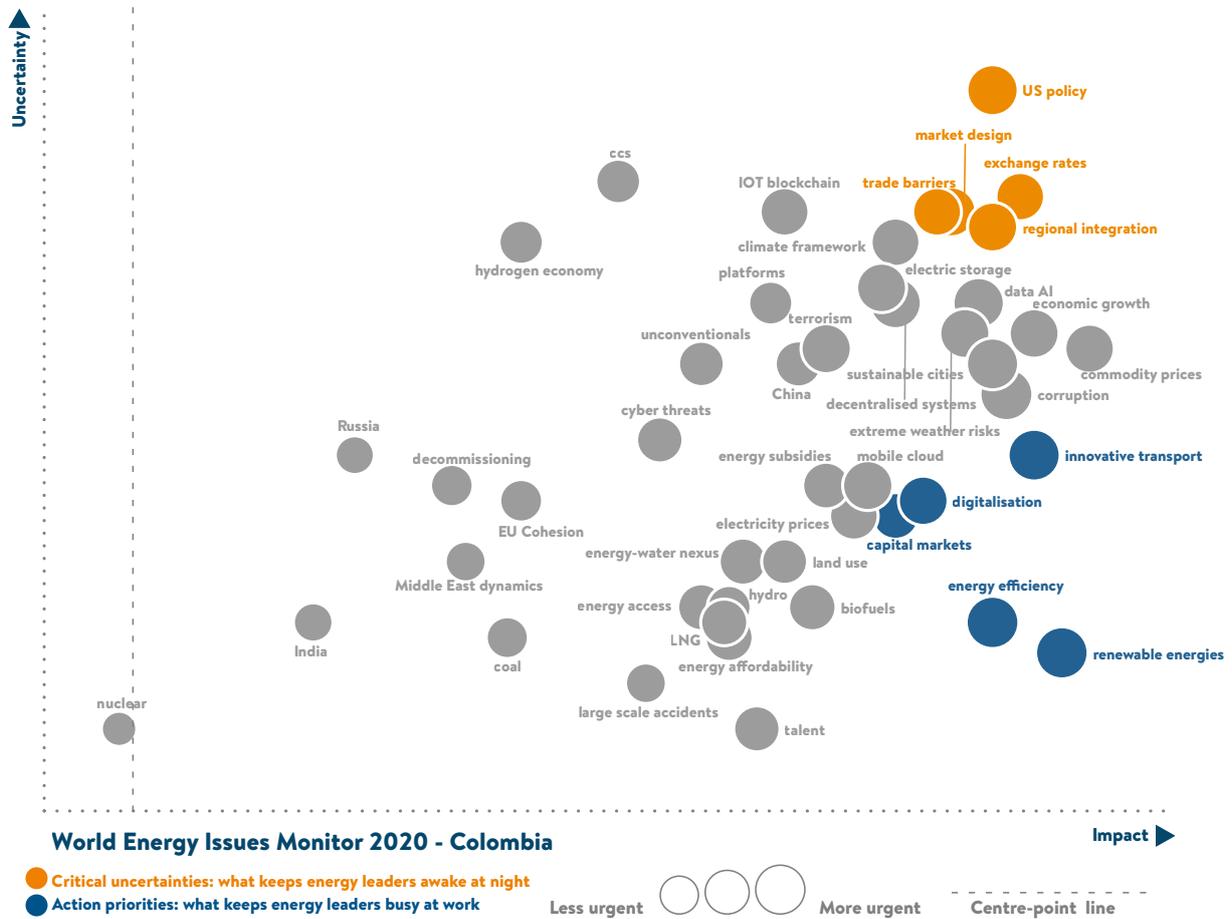
ACTION PRIORITIES

Sustainable Cities are perceived by Chile's energy leaders with low uncertainty and increased impact. In 2019, Santiago de Chile was among the finalists and winners of multiple smart cities awards across the world, thanks to policy and technology innovation to solve urban issues around mobility, environment, security, risk management, economic development and social equity.

Innovative Transport is seen with reduced uncertainty and greater impact, thanks to a focus on developing healthier, cheaper, more efficient and cleaner forms of mobility. The Comprehensive Mobility Plan 2019-2029 (Plan Integral de Movilidad) designed for Santiago builds on a previous plan to optimise and expand the scope of action for infrastructure and enhance the environmental sustainability of public and private mobility.

Digitalisation becomes an Action Priority with reduced uncertainty. The issue has been discussed for the past few years for its potential to support Chile's energy transition. 2019 has seen several developments that inspired confidence about the prospects of digitalisation of energy, including the implementation of public and private sector initiatives for blockchain in energy and distributed generation

COLOMBIA



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Colombia’s energy leaders see higher uncertainty around the country’s relationship with the US, regional integration dynamics and economic issues. Action Priorities are consistent with those identified in the previous year, with a clear focus on innovation and technology progress.

CRITICAL UNCERTAINTIES

US Policy rises in the uncertainty section in this year's survey. The first quarter of 2019 saw an increase in Colombia's oil exports to the US, which benefited from weakened transactions with other countries, including Venezuela. This makes Colombia even more reliant on US trade relations. At the same time, there is concern about the impact of the US-China trade dispute on investments from both countries into Colombia.

Regional Integration is perceived with higher impact and higher uncertainty, reflecting strained relations with neighbouring Venezuela. The influx of migrants fleeing Venezuela into Colombia is defined by President Ivan Duque Marquez as "the most horrendous migration crisis in Latin America's recent history." At the 2019 United Nations Climate Action Summit, the Colombian President appealed for a next phase in the partnership with the US to manage growing regional challenges and enable economic development.

Exchange Rates are perceived with much higher impact this year. Since 2014, Colombia's economy has been struggling following the collapse of oil prices. Up until then, the petroleum industry generated a fifth of government fiscal revenues, 5% of GDP and the majority of export income. More recently, drilling operations for oil and gas have picked up and licensing rounds are being run for the first time in 5 years. Exchange rates will be crucial to define the potential for economic recovery from restored oil production.

ACTION PRIORITIES

Innovative Transport remains consistent as an Action Priority, with the steady rollout of government initiatives to introduce nearly half a million EVs in the market over the next decade. Recent developments include the completion of the country's first charging station for electric vehicles and the 2019 release of Eolo, a wind-powered electric car which is 100% designed, developed and built by Colombian engineers.

Energy Efficiency also maintains the same level of impact and persists as an Action Priority. Recent years have seen the implementation of the Programmes for Efficient and Rational Energy Use (Proure). The Mining and Energy Planning Unit (UPME) expects an increase of nearly 52% in energy demand between 2016 and 2033. Energy efficiency is seen as a way to improve energy security along with the effort to diversify energy sources.

Digitalisation is seen with higher uncertainty but remains an Action Priority. The importance attributed to this issue follows progress towards renewables integration and energy efficiency measures. Still, laws and projects that have been put forward seem to revolve around the need to increase savings with less focus on digital solutions to improve performance and encourage 'prosumer' engagement. A key challenge is the difference in pace between technology development and regulatory adaptation, which is comparatively slow

CRITICAL UNCERTAINTIES

Energy Subsidies become the top uncertainty. In 2019, the government announced an end to fuel subsidies as part of public spending cuts agreed with the International Monetary Fund in return for a loan. Eliminating subsidies was part of the country's plan to shore up Ecuador's flagging economy. The government has agreed to restore fuel subsidies in a deal with indigenous leaders to end mass protests that brought the capital, Quito, to a standstill in October 2019. A targeted subsidy plan is being considered to benefit low-income households.

Trade Barriers are perceived with lower uncertainty but still with high impact. After a decade of protectionism, the new government (2017) has sought more trade flexibility without destabilising the dollarized economy. Ecuador has used the US dollar as its currency since 2000, which helps to contain inflation but does not make the country competitive in relation to neighbouring countries. Trade policy reforms are of concern to investors in energy infrastructure.

Innovative Transport remains a Critical Uncertainty, closely linked to fossil fuel reform, abundant 'cheap' hydroelectricity and the need to modernise urban mobility. Quito has the country's first metro system and the first tram system, Cuenca, under construction. Electricity availability makes the country a strong candidate for electromobility solutions. Uncertainties remain for private users and road transport on EV technology maturity, charging infrastructure and additional grid reinforcements.

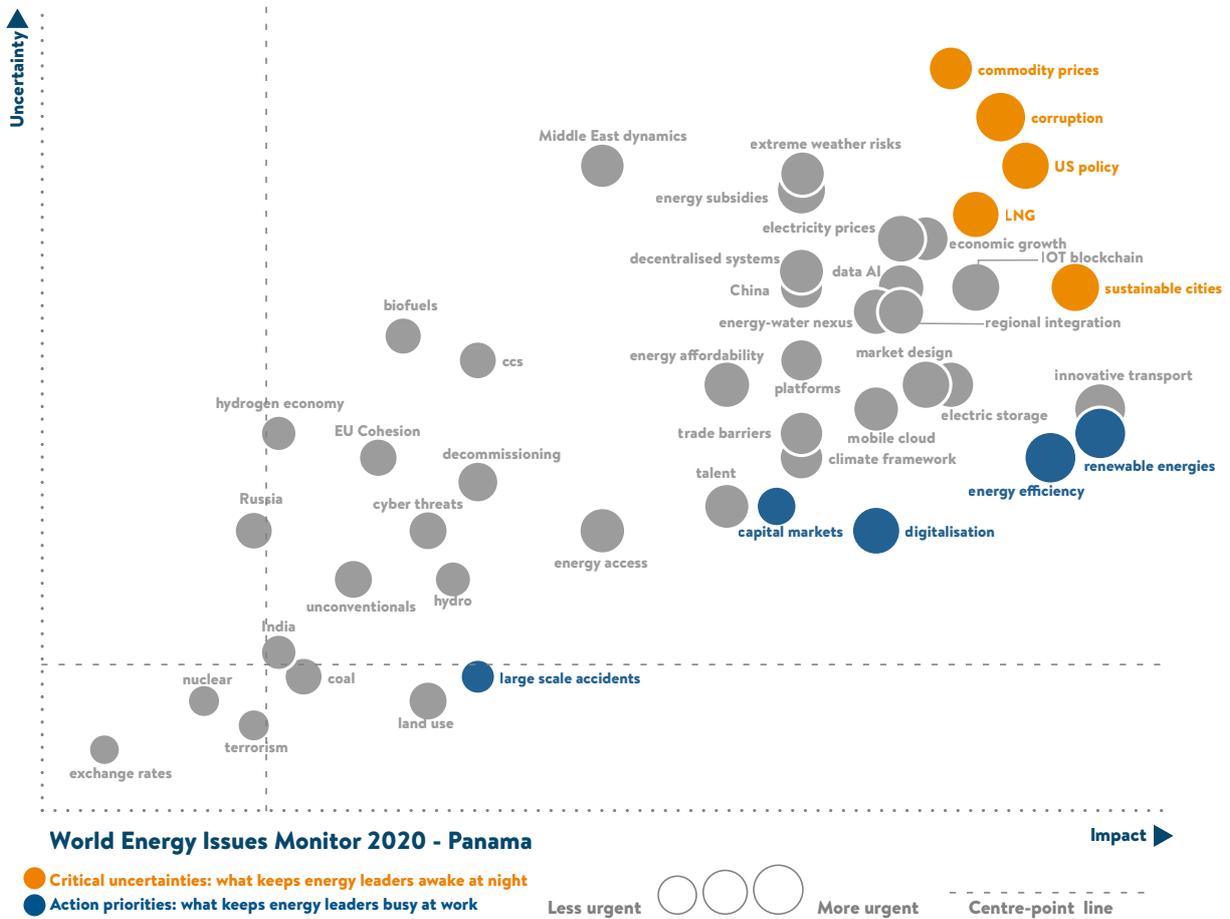
ACTION PRIORITIES

Hydropower remains as an Action Priority as the country seeks to make the most use of its oversized electricity generation infrastructure. Ecuador has installed capacity of 7.1GW (2/3 of which is hydro) while peak demand barely reaches 3.5GW. Exporting electricity to neighbours (Colombia and Peru) and expanding interconnection capacity could be a game-changer for the Andean interconnected power system. Ecuador aspires to become a regional electricity exporter and is looking to diversify its renewables mix. In July 2019, bidding processes were launched for solar PV (200 MW) and wind (102 MW).

Electricity Prices become an Action Priority as the country seeks to harmonise its power costs structure and adapt it to a new generation system that relies on low marginal cost hydropower. Ecuador has one of the region's lowest electricity prices for industry and residential sectors (on average 10 US cents/kWh). Although prices are unlikely to fall further, low cost electricity emerges as an investment opportunity for energy-intensive industries.

Energy Access appears as an Action Priority, even as the country enjoys a 97.05% access rate. The rural population is still behind, with access lagging at 89%. The Government has a National Rural Electrification Program which has been supported by the IDB since 2009. This programme is designed to widen and improve electricity access in rural areas. This will allow households to replace cooking with LPG which has a high leakage and accident risk due to poor ventilation in dwellings.

PANAMA



NATIONAL OVERVIEW & CONTEXT:

Comparing the results of 2019 and 2020, Panama’s Critical Uncertainties continue to be dominated by the LNG market, but indicates growing attention to sustainability and innovation issues. The Action Priorities section is led by Renewables and continues to be driven by decarbonisation and digitalisation trends.

CRITICAL UNCERTAINTIES

LNG remains a Critical Uncertainty. In October 2019, AES initiated commercial operations of the liquefied natural gas hub at the AES Colón plant. The LNG storage facility and combined cycle power plant is expected to position Panama as the natural gas hub for the Central American region. At the same time, the construction of two major LNG power plants with a combined installed power capacity of approximately 1000MW has experienced significant delays. This has put supply contracts on hold, causing uncertainties in the electricity market. In this scenario, no medium and long-term PPAs can be offered as this would lead to an over-contracting of electricity supply.

Commodity Prices emerge with the highest level of uncertainty, reflecting the impact on electricity prices caused by delays in the construction of two LNG power plants and the above-mentioned consequences which are indirectly related to delays.

Sustainable Cities rise in uncertainty with the country's capital as the focus of attention. Panama City hosts 46% of Panama's population but it occupies only 4% of the territory. High population density and a lack of planned urban growth highlight the importance of sustainability for the city's energy agenda. Recent strategies to address the issue include an electric mobility strategy with UN Environment and EU support to reduce pollution.

ACTION PRIORITIES

Renewable Energies are seen with lower uncertainty. Today Panama relies heavily on fossil fuels, which historically have accounted for about two-thirds of total primary energy supply. Until recently, the national transport sector was almost entirely dependent on oil and petroleum products. Panama's National Energy Plan 2015-2050 aims for renewables to make up 70% of its energy supply. Challenges revolve around the current power market model, which favours conventional fuel sources.

Energy Efficiency remains an Action Priority with higher impact. Multiple policies on energy efficiency are being implemented, such as the Sustainable Building Regulation that was put in effect in July 2019. The Panamanian energy efficiency technical standards and labelling for A/C, fridges and motors will start to be enforced from January 1, 2020.

Digitalisation enters the Actions space, reflecting perceptions around a recent re-focus of the country's approach to technology development proposed by the new administration. The government defines energy as one of the target areas for a technology review. The state-owned transmission company ETESA leads the way, having incorporated intelligent tools such as drones with advanced data and image processing software to improve network stability

Assessing The Energy Agenda for the Middle East & the Gulf States





CRITICAL UNCERTAINTIES

IoT/Blockchain is seen as an issue of greater uncertainty in a region where national grids tend to be centralised. This is likely to change as renewable technologies expand and systems are decentralised. Off-grid solutions offer possibilities of access in a country like Lebanon, which suffers from acute power shortages because of damage to the national grid. However, blockchain has not yet taken off.

Data AI also emerges as a Critical Uncertainty. While the technology is seen as a means of enhancing energy access and affordability, the risk of cyber-attacks is a concern. The use of drones to attack strategic targets in Saudi Arabia is an example of how technology can be seen as a threat. Growth in the Middle East's digital market has exposed several countries to cybercrime.

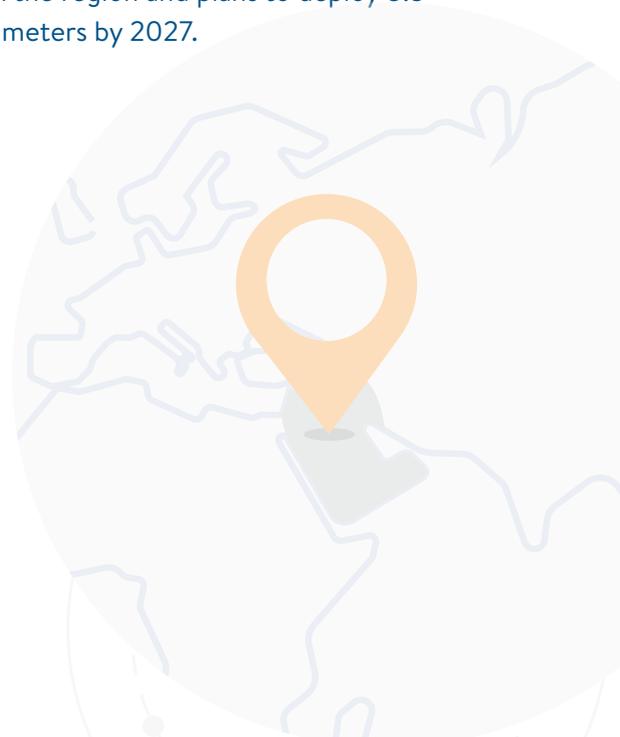
Sustainable Cities also appear as a Critical Uncertainty. Across the region, there is a push towards renewable forms of energy and less dependence on fossil fuels for power generation. This has prompted action to design sustainable cities with a particularly focus on heating and cooling systems. The effort uncertainties exist around technology maturity and infrastructure.

ACTION PRIORITIES

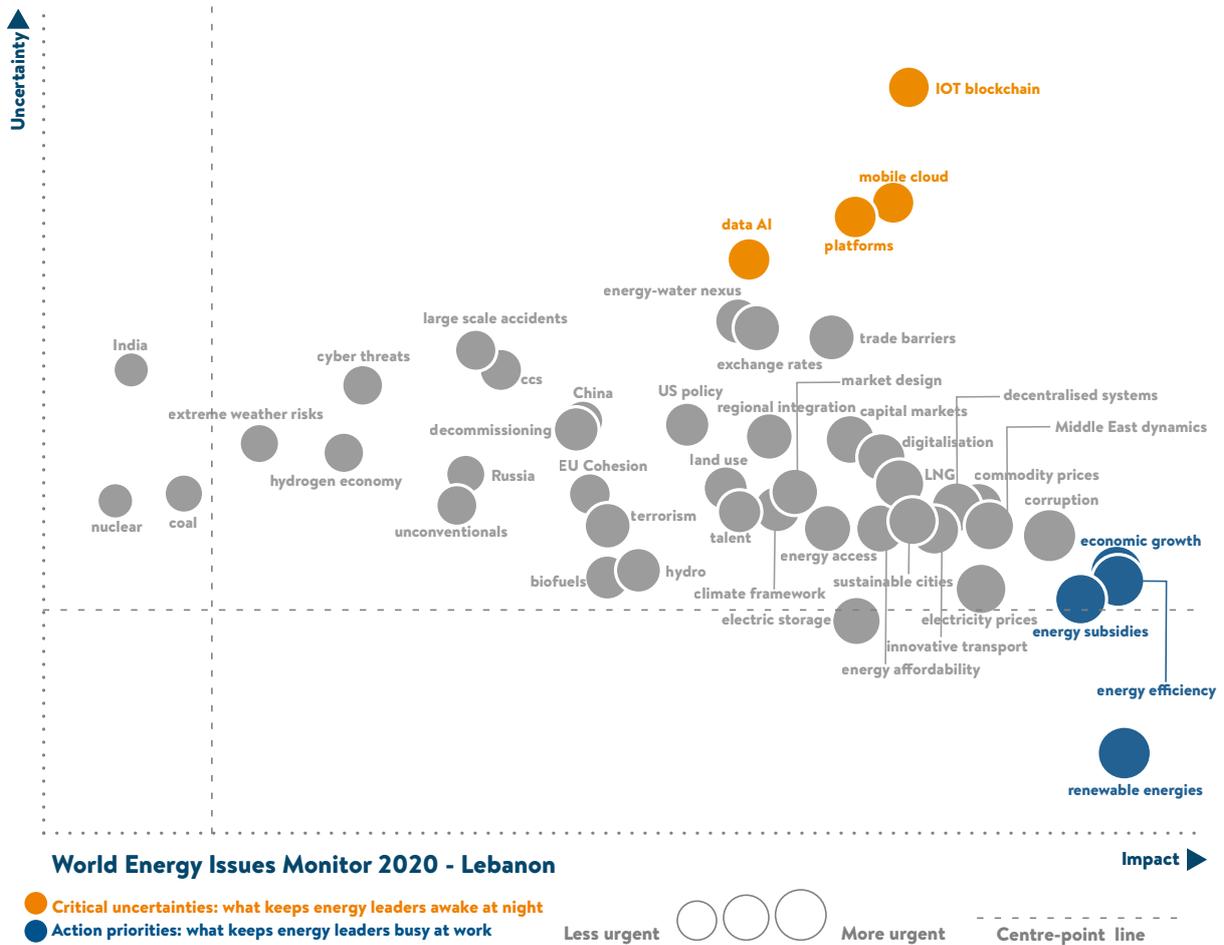
Renewable Energies remain an Action Priority and are seen having greater impact. This is due to the stepped-up deployment of renewable technologies in several countries in the region. The UAE leads the way through deployment of large-scale solar PV and CSP at highly competitive prices. Saudi Arabia plans to generate 9.5GW of electricity from solar and wind by 2023. The seven members of the Gulf Cooperation Council (GCC) had 146GW of installed capacity in 2017 or which renewables accounted for less than 1%.

Energy Efficiency remains an Action Priority but moves closer to the uncertainties section. Subsidised energy prices encourage higher consumption in a region where fossil fuels still dominate the energy mix. Saudi Arabia and the UAE have introduced efficiency standards for electrical appliances but there are no standardised energy efficiency codes in several countries.

Digitalisation is perceived as an Action Priority. Several governments in the region are implementing subsidy reforms and investing more in modernising their energy systems. This is being achieved in some instances through collaboration between local utilities and technology firms. Saudi Arabia is set to become the largest smart grid market in the region and plans to deploy 8.3 million smart meters by 2027.



LEBANON



NATIONAL OVERVIEW & CONTEXT:

Comparing the results from 2019 and 2020, Lebanon’s Critical Uncertainties section is led by innovation issues rather than geopolitical ones. The Action Priorities section indicates consistency around the sustainability approach for sector development

CRITICAL UNCERTAINTIES

IoT/Blockchain emerges in the Critical Uncertainties section as the technology is gaining more attention as an instrument to enhance energy access and affordability. A shared solar energy system was piloted by the UNDP ‘Village 24 Initiative’, first implemented in the municipality of Qabrikha. The test led to a substantial reduction of electricity costs, but uncertainties remain regarding the role of the national utility and how to coordinate a transition to a more decentralised energy system.

Mobile Cloud and Platforms enter the high impact and high uncertainty section for the first time in Lebanon. This is an indicator that the country is moving towards digitalisation. However, as of yet, there are no set initiatives or implemented projects to showcase the extent of their feasibility.

Data AI is also seen with higher impact, confirming a year of critical attention to innovation issues. Digital platforms are expected to have a high impact on the energy sector and are considered as an area that must be addressed urgently to help improve the current energy situation. Both the public and the private sector are looking into these types of projects and studying their potential.

ACTION PRIORITIES

Renewable Energies remain a key Action Priority, as underlined by the government’s increased ambition to source 30% of electricity and heat from renewable energies by 2030. Tenders for the competitive procurement of solar PV projects and wind farms, each coupled with electricity storage capacity, are currently being auctioned. Given Lebanon’s challenges with regards to under-capacity and high import dependence, renewables are considered as a resilience tool to enhance the demand-supply balance and diversify the energy mix.

Energy Subsidies are seen with reduced uncertainty. Oil products are traditionally highly subsidised in Lebanon, reinforcing concerns around their impact on the state budget, climate and welfare. The 2019 popular protests have further enhanced the urgency for action around issues related to the national economy. Currently, subsidies mainly support the operations of the national utility, but parallel developments towards decentralisation, decarbonisation and digitalisation are creating a new set of needs and priorities around this issue.

Economic Growth moves from Critical Uncertainty to Action Priority. A ‘Vision for Stabilization’ was presented in April 2018 as an attempt to address economic growth, create productive jobs and alleviate the burden of reforms on communities. Recent actions include the issuance of about US\$2 billion worth of foreign currency bonds aimed at recovering hard currency and improving the investment landscape

Assessing The Energy Agenda for North America





CRITICAL UNCERTAINTIES

US Policy is perceived with the highest uncertainty and impact in the region. Mexico, the US and Canada are strong energy trade and investment partners. As the three countries continue to call for a continuation of existing relations, uncertainty emerges from the restructuring of trade agreements which, at the time of this survey, were still unsettled. While the United States-Mexico-Canada Agreement (USMCA) provides a framework for greater energy investment and stronger private sector engagement across the region, it has been pending ratification since 2018 over the need to reach full consensus on its terms.

Economic Growth is seen with greater impact and becomes a Critical Uncertainty for North America. On the one hand, this view reflects the uncertainty around regional trade relations as they are restructured. On the other hand, it points to concerns around the impact of the US-China trade dispute on investments from these two countries in the region. It also highlights the attention to the effects of new trade dynamics on the price of technology imports and their implications for competitiveness and growth within the energy sector.

Commodity Prices are perceived as a Critical Uncertainty, also reflecting concerns on the effects of US-China trade relations on energy engagements in the region. At the time of this survey, a 5% tariff on US crude oil shipments had been imposed by China, on top of a 25% tariff on US LNG since 2018. China's crude oil imports from the US have also halved year-on-year according to Chinese customs data. In December 2019, both sides agreed on terms for the first phase towards a trade agreement.

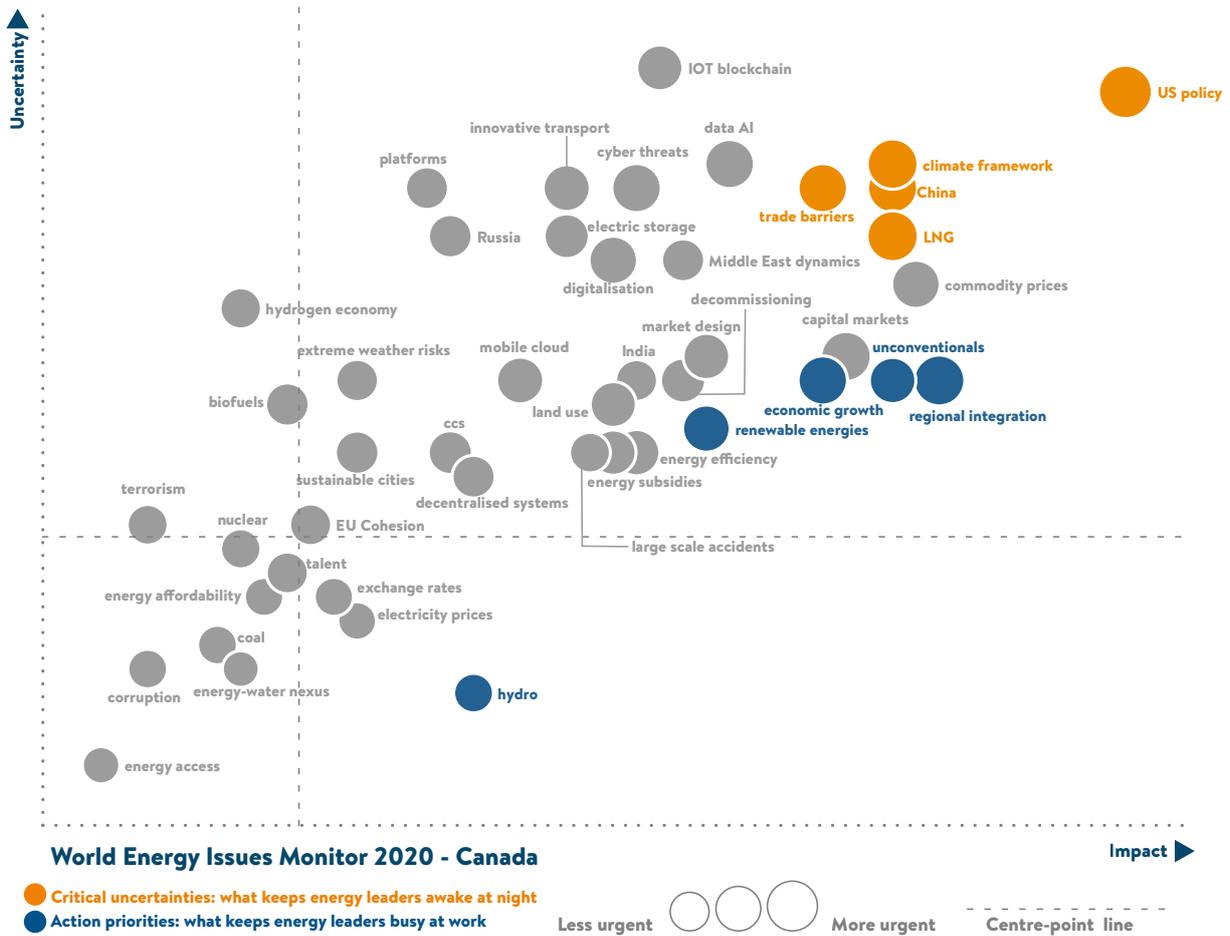
ACTION PRIORITIES

Energy Efficiency is seen with reduced uncertainty and leads the Actions section, as efficiency plans are being implemented across the region to meet climate adaptation targets. Since 2016, Mexico's Energy Conservation Code for Buildings provides guidance for promoting building efficiency in its expanding urban centres. Launched in 2019, Canada's Energy Manager Program will provide \$3.1 million to public and private organisations aimed at reducing energy use, operating costs and greenhouse gas emissions. In the US, 30 out of 50 states are voluntarily committed to efficiency goals which are pursued through a mix of infrastructural changes, federal appliance standards and enhanced building codes.

Renewable Energies continue to be seen as an Action Priority but with higher uncertainty. Canada's wind power capacity has been growing steadily in the last 10 years. In the United States, the consumption of nonhydroelectric renewable sources more than doubled from 2000 to 2018, following state and federal government requirements and incentives. In Mexico, the liberalisation of the energy sector and the implementation of carbon credits have accelerated investment in solar and wind. The increase in uncertainty reflects concerns on the possibility of policy changes which may disrupt the pace of growth in this sector.

Unconventionals enter the Actions section with higher impact, reflecting perceptions around the exponential growth of shale oil and gas production in the US and Canada, and the positioning of the region as a lead exporter on the global energy stage

CANADA



NATIONAL OVERVIEW & CONTEXT:

Contrasting 2019 and 2020 results, Canada’s energy leaders continue to see uncertainty around Energy Geopolitics related to US Policy and China. In addition, LNG and Climate Framework enter the Uncertainties section with increased impact. Actions continue to revolve around Economic Growth and Renewables together with Regional Integration. Unconventionals also enter the Action Priorities section with higher impact.

CRITICAL UNCERTAINTIES

US Policy continues to lead the Uncertainties space as the ratification of the US-Mexico-Canada Agreement struggles to reach a final settlement. The energy markets between the three countries are strongly intertwined, making the continuation of trade relations an important aspect of energy security and economic growth in the region. Today, Canada is the second-largest importer of energy from the US, in terms of trade value, while energy accounted for 26% of the value of all US imports from Canada in 2018, according to the US Energy Information Administration (EIA).

LNG is perceived as having increased impact, reflecting perceptions around the construction of a US\$40 billion LNG Canada terminal in Kitimat, B.C., due to be completed by 2024. The project is supported by Canada's federal government to diversify their country's natural gas customer base away from the US. This is the single-largest investment in the country's history and is expected to create nearly 10,000 jobs once fully operative. Current challenges include regulatory hurdles to enable a flourishing LNG sector.

Climate Framework is also seen with greater impact and becomes a Critical Uncertainty, as the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change faces challenges at the provincial levels. The plan aims at a 30% reduction below 2005 levels of GHG emissions by 2030. Current hurdles include resistance to a mandatory federal carbon pricing system among some provinces.

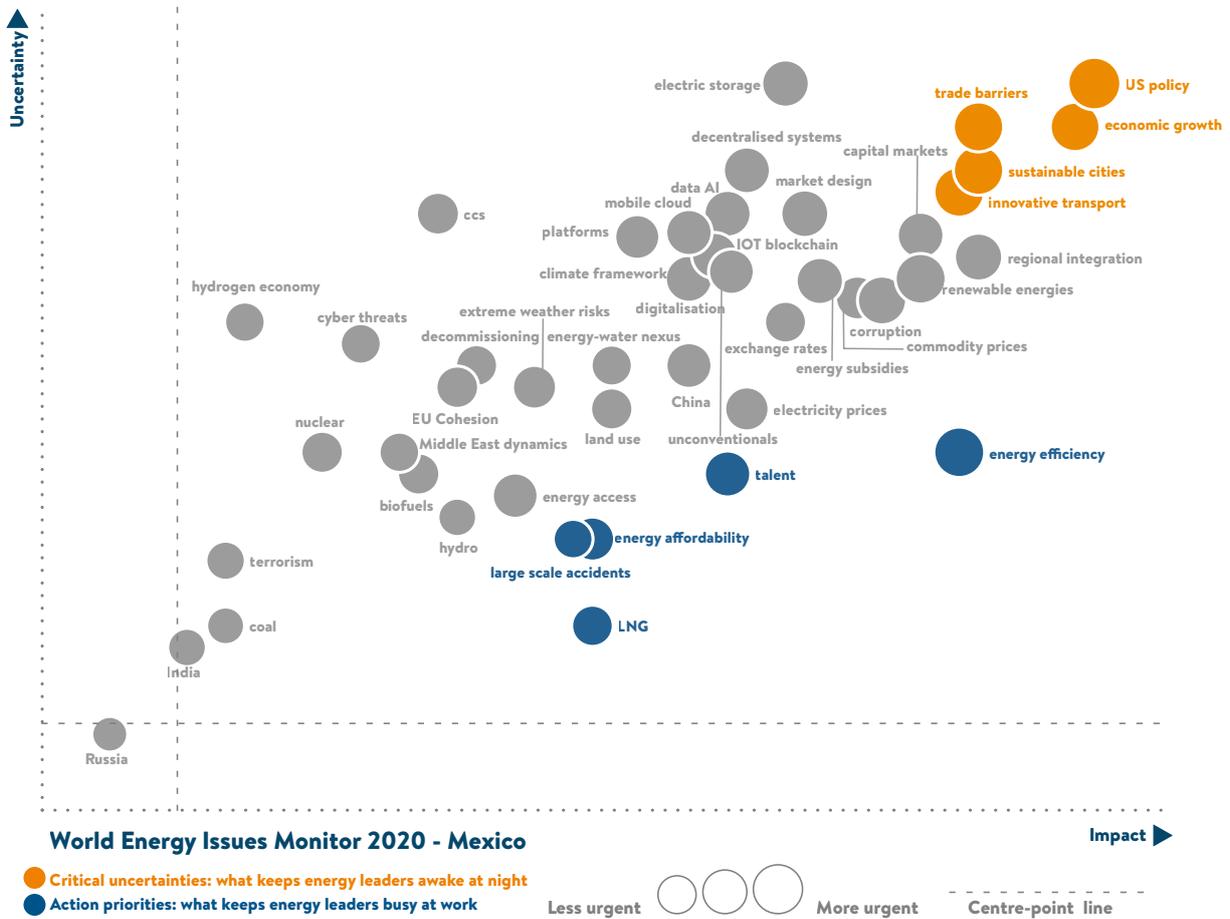
ACTION PRIORITIES

Regional Integration is perceived with reduced uncertainty as an Action Priority, reflecting perceptions around the development of Canada-US-Mexico energy relations in recent years. As the US emerged as the world-leading oil producer, Mexico reformed its energy industry and Canada increased its oil production, the scope of energy and trade investment relations in the region has further expanded. The Energy Chapter of the USMCA (yet to be ratified) provides a predictable framework for continuous expansion of energy trade, including zero tariffs on energy products, new pipeline infrastructure, among others.

Unconventionals are seen with reduced uncertainty and higher impact. Although production of conventional natural gas in Canada has been declining, unconventional natural gas production has been increasing in the country. In 2018, Canada was the fourth-largest gas producer behind the United States, Russia, and Iran, according to the EIA. The increased impact around this issue reflects how opportunities are perceived as the country builds LNG infrastructure to enhance its gas export market.

Economic Growth continues to be perceived as an Action Priority. According to Canada's Ministry of Natural Resources, in 2018 the country's energy sector directly employed over 269,000 people and indirectly supported over 550,500 jobs. Canada's energy sector accounts for over 11% of nominal GDP and was responsible for \$14.1 billion of government revenues in 2017

MEXICO



NATIONAL OVERVIEW & CONTEXT:

Comparing 2019 and 2020 results, Mexico’s energy leaders depict an energy landscape with more uncertainties revolving around a mix of macroeconomic, geopolitical and technology issues. On the other hand, Action Priorities issues are seen with lower impact, with a clear vision for Energy Efficiency as the primary focus.

CRITICAL UNCERTAINTIES

US Policy is perceived with greater uncertainty and is closely associated with Economic Growth. The new United States-Mexico-Canada Agreement (USMCA) signed in 2018 is still pending ratification. The agreement lays the foundations for a liberalised energy sector with strong focus on private investment and economic growth. Given the importance of US investment in Mexico's energy industry, uncertainty emerges around the possible impact of parallel dynamics (such as the migration settlement) on trade relations.

Sustainable Cities appear with higher impact. Urban centres in central Mexico account for the majority of the overall population and are faced with challenges including water availability, air pollution, waste, land consumption and loss of green areas. Grassroots initiatives and innovative private sector projects such as the 'Smart Forest City Cancun' continue to flourish, envisioning a transition to higher urban sustainability. Yet, insufficient public policies towards sustainability have increased uncertainty on this issue.

Regional Integration moves up towards the Uncertainties section, reflecting perceptions of regional negotiations on investment relations and migration policies. Energy is a central topic as most countries in the region are faced with environmental challenges that contribute to migration flows. In late 2019, Mexico became the largest single source of migrants in Central and South America, Africa and Asia, adding even greater complexity to integration negotiations.

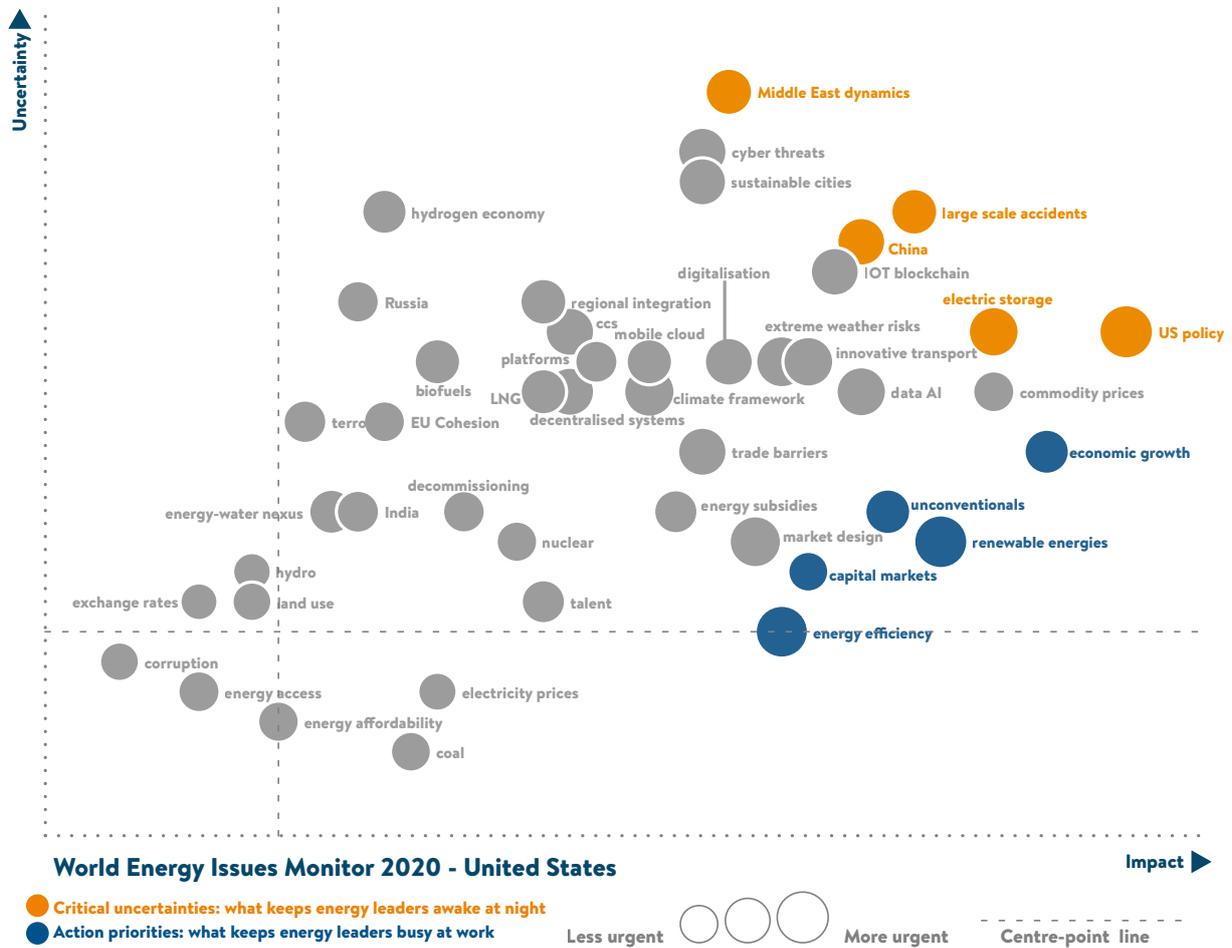
ACTION PRIORITIES

Renewable Energies also leaves the Action Priorities section at a higher level of uncertainty amid changes in the sector's governance. These include changes in regulation for clean energy certificates which now allow power hydro plants built before 2014 to obtain clean energy credits. For the moment, a judicial order has suspended the implementation of this procedure. Uncertainty also emerges from the cancellation of power auctions, which affects investors' confidence in the renewables space.

Energy Efficiency is perceived with a very high impact compared to other Action Priorities. In the last decade, primary energy intensity has fallen by 10.1% and the final energy consumption intensity has decreased at an annual rate of 1%. The decoupling of GDP growth and national energy consumption has been observed since 2013. The main factor for these variations was the implementation of energy efficiency regulations for energy-intensive equipment and systems used in the domestic and industrial sectors.

Talent is seen with less uncertainty and enters the Action Priority area. In the present decade, significant effort has been made in the development of human resources for the energy sector. As a result, conventional energy industries have attracted young dynamic qualified personnel and new energy areas such as the renewables sector. In addition, new companies have been created to respond to the growth of competitive markets

UNITED STATES



NATIONAL OVERVIEW & CONTEXT:

The United States’ energy leaders profile an energy landscape where uncertainties are primarily defined around energy geopolitics and regional issues, followed by attention to macroeconomic risks. Action Priorities clearly build around energy technologies together with a focus on economic growth.

CRITICAL UNCERTAINTIES

Middle East Dynamics appear with the highest uncertainty, although with medium impact. While perceptions are clearly influenced by uncertain Middle East geopolitics and shifting alliances, price spikes from attacks on production or shipping have been short lived with rapid recovery and robust supplies from elsewhere, most notably with the US' re-emergence as a significant oil and gas producer and exporter that have helped reduced their impact. But the Middle East region remains an important contributor to global energy supply and policy changes can change supply-demand balances with implications for the global economy as well as for US the economic and energy security interests.

Electric Storage is also identified as a Critical Uncertainty, as utility-scale battery storage units steadily enter the US market. The EIA reports that operating utility-scale battery storage power capacity has more than quadrupled from the end of 2014 (214 MW) through March 2019 (899 MW), where California, Illinois, and Texas accounted for nearly half of the total storage capacity. This progress is a result of a mix of state and federal regulations promoting storage use, as well as increasing competitiveness of this technology.

China is perceived with high uncertainty and high impact, reflecting perceptions on the on-going trade contest between the two countries. In 2019, China imposed additional tariffs on US crude oil for the first time, as well as a 25% duty on US LNG. In addition, the US government has expanded tariffs on Chinese imports, including renewables technologies. Uncertainty revolves around the impact of tariffs on investments, and especially on wind and solar construction costs.

ACTION PRIORITIES

Economic Growth is seen as the most impactful of the Action Priorities. Views are strongly associated with China trade relations, and their impact on raising import costs and on business competitiveness. Federal actions include multiple interest rates cuts by the US Central Bank aimed at reducing the cost of borrowing and stimulating business activities and economic growth.

Renewable Energies are also seen as an Action Priority. In the first half of 2019, wind and solar together accounted for approximately 50 percent of total US renewable electricity generation, overtaking hydro as the main renewables source. The consumption of biofuels and other non-hydro renewable energy in the country has more than doubled between 2000 and 2018, responding to state and federal government incentives. The EIA projects that US renewable energy consumption will continue to increase through 2050.

Unconventionals appear as the third actionable issue. Today, the US exports 25 percent of its oil output and a growing percentage of natural gas. According to the EIA, most of the production increases since 2005 are the result of horizontal drilling and hydraulic fracturing techniques, notably in shale and other tight geologic formations. In 2018, US dry natural gas production was about 2% higher than the country's total natural gas consumption. Production growth ran at a pace of roughly 3% in 2019, though estimates suggest a slight slowdown for 2020

CRITICAL UNCERTAINTIES

US Policy is seen as a critical uncertainty, reflecting perceptions the 2020 election cycle and the seemingly growing partisanship in US politics. While the US is pushing forward with the energy transition at state level, there is a significant difference not only in the policy approaches of Republicans and Democrats but even between the Democratic presidential candidates in relation to energy matters. It is unclear how this will develop in 2020 and whether there will be more clarity or a shift to a less-conventional, pro-renewable, Federal Government.

Market Design moves from the Action Priorities to the Uncertainties section, as renewables become more competitive without subsidies and their market penetration expands. There is a sense of ambiguity as to how regulators will manage both large scale intermittency on the supply side and increasing involvement of consumers on the demand side.

Commodity Prices are also identified as a Critical Uncertainty because of concerns about how markets will evolve in the changing energy landscape. There expectation that demand for oil will peak by the end of the decade and lead to a change in both the oil market's price structure and the future energy mix.

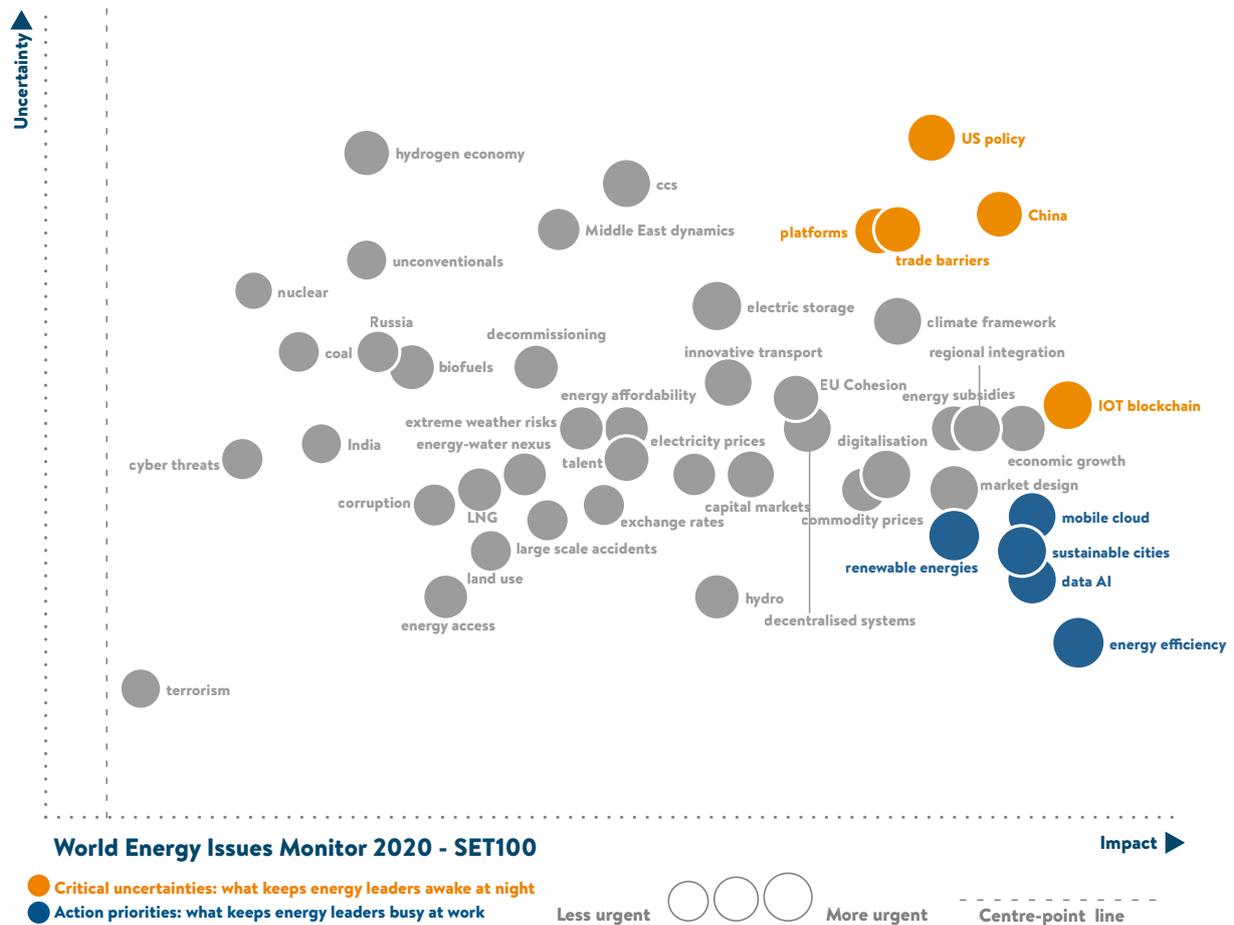
ACTION PRIORITIES

Energy Efficiency remains an Action Priority for FELs. In this, FELs are aligned with industry leaders while also recognising the value of continued development of energy efficiency mechanisms as one of the lowest cost options for decarbonisation.

Renewable Energies are also perceived by the Future Energy Leaders to be a central Action Priority in the energy transition.

Energy Efficiency and Renewable Energies occupy similar spaces for the first time in the FELs Energy Issues map. The FEL community is unanimous in its view that these issues will be top Action Priorities in coming years, with other low uncertainty/high impact issues falling significantly back in their perceived impact. For example, Climate Framework and Talent continue to be important Action Priorities for FELs but to a much smaller degree.

ASSESSING THE ENERGY AGENDA FOR THE ENERGY INNOVATORS (SET100)



OVERVIEW & CONTEXT

The Start Up Energy Transition (SET) is a global platform supporting innovation in energy transition. It brings together the most outstanding international start-ups in the field of energy transition with key stakeholders in the energy sector including investors, industry leader incumbents, media and government. Each year, the Start Up Energy Transition Award selects the Top 100 list (#SET100) of international start-ups working on ideas affecting global energy transition and climate change. This map provides the perspectives of 87 start-ups, reflective of a total of 570 applicants for SET2020. The SET platform is powered by the German Energy Agency (dena) in cooperation with the World Energy Council.

CRITICAL UNCERTAINTIES

US Policy and China are seen as issues of high uncertainty. The trade dispute between the U.S. and China and policy shifts from both sides has been a matter of concern in relation to its potential impact on international trade and energy and commodity markets. Another area of uncertainty for energy start-ups concerns China's AI industry and whether it will build on an open system that is integrated into the global market.

Trade Barriers are also perceived as a Critical Uncertainty. Protectionism is weighing on sentiment in the start-up community because of their potential impact on global trade and the economy. The imposition of tariffs by the U.S. and China on a number of imported goods and the possibility of further action by each side if the trade dispute is not resolved fully also weighs on the minds of start-ups. The trade dispute between the U.S and China has been one factor in the decline in oil prices because of fears of a slowdown in demand from China, the world's biggest importer of crude oil, moving oil markets with higher (European Central Bank, 2019).

IoT/Blockchain is identified as the highest impact issue among Critical Uncertainties. The main concern revolves around risks associated with IoT/Blockchain technologies, such as the risk of cyber-attacks, the potential for data manipulation, storage requirements, high energy use and the inefficiency of some existing systems. Despite the downsides, a number of industries are getting to grips with the advantages and disadvantages of blockchain systems. The next few years will likely see businesses and governments experimenting with new applications to find out where blockchain technology adds the most value.

ACTION PRIORITIES

Energy Efficiency is seen as an issue of high impact and low uncertainty. Policy makers around the world are increasingly passing legislation to support energy efficiency measures, which is encouraging for stakeholders and innovators.

Data AI is seen as an Action Priority. AI's potential is being unlocked by the generation of big data and increased processing power. In the energy sector, AI can enable fast and intelligent decision making, leading to increased grid flexibility and integration of VRE. However, it can also be a double-edged sword as along with its benefits, it can , can also be abused, which could result in s privacy violations, accidents, and manipulation for political gain (IRENA, 2019).

Sustainable Cities is also among the SET100's Action Priorities. Decision makers appear to be increasingly of the view in approving projects that would make cities more liveable and sustainable, thereby making their inhabitants healthier, happier and more connected to nature. This emerging consensus may encourage higher investment in green projects.

Issues Monitor Methodology



ISSUES MONITOR METHODOLOGY

The Council’s Issues Monitor Survey identifies the strategic energy landscape of specific countries and regions in the world, through an analysis of 42 energy issues and 4 digitalisation-specific 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 represents the participation of over 3,000 energy leaders from 104 countries.

The Issues Monitor uses three questions/dimensions to assess the issues:

1. **Impact** – How strong do you perceive the potential impact of the issue (e.g. nuclear) to be on the energy sector in your country? This impact may be positive or negative.
2. **Uncertainty** – How unsure are you about the selected issue in terms of its impact on the energy transition?
3. **Urgency** – How soon do you think the energy sector in your country needs to react to the issue?

The survey rates each issue for each of the three questions using the range of low (1), medium (2) and high (3) and designates a number for each, respectively. Once all Issues Monitor Survey responses have been collected, then the process of generating maps can begin

Figure A: Issues Monitor Survey PDF

SECTION A – The Issues Survey For explanations of issues, hover mouse over the issue or refer to the final page for further description.	How strong do you perceive the potential IMPACT of the issue to be on the energy sector in your country?			How UNCERTAIN are you about the impact of the issue?			URGENCY – How urgent is the issue in your country?		
	High	Med	Low	High	Med	Low	Very Urgent	Urgent	Not Urgent
Macroeconomic Risks & Vulnerabilities									
Global climate framework agreement	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Large-scale accidents	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic growth	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capital market access	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Energy & commodity prices	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Electricity prices	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Exchange rates	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Energy-water-food nexus	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Land availability	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Talent	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Energy access	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy affordability – households	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Extreme weather risks	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cyber threats	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corruption	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Terrorism	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

NATIONAL MAPS

The methodology for generating country maps involves taking the weighted average of the number of responses from that country and the strength of those responses to each of the three dimensions (impact, uncertainty and urgency).

For instance, for country X, the number of responses collected is 128. A sample of the IMPACT responses is shown below

Table 1: Impact

Issues	What is the Impact?			
	Low	Medium	High	Total
Climate framework	5	47	76	128
Large scale accidents	50	49	29	128
Economic growth	8	70	50	128
Capital markets	38	62	28	128
Commodity prices	9	50	69	128
Electricity prices	16	46	66	128
Exchange rates	71	47	10	128
Energy-water nexus	68	48	12	128
Land use	44	57	27	128
Talent	24	54	50	128
Energy access	89	22	17	128
Energy affordability	57	56	15	128

Table 2: Uncertainty

Issues	How Uncertain is the overall impact of this issue?			
	Low	Medium	High	Total
Climate framework	42	59	27	128
Large scale accidents	55	50	23	128
Economic growth	49	66	13	128
Capital markets	64	56	8	128
Commodity prices	44	64	20	128
Electricity prices	50	60	18	128
Exchange rates	68	51	9	128
Energy-water nexus	66	50	12	128
Land use	65	55	8	128
Talent	44	67	17	128
Energy access	95	26	7	128
Energy affordability	71	48	9	128

Table 3: Urgency

Issues	How Urgent is this Issue?			
	Low	Medium	High	Total
Climate framework	9	33	86	128
Large scale accidents	40	52	35	128
Economic growth	19	58	51	128
Capital markets	36	50	42	128
Commodity prices	19	46	63	128
Electricity prices	15	48	65	128
Exchange rates	44	58	26	128
Energy-water nexus	51	61	16	128
Land use	54	57	17	128
Talent	12	54	62	128
Energy access	79	34	15	128
Energy affordability	57	48	23	128

Once this data is received and categorised, weightage is given to the strength of responses as follows:

- Low – 1
- Medium – 2
- High – 3

The overall score for a particular issue for each dimension is then calculated using the weighted average method as follows (using impact as an example):

Dimension: IMPACT

Overall score (e.g. for energy-water-nexus issue) =

$$\frac{[(\text{No. of responses indicating low strength} * 1) + (\text{No. of responses indicating medium strength} * 2) + (\text{No. of responses indicating high strength} * 3)]}{\text{Total no. of responses.}}$$

Figure 2: Calculation of Weighted Average Score for Impact Dimension

Issues	No. of Responses				Overall IMPACT Score
	Low	Medium	High	Total	
Climate framework	5	47	76	128	$=((B3*1)+(C3*2)+(D3*3))/E3$
Large scale accidents	50	49	29	128	$=((B4*1)+(C4*2)+(D4*3))/E4$
Economic growth	8	70	50	128	$=((B5*1)+(C5*2)+(D5*3))/E5$
Capital markets	38	62	28	128	$=((B6*1)+(C6*2)+(D6*3))/E6$
Commodity prices	9	50	69	128	$=((B7*1)+(C7*2)+(D7*3))/E7$
Electricity prices	16	46	66	128	$=((B8*1)+(C8*2)+(D8*3))/E8$
Exchange rates	71	47	10	128	$=((B9*1)+(C9*2)+(D9*3))/E9$
Energy-water nexus	68	48	12	128	$=((B10*1)+(C10*2)+(D10*3))/E10$
Land use	44	57	27	128	$=((B11*1)+(C11*2)+(D11*3))/E11$
Talent	24	54	50	128	$=((B12*1)+(C12*2)+(D12*3))/E12$
Energy access	89	22	17	128	$=((B13*1)+(C13*2)+(D13*3))/E13$
Energy affordability	57	56	15	128	$=((B14*1)+(C14*2)+(D14*3))/E14$

Similarly, overall scores are calculated for the other two dimensions. As a result, the following matrix of overall scores for each dimension is formed:

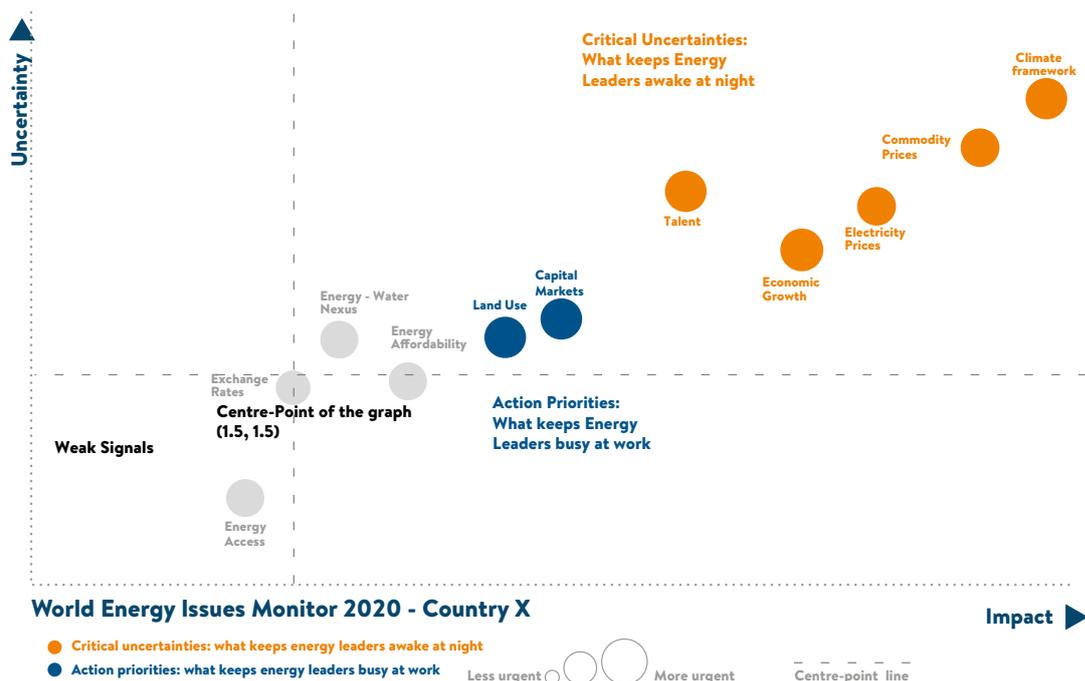
Table 4: Overall Weighted Average Scores for Country X

Issues	Overall Weighted Average Scores		
	Impact	Uncertainty	Urgency
Climate framework	2.55	1.87	2.60
Large scale accidents	1.83	1.73	1.94
Economic growth	2.33	1.71	2.24
Capital markets	1.91	1.54	2.03
Commodity prices	2.47	1.80	2.34
Electricity prices	2.39	1.74	2.38
Exchange rates	1.51	1.50	1.84
Energy-water nexus	1.55	1.54	1.70
Land use	1.86	1.53	1.69
Talent	2.20	1.77	2.38
Energy access	1.43	1.29	1.48
Energy affordability	1.66	1.49	1.71

The Country Map for all 46 issues is plotted with the dimensions denoted as follows:

- X-axis measures Impact
- Y-axis measures Uncertainty
- Z- axis (size of the bubbles) denotes Urgency
- The scale considered for all the 3 axes is 0-3

Figure C: Issues Monitor Map for Country X



- Denotes Action Priorities: What keeps energy leaders busy at work
 - Top 5 issues that have the highest impact on a country (is measured by the distance of the issues from the bottom right coordinate (3,0))

- Denotes Critical Uncertainties: What keeps Energy Leaders awake at night
 - Top 5 issues whose impact on the country is considered most uncertain (is measured by the distance of the issues from the top right coordinate (3,3))

Scaling - Please note that every map for every country has a 3x3 scale with origin as (0,0). The coordinates (1.5,1.5) act as the centre-point of the square matrix. For visual clarity and ease of interpretation, the maps for the countries are zoomed out or zoomed in depending on the range of data points, hence the corresponding shifting of the axes passing through the mid-point of the square matrix. For instance, the largest weighted average score for 'Impact' dimension could be 2.8 and that for 'Uncertainty' dimension could be 1.9. However, this does not imply that data has been adjusted, the scale still remains 3x3.

Further, to compare maps of different countries and a country across time horizons, the centre-point can serve as the reference point. It is also indicative of the difference in spread of data points, in terms of both direction and significance, for different countries. It should be noted that there are no negative values here and the centre-point should not be considered as the origin (0,0).

REGIONAL MAPS

Regional maps are generated using a formula based on total energy consumption, production and national income per capita. This formula is used to create a corresponding weight which will be used to ensure that we have accounted for over and under representation. For instance, country A with a high energy consumption, production and income per capita has submitted a total of 50 responses. Country B with much lower energy consumption, energy production and income per capita has submitted a total of 200 responses. The Issues Monitor methodology ensures that Country A (with higher energy consumption, production and income per capita) has a higher corresponding weightage for its voice in where the specific issue is placed on the map.

The Council also uses this formula to calculate its member country fees. Every year, the data for consumption, production and income are updated to ensure fair and up to date representation. We will use the same weightage as calculated already and they are as follows:

Category	Weightage (W_n)
1	0.143
2	0.286
3	0.429
4	0.572
5	0.715
6	0.858
7	1

Giving different weightage based on energy consumption, production and national income per capita ensure that countries which are prominent in the energy sector have a greater voice and vice versa.

If 5 countries are a part of one region, the overall regional weighted score for a particular issue for each dimension is then calculated using the weighted average method as follows (using impact as an example):

Dimension: IMPACT

Overall scores of each of the 5 countries (Country A to E) for each of the issues will have already been calculated similar to that in Table 4 for country X. To calculate the overall regional weighted score:

Overall score (e.g. for energy-water-nexus issue) =

$$\frac{\sum_{n=1}^{n=5}(\text{Overall Score of Country } n * W_n)}{\sum_{n=1}^{n=5}(W_n)}$$

Figure D: Calculation of Overall Regional Weighted Average Score for Impact

	Country 1 (5 responses, 4 sectors)	Country 2 (12 responses, 1 sector)	Country 3 (23 responses, 8 sectors)	Country 4 (28 responses, 11 sectors)	Country 5 (100 responses, 3 sectors)
	Overall Weighted Average Scores				
Climate framework	2.55	1.75	2.25	2.39	2.41
Large scale accidents	1.83	1.03	1.53	1.67	1.69
Economic growth	2.33	1.53	2.03	2.17	2.19
Capital markets	1.91	1.11	1.61	1.75	1.77
Commodity prices	2.47	1.67	2.17	2.31	2.33
Electricity prices	2.39	1.59	2.09	2.23	2.25
Exchange rates	1.51	1.71	1.21	1.35	1.37
Energy-water nexus	1.55	1.75	1.25	1.39	1.41
Land use	1.86	1.06	1.56	1.7	1.72
Talent	2.2	1.4	1.9	2.04	2.06
Energy access	1.43	1.63	1.13	1.27	1.29
Energy affordability	1.66	1.86	1.36	1.5	1.52

Similarly, overall scores are calculated for the other two dimensions. As a result, the following matrix of overall scores for each dimension is formed-

Dimension Table 5: Overall Regional Weighted Average Scores

Issues	Overall Regional Weighted Average Scores		
	Impact	Uncertainty	Urgency
Climate framework	2.34	1.73	2.43
Large scale accidents	1.61	1.59	1.78
Economic growth	2.11	1.57	2.07
Capital markets	1.70	1.40	1.86
Commodity prices	2.25	1.66	2.17
Electricity prices	2.17	1.60	2.21
Exchange rates	1.35	1.36	1.67
Energy-water nexus	1.39	1.40	1.55
Land use	1.64	1.39	1.55
Talent	1.98	1.63	2.21
Energy access	1.26	1.15	1.36
Energy affordability	1.50	1.35	1.55

The Regional Map for all 46 issues is plotted with the dimensions denoted as follows:

- X-axis measures Impact
- Y-axis measures Uncertainty
- Z- axis (size of the bubbles) denotes Urgency

The scale considered for all the 3 axes is kept 0-3.

Overall Regional Weighted Average Scores
$=((B3*0.25*0.5)+(C3*0.5*0.25)+(D3*0.75*0.75)+(E3*1*1)+(F3*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B4*0.25*0.5)+(C4*0.5*0.25)+(D4*0.75*0.75)+(E4*1*1)+(F4*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B5*0.25*0.5)+(C5*0.5*0.25)+(D5*0.75*0.75)+(E5*1*1)+(F5*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B6*0.25*0.5)+(C6*0.5*0.25)+(D6*0.75*0.75)+(E6*1*1)+(F6*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B7*0.25*0.5)+(C7*0.5*0.25)+(D7*0.75*0.75)+(E7*1*1)+(F7*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B8*0.25*0.5)+(C8*0.5*0.25)+(D8*0.75*0.75)+(E8*1*1)+(F8*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B9*0.25*0.5)+(C9*0.5*0.25)+(D9*0.75*0.75)+(E9*1*1)+(F9*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B10*0.25*0.5)+(C10*0.5*0.25)+(D10*0.75*0.75)+(E10*1*1)+(F10*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B11*0.25*0.5)+(C11*0.5*0.25)+(D11*0.75*0.75)+(E11*1*1)+(F11*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B12*0.25*0.5)+(C12*0.5*0.25)+(D12*0.75*0.75)+(E12*1*1)+(F12*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B13*0.25*0.5)+(C13*0.5*0.25)+(D13*0.75*0.75)+(E13*1*1)+(F13*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$
$=((B14*0.25*0.5)+(C14*0.5*0.25)+(D14*0.75*0.75)+(E14*1*1)+(F14*1*0.5))/((0.25*0.5)+(0.5*0.25)+(0.75*0.75)+(1*1)+(1*0.5))$

GLOBAL MAPS

Similar procedure as that followed while developing Regional Maps is adopted. The global map includes analysis of 104 countries.

PROJECT PARTICIPATION

Africa: South Africa, Nigeria, Kenya, Algeria, Namibia, Cameroon, Côte d'Ivoire, Eswatini, Malawi, Egypt, Botswana, Democratic Republic of the Congo, Zambia, Niger, Uganda, Senegal, Benin, Morocco, Togo, Congo Brazzaville, Djibouti, Guinea, Burkina Faso, Tunisia, Rwanda, Sudan, Chad, Mali, Ghana, Zimbabwe, Burundi, Liberia, Libya, Mauritius.

Asia: Australia, Azerbaijan, China, India, Indonesia, Japan, Korea (Rep.), Mongolia, New Zealand, Pakistan, Singapore, Sri Lanka, Thailand.

Europe: Armenia, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Malta, Monaco, Montenegro, Netherlands, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom.

Latin America & the Caribbean: Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Grenada, Panama, Peru, Uruguay.

Middle East & Gulf States: Kuwait, Lebanon, Oman, Saudi Arabia, United Arab Emirates.

North America: Canada, Mexico, United States of America.

THE 42 WORLD ENERGY ISSUES

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

Energy Geopolitics & Regional Issues

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

Energy Policies & Business Environment

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

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

THE INTERACTIVE ENERGY ISSUES MONITOR TOOL

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

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

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

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 Marzia Zafar by emailing zafar@worldenergy.org

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