

ABOUT

WORLD ENERGY COUNCIL

The World Energy Council is the world's principal independent and 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 premier 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

Published by the World Energy Council 2021

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WORLD ENERGY ISSUES MONITOR 2021

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 12th iteration of the World Energy Issues Monitor is based on insights of more than 2,500 energy leaders in 108 countries to provide 60 national assessments across six world regions. This year's report also asks energy leaders to highlight the priority issues for 2021 and how prepared their country is to handle different risks.

In addition to this report, the [interactive Issues Monitor online tool](#) allows the visualisation of the data that underpins the Issues Maps.

This tool has been developed in collaboration with our Project Partner, ARUP.

World Energy Issues Monitor 2021, published by the World Energy Council.



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BUILDING FORWARD TOGETHER

We are living in turbulent times. The need for rapid and agile sensemaking of faster paced and more disruptive energy developments has never been more vital or challenging.

The key finding of **World Energy Issues Monitor 2021** is that energy leaders everywhere are **grappling with the certainty of much greater economic uncertainty** and there is a **re-alignment in energy leaders' ambitions** to decarbonise energy, secure climate neutrality and avoid climate change catastrophe.

A global energy transition is underway. Many investors are responding to **changing perceptions of 'value' and new sources of value generation**. Large and well-established energy companies are adopting new business models and rebranding. The more agile, digital and customer-centric energy players are growing through the crisis. Competition in energy transition leadership is intensifying, with new and unconventional players entering from beyond the energy industry.

The 'Race to Zero' campaign of the UK-host of this year's UNFCCC COP26 meeting has triggered a new round of national, corporate, and community 'net-zero' agendas. **There is, however, no single 'race to zero'**. There are, in fact, multiple pathways being progressed with tremendous geographical and technological diversity and this 12th World Energy Issues Monitor once again shows that there is no 'one size fits all' in progressing climate neutral and socially just energy transition.

The World Energy Issues Monitor also highlights that energy is not a single-issue agenda and it **is vital to maintain the connections between Planet and People**. The crisis has catapulted millions of people in poverty back into destitution. Energy poverty is on the rise in both developed and developing countries and we will see more evidence of this in the year ahead. Energy justice is an issue in all geographies. **The challenge is to secure more energy and climate neutrality and enable all societies to recover from crisis and flourish together**.

Despite the widespread attention to energy matters, energy literacy is littered with false promises of green energy technology 'silver bullets'. **Technology changes alone will not do the job** and wider implications of large-scale behaviour change, new workforce capabilities and fiscal sustainability are inherent in managing the pace of transition.

ACHIEVING AN AFFORDABLE PACE IN THE MULTIPLE RACES TO ZERO

The post-pandemic outlook raises new questions about **energy affordability and fiscal crisis**. Whilst sudden drops in company cashflow and uncertainty about energy prices are challenging those in the C-suite, there is also awareness of the more precarious economic situation of energy customers, include aging households, industrial manufacturers, and the rural and urban poor in emerging and developing nations.

We need to act urgently to **avoid new patterns of social exclusion with energy 'haves' and 'have nots'**. A common response to the pandemic has been to accelerate the pace of digitalisation in energy, including automating processes and working from home. This has also increased cyber security risk and triggered new concerns about new digital energy services 'haves' and 'have nots', even in developed nations.

Digital capacity and capability have also proven a key enabler in energy access, notably in Africa. Mobile phones, digital payments and mini grids are enabling access to new energy services for remote and rural communities. However, affordability and default on payments can become an issue, even with the cheapest, solar-powered, mini-grid system.

RECOVERY REQUIRES 'BUILDING IN' RESILIENCE AND EXTENDING IT TO PEOPLE AND SUPPLY CHAINS

Responses to the crisis highlight the importance of reliability and resilience. The crisis has **extended resilience concerns beyond critical physical infrastructures to include people and supply chains**.

Like physical energy infrastructures, it is very hard to re-tool or re-purpose entire workforces overnight. **Workforce capabilities are rapidly emerging as an issue as senior leadership fathoms out how to deliver ambitious change programmes in double quick time.** New skills and employment structures will be required. Managing the change in work associated with the energy transition will have widespread social impacts at personal, community and societal levels. Many of the skills associated with existing energy industries, notably engineering, but also offshore know-how, will be key to delivering the changes.

At the same time, there are increasing concerns about the growing risk of failure of critical infrastructures triggered by an **under-investment shock**. This under-investment could apply to building new and maintaining, decommissioning and repurposing existing critical infrastructures. Energy investments by their nature tend to be long term. A diverse and flexible portfolio of affordable, net-zero emissions solutions is possible if the risk of green-only energy technologies prescription in policy is avoided and investment flows to redeveloping existing sites and repurposing existing infrastructures.

This year's survey reveals diversity in regional perceptions of preparedness to pandemic crisis, adding to the list of **new energy shocks** – cyber threats, extreme weather events (flooding, drought, ice and forest fires). Successful recovery planning will **require resilience to be built-in** to avoid new energy shocks.

A NEW ENABLING FRAMEWORK FOR HUMANISING ENERGY

The 'tectonic shifts' in energy which have become more visible over the past year remind us all that energy is becoming more demanding, literally! People and lives are involved. **In building forward together, improvements in energy literacy are needed** to help societies understand that new and exciting models of human and economic development – climate neutral, circular, safe and regenerative – will require more energy, at least in the medium term.

The **complexity of coordination challenges is also becoming clearer** in a new era of multi-level co-operations. Citizens and customers, and new patterns of behaviour, are required to deliver change. New enabling frameworks for humanising energy are needed, which reflect the increasing diversity of energy uses, people and skills – as well as technologies – in energy systems. Convening the increasing diversity in policy shapers is both challenging and yet imperative to reset market design.

THE WORLD ENERGY COUNCIL IS OPEN TO ALL

I thank our worldwide energy expert community for the impressive depth of this report. We hope that you actively use these insights to prompt a much-needed conversation about the need for a human-centric energy transition.

Rather than being fuelled by fear of a less certain energy future, my sense is that energy leaders, entrepreneurs and professionals are inspired to develop new and better solutions. Furthermore, we have made it possible to monitor and track if we are doing enough to manage the speed and direction of global energy transition – please take a look at the **World Energy Transition Radar**.

Please join us in October 2022 at the St Petersburg 25th World Energy Congress, hosted by the Russian Federation, where the theme will be '*Energy for Humanity*'. It will mark our centenary as the world's first permanent energy community and an independent voice of common sense.

AWilkinson



Angela Wilkinson
Secretary General & CEO
World Energy Council

OVERVIEW

The World Energy Council has been tracking energy leaders' perspectives on the issues affecting the sector over the past 12 years through the annual World Energy Issues Monitor. By asking policy makers, CEOs and leading industry experts to assess the level of impact and uncertainty they attribute to pre-identified energy transition issues, the World Energy Issues Monitor provides a unique overview of: a) the Action Priorities or areas where countries are acting pragmatically to progress in their energy transition; and b) the Critical Uncertainties or issues are in the energy leaders' radar as areas of concern, and how these have evolved over time.

Each Issues Map provides a visual snapshot of the critical uncertainties and action priorities that policymakers, CEOs and leading experts strive to address, shape and manage energy transitions.

Figure 1: How to Read the Issues Maps





The Issues Survey questionnaire considers 25 core energy transition issues which are divided into 5 categories:

1. Global Trends and Macroeconomics;
2. Social Dynamics;
3. New Technologies;
4. Energy Policy and Business Environment;
5. Environment.

The bubbles in the Issues Map represent the averaged level of: a) uncertainty; and b) impact that respondents attribute to each energy transition issue. Those issues in the top right-hand corner of the map highlighted in orange have the highest levels of impact and uncertainty, and are defined as Critical Uncertainties. The bottom right-hand corner of the map highlights issues in blue that have high impact but low uncertainty, and are defined as Action Priorities. The centre-point of the issues map represents the medium level for impact and uncertainty to help comparison between different issues maps.

The issues and the questionnaire were refined this year drawing upon an expert group from the Council's global community. The issues were refocused to remove potential overlaps while retaining continuity with previous iterations of the World Energy Issues Monitor to preserve the tools' ability to track the evolution of issues over time. At the same time, the questionnaire was redesigned and simplified to make it quick and easy to complete.

In the new simplified questionnaire, energy leaders are asked to indicate their top 3 issues of priority focus for the following year, together with new sections to assess countries' levels of preparedness to withstand shocks and for comments on the opportunities afforded by energy transition. Together, these additions expand the scope of the insights from the Issues Survey and help to contextualise energy leaders' views on transition issues through their individual reflections.

The Issues Monitor is widely used by the World Energy Council's Member Committees and by the global energy community as a reality check tool that provides a horizon-scanning of perspectives on energy transitions from a country's own energy stakeholders. This energy insiders' perspective, which is presented in the report through the Issues Maps, in combination with the respective commentaries has, over the years, informed decision-making discussions by:

- Promoting a shared understanding of successful energy transitions;
- Understanding how energy transitions are perceived by sector stakeholders in relation to countries' national and regional energy strategies;
- Appreciating and contrasting regional variations to better understand differing priorities and areas of concern;
- Following the evolution of specific economic, social, technology, political, business and environmental trends related to the energy sector.

An online, interactive mapping tool

The country-level Issues Maps are available exclusively using the Issues Monitor online tool that also provides scope to develop your own customised map. The interactive Issues Monitor online tool can be found at: <http://www.im.worldenergy.org>.

ENERGY TRANSITION AND CRISIS RECOVERY

This year's World Energy Issues Monitor Survey is not like any other. Set against the backdrop of crisis caused by the continuing COVID-19 pandemic, the 2021 survey of more than 2,500 energy leaders from 108 countries has reframed and reset the energy transition agenda.

As the largest survey of its kind of senior energy professionals, governments and civil society, this annual survey, now in its 12th year, highlights the major trends in energy-related developments and provides a unique insight into what energy leaders identify as the risks, opportunities and action priorities for their sector.

Data collection for the survey was carried out between October and December 2020, and the emerging findings were tested with the Council's regional communities during a series of digital workshops held during February 2021.

THE COVID-19 CONTEXT

The COVID-19 pandemic has shaped this year's World Energy Issues Monitor and the findings must be considered against the ongoing global response and recovery to the pandemic.

The world experienced an unparalleled shock in 2020, both in terms of lives lost and the economic disruption caused, as nations closed down their economies in their response to halting the spread of the virus.

From the World Energy Council's 2nd COVID-19 Global Survey Results¹ published in June 2020, it was clear that the COVID crisis triggered an immediate transformation in the process of energy transition, exposing pre-existing stresses, including social issues and climate change, coupled with a significant decrease in energy-related investment.

In the initial response to the pandemic, energy companies responded by enacting drastic financial measures, including shedding jobs (an estimated 350,000 jobs at risk across G7 Economies²), reductions in capital expenditures (estimated at \$200-400bn)³ which was particularly acute within oil and gas and major energy firms, and a cutting of operational expenses⁴.

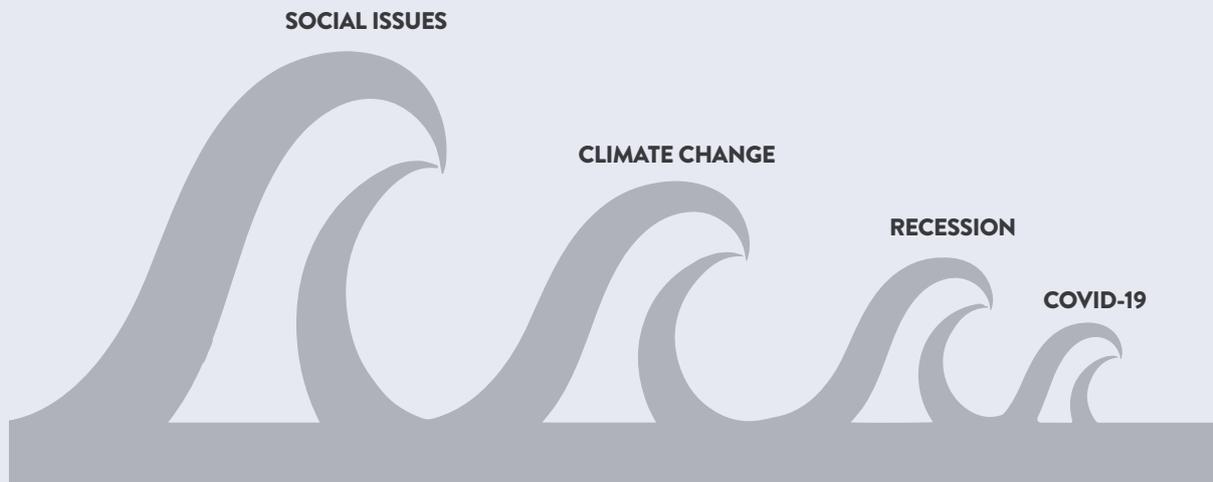
¹World Energy Council COVID 2nd Global Survey Results
https://www.worldenergy.org/assets/downloads/World_Energy_Council_-_Covid_2nd_Global_Survey_Results.pdf

²ILOSTAT explorer www.ilo.org – 1.85% energy employment across G7.

³IEA of total energy CAPEX 2018 \$1.8 trn, World Energy Council analysis.

⁴World Energy Council COVID Surveys April-May 2020 & May-June 2020.

Figure 2: Waves of disruption



By the end of 2020 when the 2021 World Energy Issues Monitor Survey responses were being collected, there were clear signs that economic recovery was underway, but its pace continues to be uneven across geographies and economies.

China has recovered quickly due to strong policy support and other Asian economies appear to have been mildly impacted, primarily due to good control of the virus. The success of multiple vaccine candidates and the start of mass-vaccination deployment around the world brings renewed promise of economic recovery in 2021. This follows an anticipated weak Q1, with recovery hampered by the emergence of new and more infectious variants of the virus and a return to lockdown measures to control virus transmission (see Rewind Scenario – World Energy Council COVID Scenarios Summary⁵).

Growth in China is forecast at around 8% in 2021, with a gradual recovery forecast in major advanced economies to around 3.5-4% through 2021 and 2022⁶ representing a return to pre-pandemic levels.

WORLD ENERGY ISSUES MONITOR SURVEY RESULTS

So, against this backdrop of economic recession, reduced expenditure and reset and re-alignment of energy transition, triggered by COVID-19, what is keeping energy leaders busy at work (**Action Priorities**) and what is keeping them awake at night (**Critical Uncertainties**)?

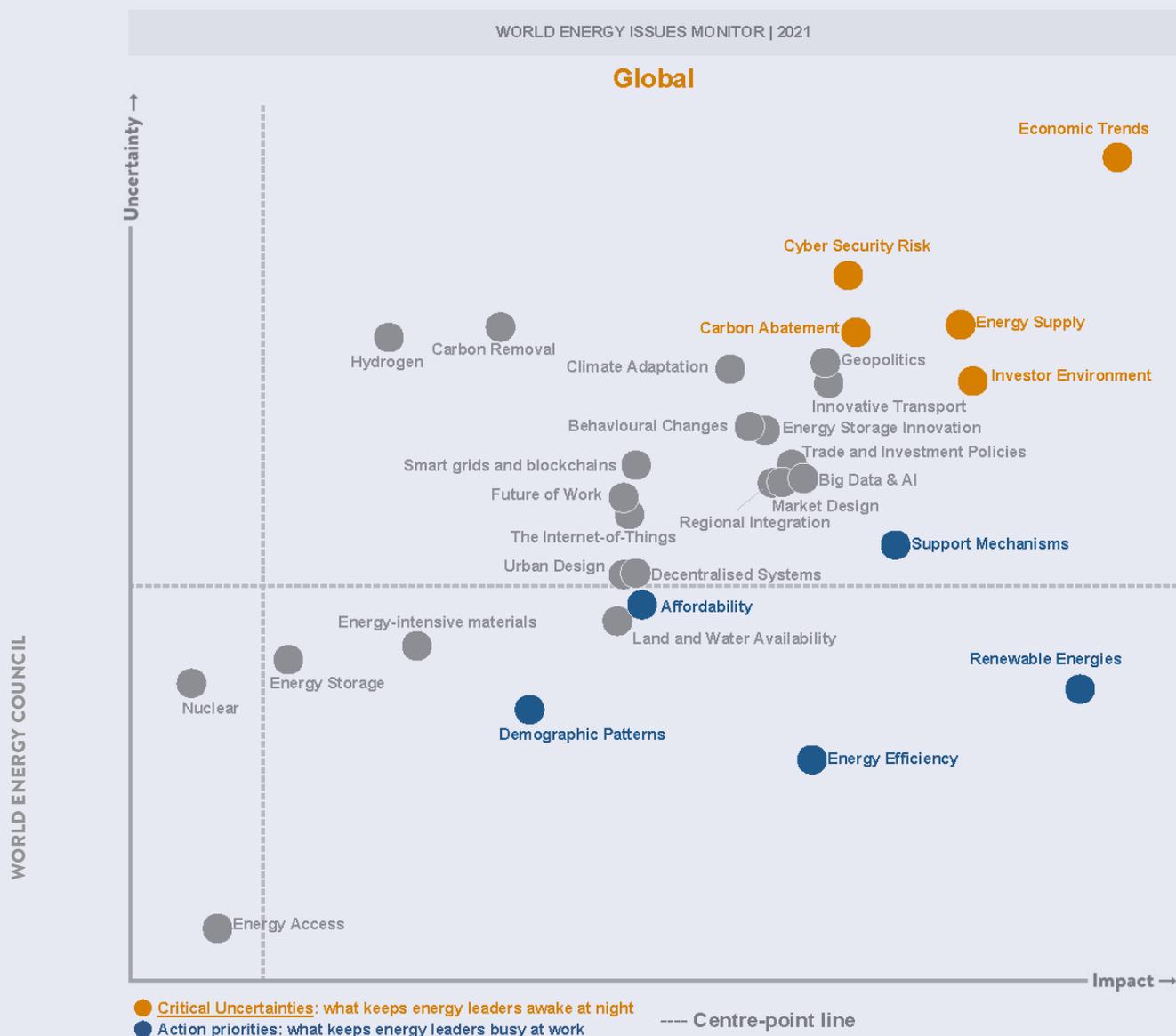
⁵ World Energy Council COVID Scenarios Summary 2020

https://www.worldenergy.org/assets/downloads/World_Energy_Council_-_Covid_Scenarios_Summary_-_FINAL.pdf

⁶ OECD Economic Outlook, Volume 2020, Issue 2

<https://www.oecd-ilibrary.org/sites/39a88ab1-en/index.html?itemId=/content/publication/39a88ab1-en>

Figure 3: Global Energy Issues Map



ECONOMIC ENVIRONMENT HEADS CRITICAL UNCERTAINTIES FOR 2021

Critical uncertainties are unsurprisingly dominated by **economic trends** and the associated uncertain **investor environment**, with **geopolitics**, **cyber security risk**, **energy supply** and **carbon abatement** also falling into the critical uncertainty domain. This represents a major shift in perspective from the 2020 World Energy Issues Monitor when critical uncertainties centred around the **macroeconomic risks** associated with volatile **commodity pricing**. **Geopolitical** issues associated with strained trade relations between the United States and China, the advancement of the **digitalisation agenda**, and **climate issues** focused around the impact of intensified extreme weather events and the need to adopt climate adaptation and mitigation measures were also at the forefront for energy in 2020.⁷

⁷ World Energy Issues Monitor 2020.

https://www.worldenergy.org/assets/downloads/World_Energy_Issues_Monitor_2020_-_Full_Report.pdf

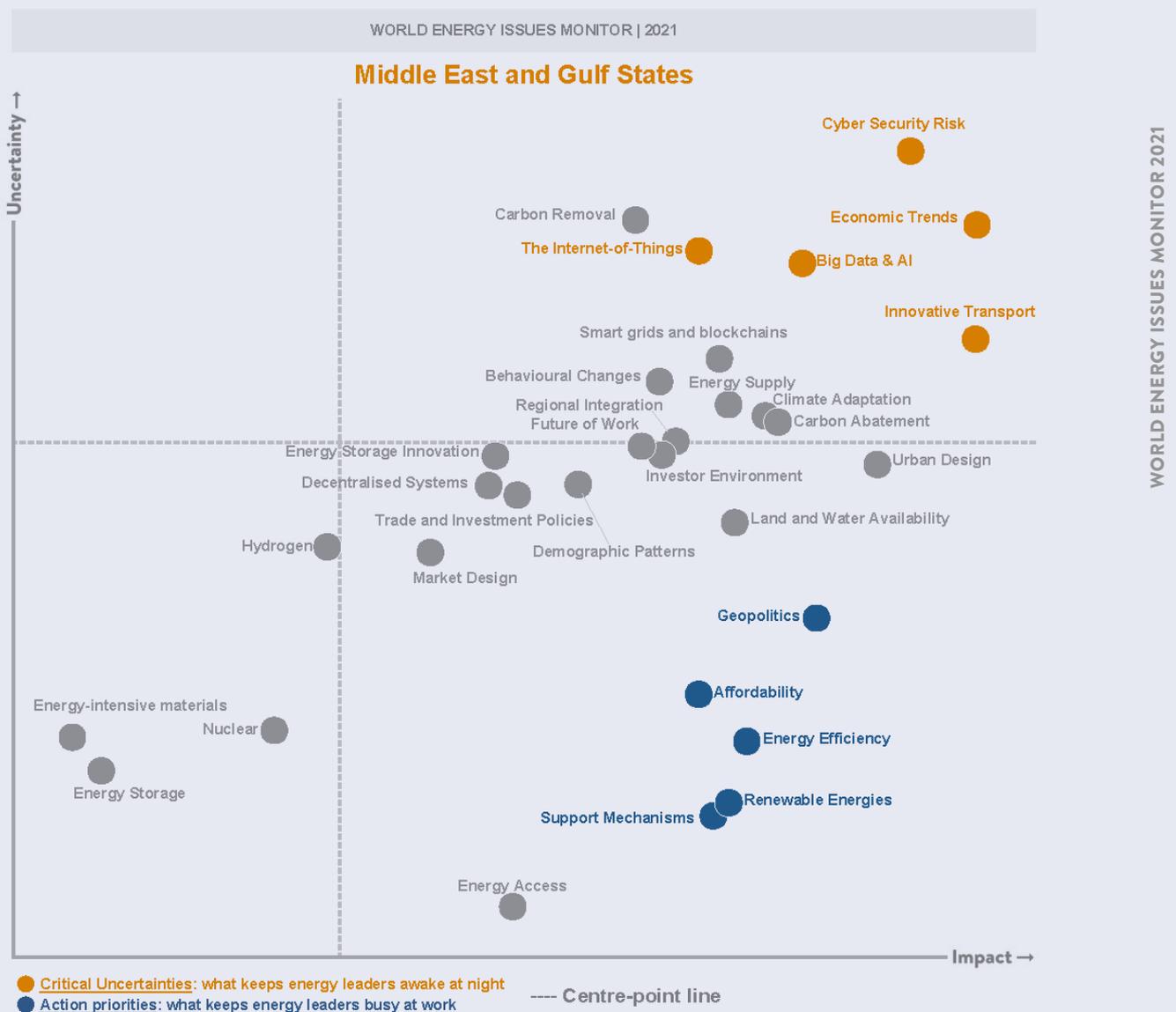
REGIONAL VARIATIONS – NO SINGLE SPEED OR ROUTE TO ENERGY TRANSITION

Whilst all geographies highlight **economic trends** as the dominant critical uncertainty, significant regional variations have emerged.

The impact of the pandemic and regional responses have not been uniform and have exacerbated and drawn attention to inequalities that were already in existence. Regional maps reflect this and also highlight significant changes in critical uncertainties over previous years surveys.

Middle East and Gulf States (MEGS) – The global shocks in energy demand, which led to unprecedented oil price crashes in 2020, have had a significant impact on economies that rely on oil. However, countries that had started diversification of their energy supply have continued or accelerated transition and reinvigorated the energy agenda in the region⁸. There is an ongoing impetus for broader innovation in enabling new energy transition solutions that will contribute to economic diversification and establish a new, circular economy energy transition pathway.

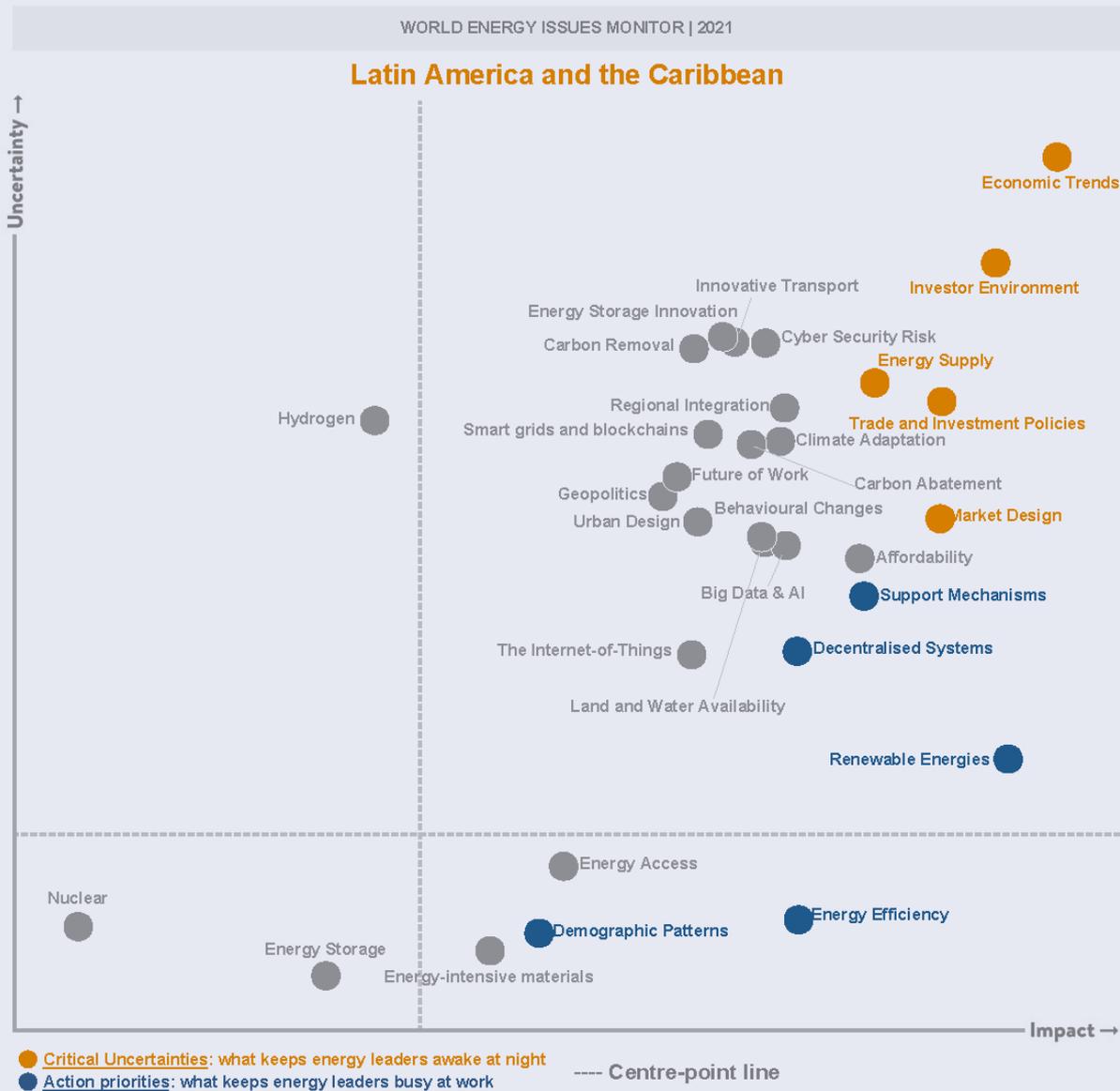
Figure 4: Middle East and Gulf States Energy Issues Map



⁸Word Energy Issues Monitor 2021 MEGS Regional Profile

energy debate¹⁰. With an already largely decarbonised power system and the lack of a heavy industrial base contributing to emissions, the region has turned its attention to implementing cleaner and more efficient transportation in its large cities in order to meet its climate goals.

Figure 6: Latin America and the Caribbean Energy Issues Map

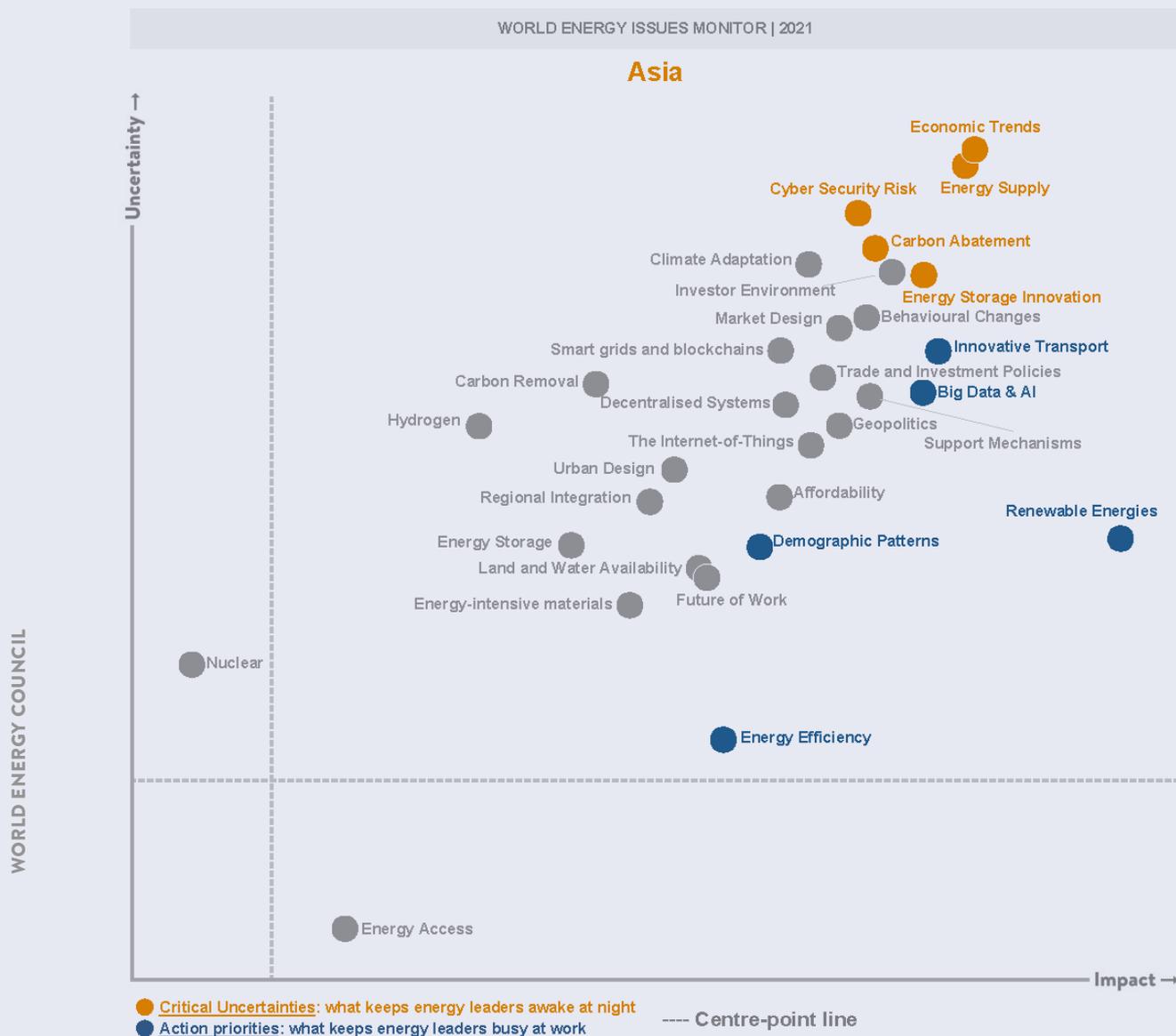


WORLD ENERGY ISSUES MONITOR 2021

Asia – In Asia, the pandemic has changed the leadership mindset. The pandemic context is well understood in Asia, which showed better preparedness and resilience in the face of COVID-19 as a result of its experiences in handling other regional pandemics. Whilst **economic trends** emerge as the most significant critical uncertainty, the challenge for the region is how to accelerate the pace of transition to **carbon neutrality**, whilst remaining inclusive and responsive to citizens, mitigating the risks associated with **digitalisation** and implementing new **market design** mechanisms – a delicate balance.

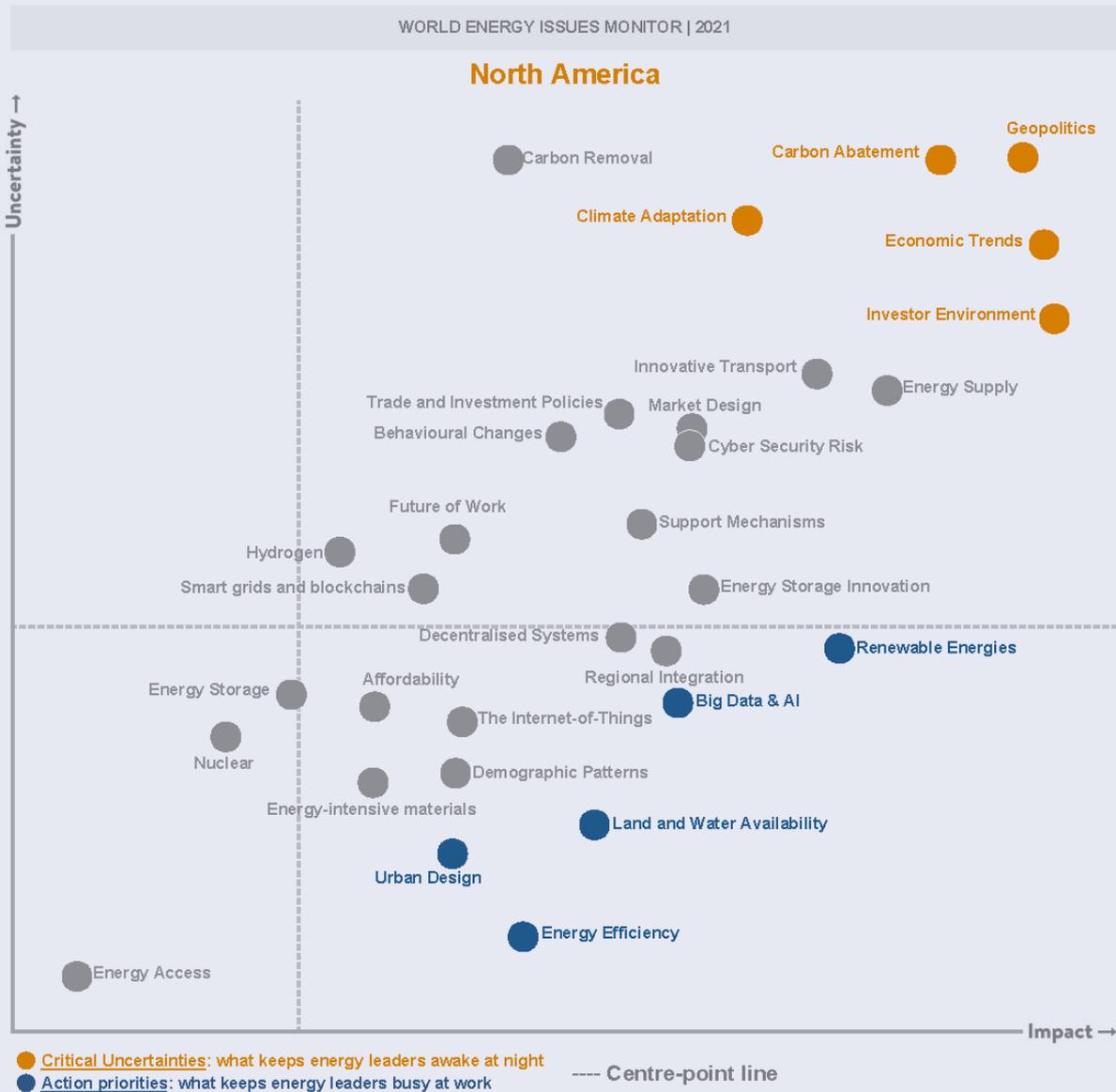
¹⁰ Humanising the Energy Debate in 2021: Reconnecting People and Planet
<https://www.worldenergy.org/news-views/entry/humanising-the-energy-debate-in-2021-reconnecting-people-and-planet>

Figure 7: Asia Energy Issues Map



North America – **Geopolitics**, together with **economic trends** and **carbon abatement**, headed the list of critical uncertainties in the North American region. Delving deeper, three different stories emerge. In the US, a political reset is underway with the election of the Biden administration, with an immediate shift in US energy policy putting **climate change** firmly back on the agenda. But it remains to be seen whether the new administration will slow down shale activities as it focuses more on cleaner energy. Recovery will focus on ‘built in’ resilience to future energy shocks including **cyber risks**, extreme weather and social unrest – deep economic and social disparities were exposed by the pandemic. For Canada, the crisis has polarised the energy transition discussion and amplified demand for wider participation in the energy agenda. The challenge will be to boost **innovation** and accelerate transition whilst paying close attention to the **humanising energy** agenda. Mexico, however, has increased national energy reliance on fossil fuel generation as part of government policy to strengthen energy sovereignty. This has polarised the energy dialogue given private industry and local government interests in renewable generation opportunities.

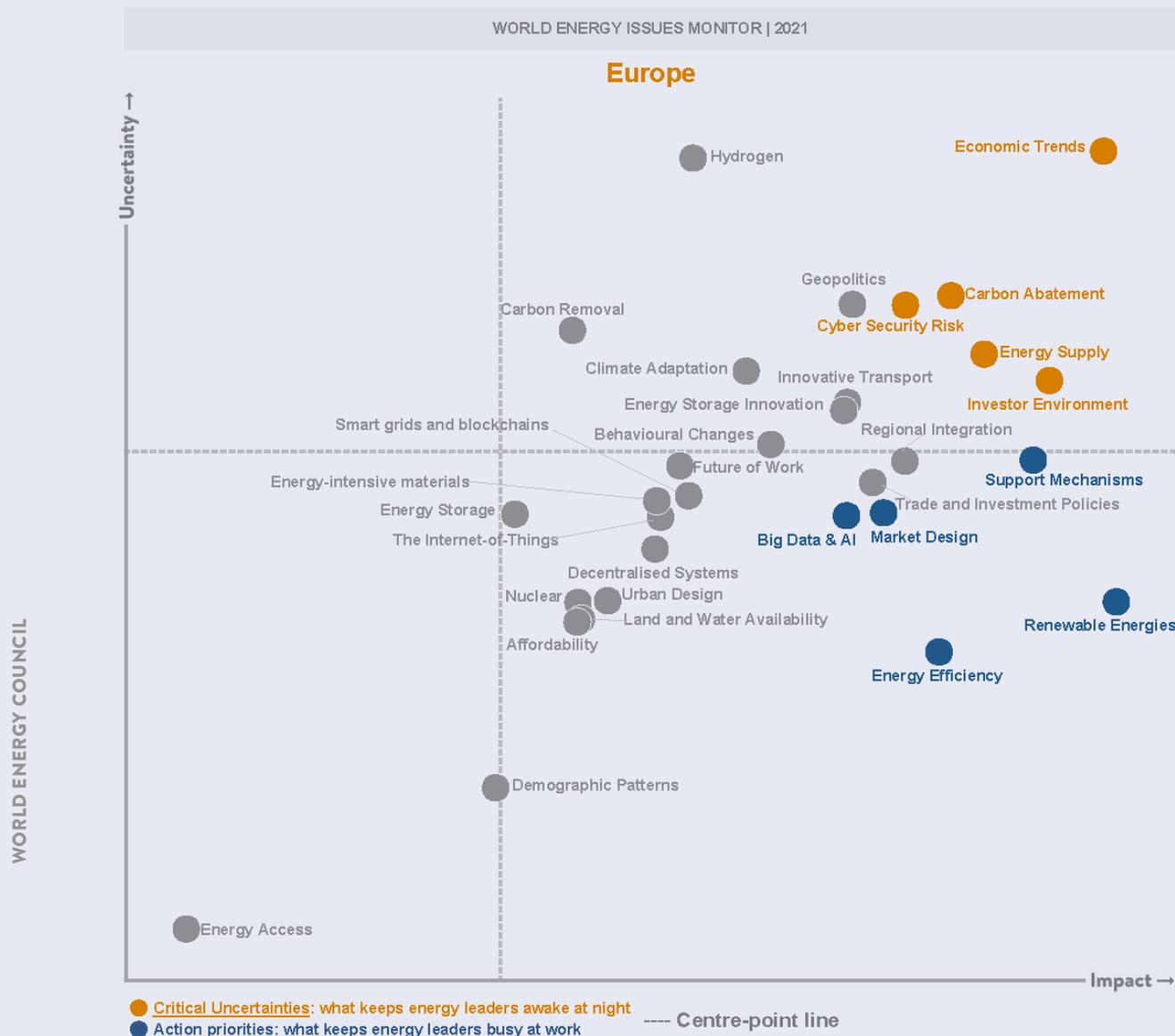
Figure 8: North America Energy Issues Map



Europe – Across Europe, the pandemic has not influenced the energy agenda to the same extent in all parts of the region. As elsewhere, **economic trends** top the critical uncertainties list. The effects of the pandemic have been predominantly economic, leading to a crisis in credit, which impacts **climate and investment** needs.

The European region’s ambitious climate agenda predated the pandemic, with carbon-neutral targets set by many countries, including those outside the European Union, for 2050. A reset of this agenda has not been observed in the post-pandemic recovery period and instead many countries are targeting ‘green recovery policies’ as a route back to economic growth. However, in order to realise the opportunities of energy transition fully, existing regulator frameworks and market design across the region need to be updated.

Figure 9: Europe Energy Issues Map



CROSS-CUTTING TRENDS

? Continued uncertainty continues to dominate the political and energy agenda

It is clear that significant levels of uncertainty prevail in 2021. A resurgence of COVID in late 2020 and reintroduction of stringent COVID mitigation measures will continue to put strain on the global economy throughout 2021. This, in turn, has the potential to impact energy transition, through limited availability of capital and continued reduced investor confidence. But the opportunity presents itself to use the post-pandemic recovery to address the societal imbalances exposed by the pandemic and enable a more inclusive clean energy transition. Governments and industry, in partnership with civil society, should grasp the opportunity to provide policy tools, frameworks and economic support mechanism to build forward more resilient and stronger economies in the wake of COVID. And low-carbon, digital energy solutions are fundamental to achieving this.



Increased digitalisation leads to increased cyber risks

There has been significant reliance on digital solutions to mitigate the economic impacts of the pandemic, which has also pushed the awareness of **cyber risks** up the leadership agenda, driving the topic into the critical uncertainty list in this year's survey. A digitally transforming energy sector will require new, agile, risk management strategies to counter its evolving risk profile and increase resilience, given its fundamental role in critical national infrastructure¹¹.



Energy supply concerns

While the energy sector performed well during the pandemic, responding to changing demand without significant shocks to the system, there are longer-term concerns about the demand destruction and how demand might change hereafter. This is a particular issue for exporter countries and offers an opportunity to rethink resilience beyond critical infrastructure and extend to people and supply chains.



Carbon abatement moves up the agenda

Carbon abatement is becoming a higher priority as countries continue to use existing hydro-carbon assets whilst trying to meet lower/zero-carbon goals. For producer countries this can be establishment of the circular carbon economy, with the use of carbon abatement technologies such as CCUS to enable longer-term use of existing gas/coal plants. Despite the prominent role that CCUS is anticipated to play in meeting countries' Paris climate change obligations, implementation is slow, largely due to the significant cost of implementing and operating the technology, and legal and regulatory challenges around safe storage of underground CO₂, which still need to be addressed.

BEYOND RENEWABLES – ACTION PRIORITIES REFLECT EMPHASIS ON MARKETS, SYSTEMS AND CONSUMERS

Renewables heads the list of action priorities identified by energy leaders in this year's survey, in tandem with **energy efficiency, energy affordability, demographic patterns, land and water availability** and **affordability**.

Renewables have been a long-term action priority for energy leaders as the energy sector implements proven technologies and works to integrate them at larger scale within the overall energy system. Solar and wind continue to dominate, with regional variations depending on availability of indigenous resources. The impact and uncertainty ascribed to renewables by survey respondents has not changed through 2020/2021 and regions assign similar levels of impact to the technology, with the exception of the MEGS region, where diversification from fossil fuel -based economies is less advanced.

Sustained policy **support mechanisms** are key enablers of energy transition. Short-term measures have been required during the COVID crisis, but longer-term, stable policy mechanisms are required in the long-term. Energy transition cannot be derailed by post-pandemic shocks and policy tools and innovative market design can provide frameworks to accelerate a sustainable, citizen-centric recovery.

¹¹ World Energy Council – Cyber Challenges to the Energy Transition.

https://www.worldenergy.org/assets/downloads/Cyber_Challenges_to_the_Energy_Transition_WEC_MMC_2019.pdf

Energy efficiency remains a key theme with high potential impacts and relatively low cost of implementation. It remains a long-term policy aspiration for many countries, with the energy sector looking for continuous improvements in the performance of appliances, buildings and the electricity and gas distribution grids.

Sharper attention has been given to **affordability** as the pandemic has exposed previously veiled long-standing societal issues related to cost and access, even in affluent societies. Emphasis has shifted from achieving basic levels of energy access and affordability towards ‘quality energy access at an affordable cost’, as consumers adapt to greater use of digital homeworking and education tools.

Demographics move up the action priority agenda, and in the case of the Africa region, fall into the critical uncertainty domain. Developing countries with rising urban populations need to focus on increasing demand and energy access, in contrast to some developed countries with flat or declining energy demand. In these countries, demand could further decline through the post-pandemic period and be further exacerbated by post-pandemic demand destruction and an aging/declining population.

TRANSITION TURNING POINTS – HOW IS THE FOCUS ON ENERGY RISKS AND OPPORTUNITIES SHIFTING?

The World Energy Council has been tracking the Issues Monitor responses of energy leaders over the past decade, enabling early identification of future trends. Analysis of this year’s survey results against historical data identifies three clear trends.

- **Hydrogen** is becoming a reality, especially for richer countries looking to reduce carbon intensity in the harder-to-abate sectors. The number of countries that directly support investment in hydrogen technologies is increasing. However, there are very different regional focuses, with developing countries showing less interest in exploring hydrogen as part of the energy mix. Dialogue among energy leaders in the upcoming year will need to focus on determining what policy and stimulus packages are required to make the hydrogen economy a reality and accelerate the shift to production from low-carbon sources.
- **Market design & electrification** are revealed as key opportunities for energy transition. Increasing levels of decentralised generation have reignited discussion between market participants and operators about how network design, optimisation and the role of the customer can work together to accelerate energy transition whilst balancing, efficiency, security of supply, and affordable quality access for all. We anticipate that market design will continue to develop in impact and importance in the coming year.
- The COVID context has reinforced the importance of **social dynamics** by highlighting access and affordability while underscoring how the future of work may develop (remote working, digital acceleration, exploitation of big data and AI, along with associated heightened cyber risks). The pandemic has also brought the future of mobility and its impact on city infrastructure into focus. Will there be a return to mass transport? What has been the impact of the pandemic on the shift to electric vehicles? What is the impact of working from home on the future of cities and their infrastructure? Tracking these trends will provide early insight into the future of work and associated energy demand.

PREPAREDNESS AGAINST FUTURE CRISIS

For the first time, this year’s World Energy Issues Monitor tracked the perception of energy leaders regarding the preparedness of their economies to withstand future crises such as pandemics, extreme weather events and natural disasters. Whilst some economies, notably in Asia and the Middle East, were deemed to be well prepared for future pandemics or extreme weather events, response was patchy. The COVID-19 pandemic has highlighted the need for great resilience and preparedness in systems, infrastructure, policy and people.

Whilst the current pandemic has led to a more nationalistic agenda as countries fight to protect their citizens and economies, lessons from the pandemic show that greater collaboration, which will extend to energy in terms of interconnection, digitalisation and market frameworks, will be required.

As we emerge post-COVID we have an obligation and an opportunity to put sustainability at the heart of the recovery strategy. As we navigate energy transition, the World Energy Council's diverse global community of energy leaders, industry, government and civil society is here to drive the agenda, work across sectors, geographies and boundaries and is committed to putting people at the heart of energy transition.

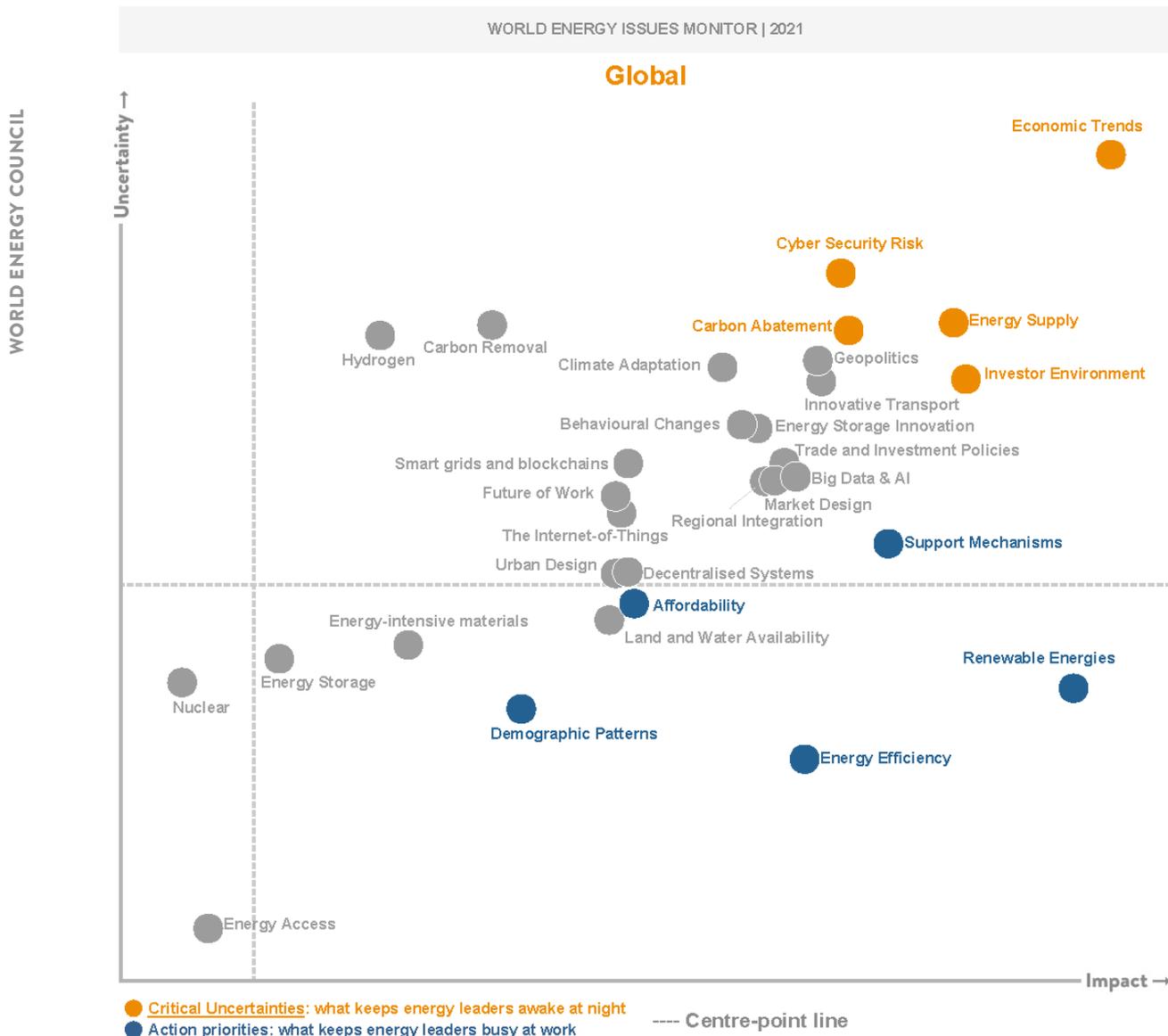
GLOBAL PERSPECTIVES

The 2021 World Energy Issues Monitor is one of the largest surveys of senior energy professionals, governments and civil society, with this year’s survey collating responses from more than 2,500 energy leaders from 108 countries to provide unique insight into what energy leaders identify as the risks, opportunities and action priorities for their sector.

The survey asks energy leaders for their perspectives on the degree of: a) impact; and b) uncertainty for 25 different issues. Critical Uncertainties are defined as those issue with high levels of uncertainty and impact and can be considered as the topics that keep energy leaders awake at night. Action Priorities are defined as having high impact but low uncertainty and are classed as the issues that keep energy leaders busy at work.

This year’s results are set against the backdrop of the continuing COVID-19 pandemic that has universally increased uncertainty across the issue categories.

Figure 10: Global Energy Issues Map





CRITICAL UNCERTAINTIES

WHAT IS KEEPING ENERGY LEADERS AWAKE AT NIGHT?

Economic trends are the clearest critical uncertainty globally and across all regions. There is a clear pandemic context of looming economic recession in the short-term, with uncertainty about economic recovery in the medium to longer term, with subsequent implications about the shape and direction for energy transition. With the pandemic still ongoing, these concerns remain live, while the vaccines offer a route back to more normal economic activities.

Closely linked to the economic situation, **investor environment** is seen as having a high impact but with lower uncertainty than **economic trends**. Highlighting the investor environment reflects concerns about continuing investments, the availability of funds, and on what or where these should be invested within the energy sector. Many traditional energy companies, particularly those in traditional hydrocarbon businesses, have slashed their investment plans, with many affected by low prices that predate the pandemic. There is an interesting read-across to the Action Priority for economic **support mechanisms** and how these might be deployed in the short- and longer-terms during the post-pandemic recovery.

Energy supply is also highlighted as a critical uncertainty. In simple terms, the energy sector has been highly resilient during the pandemic by keeping the lights on and the supply systems “wet”, but demand has been impacted. For energy producers and suppliers, there are now longer-term concerns about whether some of the demand changes may be more permanent, or structurally, whether there has been some demand destruction and how demand might change as a result. Some areas such as aviation have been heavily affected with travel significantly curtailed in the short-term, with Heathrow Airport, a major hub, reporting that its traffic levels had fallen to those last seen in the 1970s. Business travel may take some to recover after the pandemic and may be permanently affected by the rise of virtual meetings, potentially reducing future demand. The reduced demand during the lockdowns also lowered greenhouse gas emissions significantly, although such reductions appear to be temporary, with emissions returning as lockdowns eased.

While digital solutions have helped mitigate economic impacts of the pandemic, awareness of **cyber security risk** has now risen to become a critical uncertainty. While there is anecdotal evidence to suggest that there have been an increased number of cyber-attacks in 2020, this may stem from the increase in home working that has extended the periphery of company IT systems and increased the number of potential vulnerabilities.

Climate change remains a key concern in the run-up to the delayed COP26 meeting, now scheduled for November 2021, and the various national initiatives for net-zero or reduced carbon economies. The focus of energy leaders in this area, appears to be more practical, with carbon abatement being the final issue to make the critical uncertainty list. **Carbon abatement** is now becoming essential to enable the continued use of existing hydro-carbon assets while meeting lower carbon goals. For producer countries this can be the circular carbon economy, while the use of carbon abatement technologies such as Carbon Capture and Storage (CCS), may enable longer-term use of gas/coal plants.

ACTION PRIORITIES

WHAT IS KEEPING ENERGY LEADERS BUSY AT WORK?

While it could be argued that the critical uncertainties identified in this year’s survey are heavily affected by the pandemic context, the action priorities retain a high degree of continuity with previous Issue Monitor surveys.

Renewable energies have been a long-standing Action Priority as the energy sector implements proven technologies and makes them work within the energy system. The potential problems for integrating high

levels of variable renewables with zero marginal cost generation into the power grid are well known and have additionally challenged grid operators throughout the pandemic during periods of reduced demand.

Energy efficiency is another long-standing Action Priority. Many countries have longer-term policy aspirations for their energy systems to be more energy efficient with these efforts also being linked to their plans for less carbon-intensive economies. Within the energy sector, many market participants seek to improve the economic efficiency of their systems.

Energy leaders also highlight **demographic patterns** as an Action Priority, although this is clearly country specific. In developing countries with rising urban and young populations, there is a pressing need to consider how to meet increasing demand. In contrast, a number of developed countries with ageing populations anticipate the exacerbation of flat or declining demand.

The final two Action Priorities identified this year could be considered as being linked to the pandemic, but also predate it. **Affordability** has been a longstanding economic concern, particularly for developing countries, but gained a higher profile during the pandemic as persistent societal issues related to cost and access have been re-exposed. There seems to be a renewed determination to tackle these social issues across all regions addressing the differing local contexts. This can be through pressing ahead with existing policies or by using the post-pandemic recovery plans to build more inclusive energy transition.

As mentioned in the critical uncertainties, **support mechanisms** are closely linked to **economic trends** and particularly **investor environment**. In the short-term, these will be about how any general mechanisms to support business through the pandemic can be used by the energy sector while, in the longer-term, these will focus on the more sector-specific policies such as feed-in tariffs for the post-COVID recovery, where efforts could help support better energy transition.

TESTING PERSPECTIVES WITH THE COUNCIL'S GLOBAL COMMUNITY

The original 2021 Issues Survey was conducted at the end of 2020 and with the ongoing uncertainty of the continuing pandemic, we tested our early findings with our membership through a series of digital workshops in February 2021. These discussions enabled us to test the cross-cutting themes with our expert community and explore the differing local contexts in more detail.

Three broad themes were confirmed by the regional dialogues.



Pandemic Context

The pandemic amplified and reset uncertainty across all categories in the survey, most significantly with **economic uncertainty**, where looming economic recessions and unclear post-pandemic recoveries have raised significant concerns about the impact on energy transition.

But the pandemic has also exposed long-standing societal issues related to cost and access and appears to have provided new impetus to try to address these. Across all regions, there seems to be a strong desire to use the pandemic recovery as an enabler for better energy transition. Regional contexts differ; Africa has reaffirmed its efforts to extend energy access, while in the Middle East, the pandemic has confirmed the need to diversify economies.

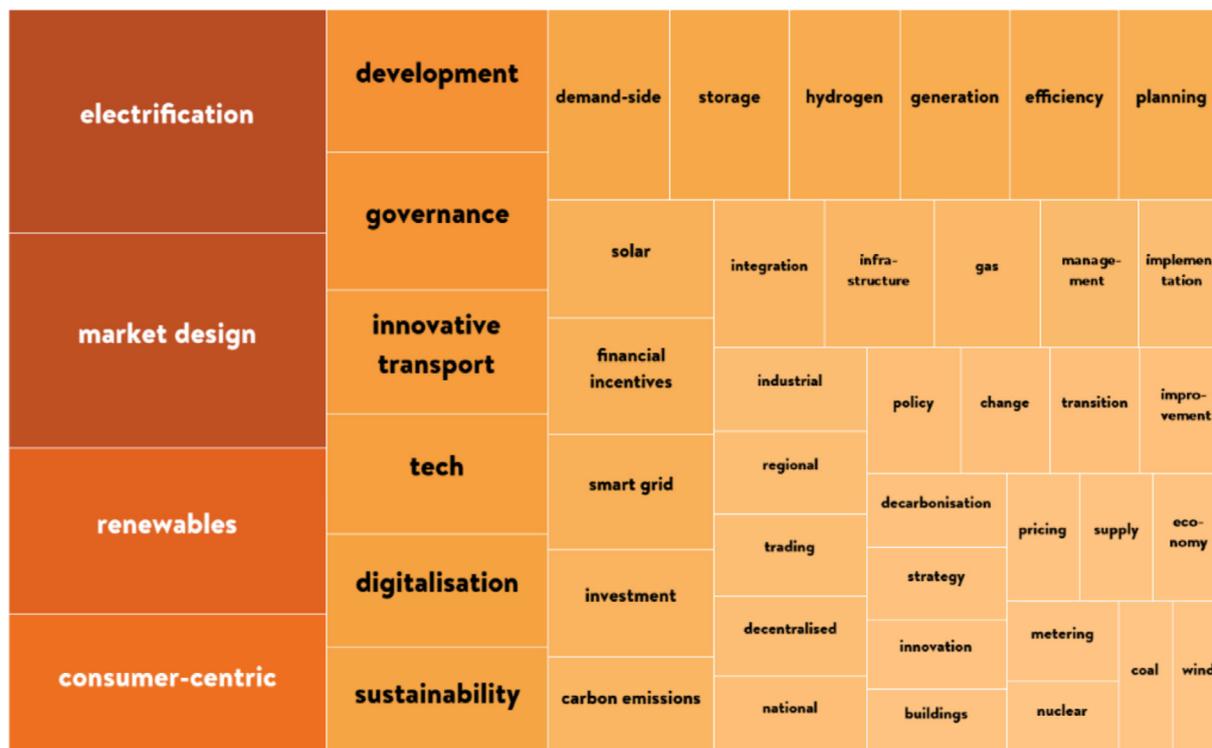
Economic uncertainty, questions about potential demand destruction and investment decisions highlight the unknown impact of the pandemic on the pace and shape of energy transition.



 **Transition Opportunities**

This year’s World Energy Issues Monitor introduced a new free-text section asking respondents about the opportunities offered by energy transition. A word cloud analysis of the responses highlighted two key areas of opportunity for electrification and market design.

Figure 11: Most frequent words used in open answers



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Energy transition will increase electrification, so it is not surprising that this tops the list for energy leaders in our study.

Until recently, market design had been a less recognised enabler for successful energy transition. Sentiment across the regional dialogues agreed that market design needs more attention, although there are differing regional contexts that require further exploration. Many of the new business models (such as electricity demand aggregators and storage) or new technologies will require market design changes to be successfully integrated into the energy system. Conversely, if market design is not properly reassessed, it could become a trigger for a future energy demand or supply crisis; in other words, a potential transition crisis trigger.

Given the critical importance of energy market design, the Council will scope a new workstream under its Innovation area to explore sentiment across our global community.

 **Innovation Turning Points – Hydrogen**

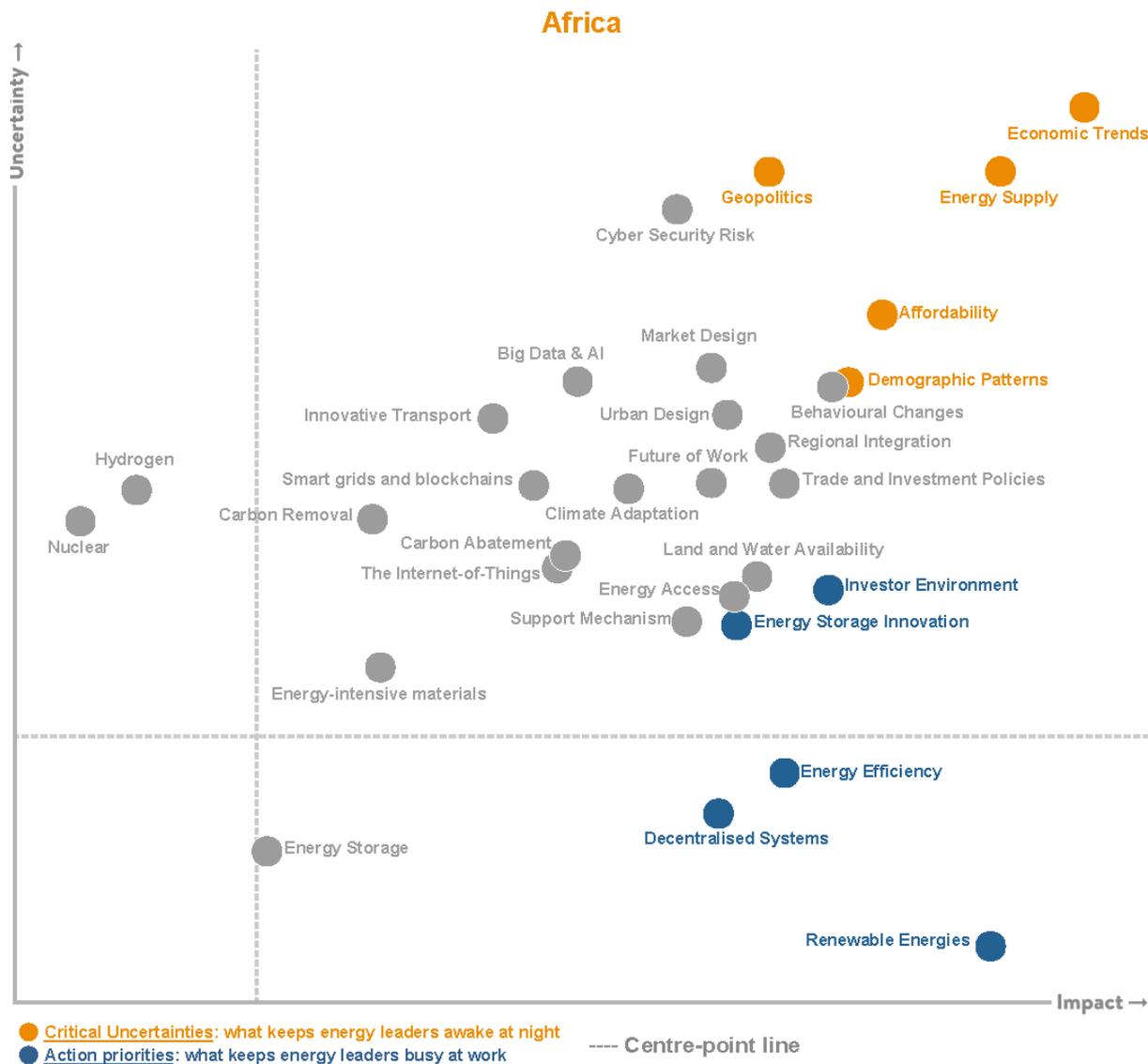
For many years, hydrogen has been seen as a potential fuel of the future, while not being quite ready for economic implementation. Sentiment around hydrogen has been shifting, and this year it seems as if we might be at an innovation turning point for hydrogen where it gains acceptance as a potential realistic part of the energy system.

REGIONAL PERSPECTIVES



AFRICA

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In keeping with all regions, **economic trends** have become the most critical uncertainty across Africa with the pandemic causing significant disruption. Falling energy demand has particularly hit those countries in the region that are reliant upon hydrocarbon exports. This, combined with concerns from other countries, disrupted by global supply chains has raised **energy supply** to a critical uncertainty. Concerns about economic trends and energy supply also combine to reinforce the pre-existing regional issue of **affordability** as a critical uncertainty.

Security of supply issues dominate the Africa regional map, with a significant shift in critical uncertainties from the picture in 2020. The continent has high levels of energy poverty that have been aggravated by the pandemic. Additionally, the region's high dependency on global supply chains has highlighted resiliency

concerns. Supplies and expertise have been significantly disrupted by the reduction in global travel, and this has reaffirmed the need for local (or regional) partners to develop skills and production.

Africa has a young and growing population with low energy access, which the UN Sustainable Development Goal 7 aims to help address. The growing population and urbanisation underpin **demographic patterns**, which are identified as a further critical uncertainty. **Geopolitics** is the final critical uncertainty for the region, which stems from a series of unresolved regional political issues.

Renewable energies and **energy efficiencies** remain African Action Priorities, as in previous years. To develop in a more sustainable manner, lower-carbon energy technologies such as renewables are a key priority, supported by energy storage and energy efficiency. The African continent is recognised for having particularly rich solar resources with significant opportunities to utilise this resource. Energy efficiency can play a significant role in improving affordability whilst reducing environmental impact, but has yet to receive sufficient attention or resource.

African countries are focused on bringing in new investment to boost energy supply and improve local reliability and access. There is a unique opportunity for the region to accelerate the implementation of clean energy technologies as part of post-COVID economic recovery initiatives. The need for investment explains **investor environment** being considered an action priority for the region.

Successful energy transition in Africa will need to address persistent challenges such as access to modern energy services, particularly in rural areas. **Decentralised systems** are an action priority because many countries are investing in decentralised and/or mini-grid systems to improve energy access and stimulate growth.

Energy storage has increased in importance over the past year and appears as an action priority for the first time. This results from many of the essential minerals needed for battery manufacturing such as cobalt and platinum being found in Africa. Given these mineral resources, coupled with the continent's vast renewable energy potential, there is a unique opportunity for the continent to manufacture not only batteries but also **hydrogen** and other clean energy vectors and drive a new energy economy.

Affordable energy provision will not only improve access but also enable new business development and subsequent economic growth. Many African countries that have introduced innovations in the energy sector have also leveraged digital technology to leapfrog into ways of supplying energy and energy services. For example, the governments of Kenya and Ghana have introduced energy safety nets, which support the poor and vulnerable in being able to afford modern energy services for a range of needs including cooking (SE4ALL).

Given the increase in mobile financial services, having a robust and sustainable **digitalisation** strategy that recognises the needs of the energy sector will be essential to scale up energy programmes. Africa is the world leader in mobile money, and this has been leveraged by some countries in the provision of energy services through “pay-as-you-go” schemes for off grid solar projects. Some 85% of the world's solar systems with pay-as-you-go mechanisms are in East Africa (Lighting Global 2018) with many providers utilising mobile money for the large-scale deployment of various energy technologies through a variety of microfinancing mechanisms.

The introduction of new technologies and approaches will mean that a review of the **markets and tariff structures** will be required in many Africa countries. New players are being introduced into the energy sector, and regulation of the sector adapted to enable private-sector investment and allow a more decentralised technological approach. **Regional integration** of markets to optimise energy resources will support energy security and improve affordability in some cases. Integration of energy systems also provides a further improvement in adaptive capacity and resilience.



African countries have long tried to encourage localisation of supply chains for the manufacturing of energy efficiency technologies, renewables and energy storage to boost economic growth and benefit their citizens. Foreign companies are frequently required to have local partners to develop local skills and expertise. Reduced travel during the pandemic highlighted the resiliency benefits of local/regional expertise essential for maintenance and operations of key energy infrastructure.

African countries continued to focus on long-standing priorities of affordability and access, but with a refreshed perspective of developing local capability. The lower energy exports for oil and gas have encouraged producers to export more local/regional customers. The desire to accelerate energy transition using post-COVID recovery measures relies on a combination of market design and the participation of new industry players, incumbents and consumers so that solutions can remain relevant and accessible.

TESTING PERSPECTIVES WITH THE COUNCIL'S AFRICA COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's African energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. The pandemic's re-exposure of unevenness has increased the motivation to address it

Africa has the highest levels of global energy poverty that has been exacerbated by the pandemic and the resultant slowdown of economic activities. This long-standing issue has been re-exposed and prompted a renewed desire to tackle it with existing and additional solutions that empower local communities with the most appropriate services. In addition to the existing investment in decentralised systems, African countries see new possibilities through energy storage to increase energy access while also creating localised manufacturing (e.g. Kenya testing investor interest in local battery manufacturing).

2. Boosting resilience through developing local capabilities and regional trade

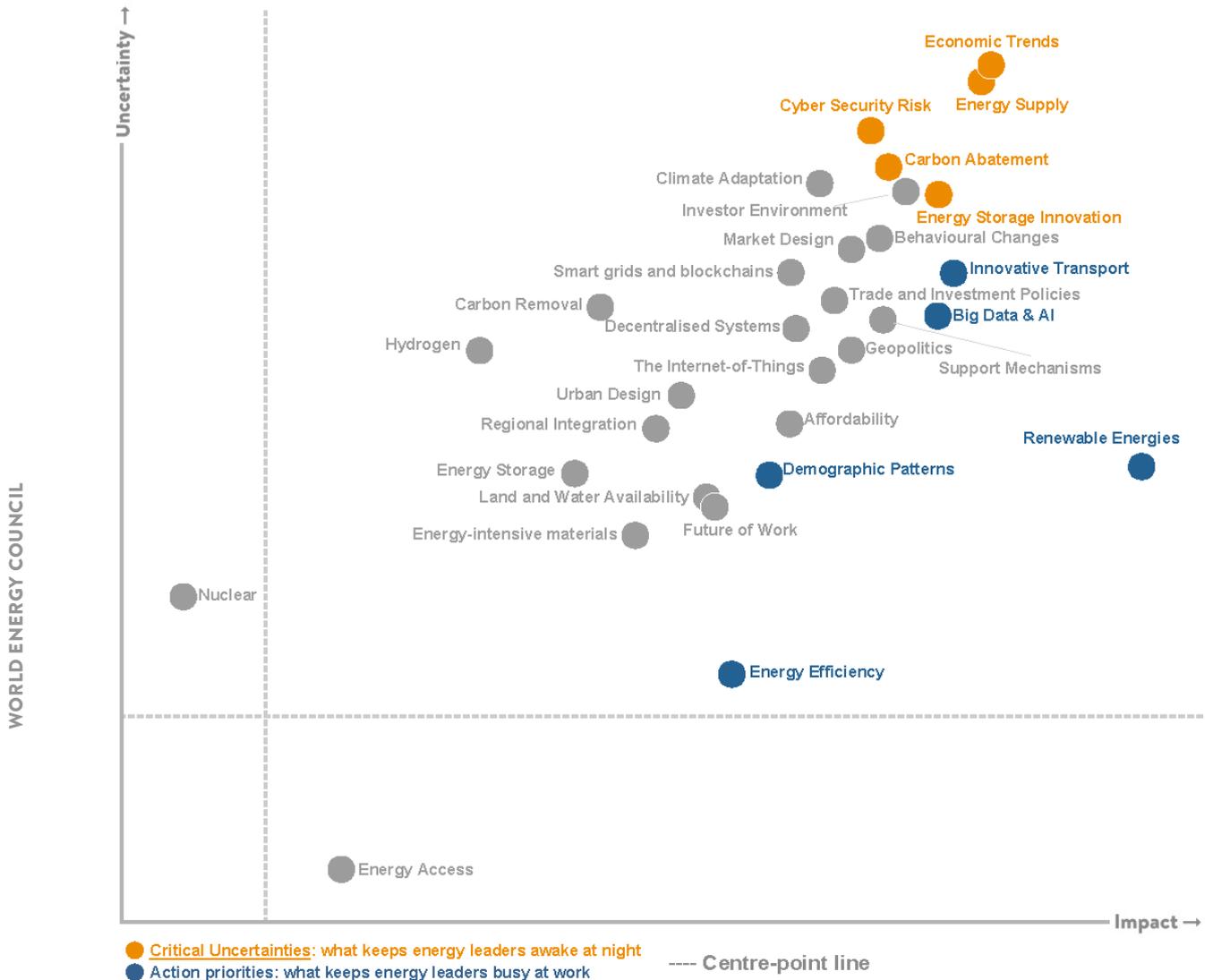
The pandemic's travel restrictions limited the availability of foreign consultants/contractors, which was partially mitigated by existing requirement for foreign companies to operate with local partners. The experience has reinforced the ambition to build local capacity and expertise to increase resilience. At the same time, Africa's oil and gas exporters have started to look to replace lost exports with local markets to boost regional resilience; for example, the Trans-Sahara Gas Pipeline Project between Nigeria and Algeria has renewed political attention to integrate supply within Africa.

3. Prioritising affordability alongside willingness to pay

The African Union's "Agenda 2063" outlines a vision for a just energy transition that will require better collaboration and coordination between countries and across business, government and civil society with strong enabling regulatory systems. Innovative solutions such as pay-as-you-go schemes for decentralised systems enabling access to energy services could have greater impact by focusing on the demand perspective rather than supply. This means focusing more on the end consumers to address their ability and willingness to pay for new services to be a "bottom-up pull" rather than a "top-down push". Africa's success with mobile money provides unique opportunities to make significant progress if communities can be successfully engaged and empowered.

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Asia



In Asia, the pandemic has changed the leadership mindset. The pandemic context is well understood in the region, which showed better preparedness and resilience in the face of COVID-19 as a result of its previous experience in handling recent regional pandemics (SARS). Whilst **economic trends** emerge as the most significant critical uncertainty, the challenge is how to accelerate the pace of transition to **carbon neutrality**, whilst remaining inclusive and responsive to citizens, mitigating the risks associated with **digitalisation** and implementing new **market design** mechanisms – a delicate balance. Results reflect a combination of unprecedented pandemic impact and a longer-term pathway for decarbonisation energy strategies.

COVID-19 in 2020 has severely affected livelihoods and manufacturing production, significantly reducing energy demand in many Asian countries. Even with such an unprecedented shock and the resulting uncertainties to the economy and energy system, several key overarching energy themes in Asia predate the pandemic and have not changed.



Renewable energies remain at the forefront as an Action Priority for Asian energy leaders with the perceived degree of impact steadily increasing over time. This is likely driven by the improving economics of renewables and the emerging trend of large corporations in Asia starting to procure “green” power directly.

In many Asian countries, the levelised cost of building utility-scale solar and wind capacity has become close to, or lower than, building new thermal power capacity. As renewable energies become economical, Asian investors and utilities start to shift their focus from traditional generation sources to renewables. For example, in the Philippines, Ayala Corp. is working to bring 1.2 GW of solar and wind projects on-line and has set a target of 5 GW renewable capacity by 2025 (Ayala 2019 Integrated Annual Report); while Aboitiz Power set its goal to expand capacity from 4.4 GW in 2019 to 9 GW in 2029, of which 50% is renewable based (Aboitiz Final Prospectus for Bond Issuance). Meanwhile, many Asian governments are shifting their long-term fuel mix target more towards renewables in their long-term integrated power planning. For example, during Singapore Energy Week, held at the end of October 2020, the Singapore government announced it would set a target of more than 2 GW DC installed solar capacity in the island by 2030 and has started to explore imports of renewables from neighbouring countries. In December 2020, the Chinese government announced they would increase their non-fossil fuels in primary energy consumption to around 25% by 2030, up from the previous target of 20%, and target increasing the total installed capacity of solar and wind to 1200 GW by 2030, translating to an annual incremental average of 72 GW solar and wind capacity in the next 10 years.

Furthermore, large power consumers in Asia have also started to procure renewable supply. For example, Longi, a large Chinese solar panel manufacturer, joined the Global Initiative RE100 to commit to 100% renewable power across its entire global operation by 2028 (Longi Press Release, 12 March 2020). This emerging trend will likely have a major impact on renewables investment, and potentially become another push for the Asian regulators to reform their electricity sectors to enable direct power procurement of end-users from renewable suppliers.

Interestingly, the uncertainty of renewable energies has also increased in Asia according to the survey. As renewable energies become more competitive without **subsidies**, Asian regulators are mulling phasing out the special tariff for solar and wind projects, leading to higher investment uncertainties. Moreover, as renewable penetration increases, its impact on grid system reliability increases, due to renewable intermittency. Debates have started on how best to maintain **power supply** reliability and allocate renewable integration cost to different stakeholders in the power system. For example, the Singapore regulator has introduced an Intermittent Pricing Regime, which allocates some of the integration cost to renewable sources. In China, the government has tasked the two grid companies to carry out studies to determine the annual cap for new solar and wind capacity in each province, and some provincial governments have also required the bundling of new large-scale solar and wind projects with battery energy storage before granting approval.

The Issues Monitor Survey also notes that **energy storage** innovation rises to be one of the top critical uncertainties in the region. Large-scale battery energy storage is an emerging technology, and many Asian energy leaders are looking to invest in it. However, the key barriers are high cost and unclear regulation. The cost of battery energy storage remains too high in almost all Asian countries. Many are hoping that innovation can help to bring down the cost rapidly, as experienced in the solar value chain over the past 10 years. Furthermore, facilitating the entry of energy storage solutions will require more innovative thinking on **market design** and regulation. However, it is challenging to set up appropriate market design and/or cost-recovery mechanisms to allow commercial investors of energy storage solutions to capture those value streams fully.

Finally, **energy efficiency** remains one of the top four Action Priorities this year, although its impact has declined. Many Asian regulators and vertically integrated utilities continue to set long-term energy efficiency targets or energy efficiency resource standards. However, it remains challenging for commercial investors in Asia to invest in energy efficiency solutions, partly because there are no clear regulations to

provide additional commercial incentives beside cost savings from reducing energy consumption. Even for cost savings related to consumption reduction, energy efficiency measurement can be contentious because it is not easy to agree on a formulaic definition of a “base-line” energy demand, given that many Asian consumers have rising consumption over time; furthermore, energy retail tariff distortion/subsidies remain common and may even increase amid the pandemic period in Asia, reducing the potential savings from adopting energy efficiency measures.

Moving forward, the expansion of renewable energies is likely to accelerate and the debate on how best to allocate the integration cost of renewables will intensify in Asia. Furthermore, as the cost of battery energy storage falls, the technology will be able to offer an economically viable option for the much-needed flexibility in the power systems of most Asian countries. The enhancement of existing electricity market design and regulatory frameworks is needed to align the incentives of commercial investors and values offered by energy storage, energy efficiency and other new types of generation sources.

TESTING PERSPECTIVES WITH THE COUNCIL'S ASIA COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's Asia energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. The pandemic has changed the leadership mindset on the need to accelerate the pace of transition to carbon neutrality, but the 'how' is unclear

COVID has stress-tested Asian energy systems where uncertainty has become the new normal in a context of less time and less capital for energy transition. Although climate change is recognised as a greater issue than COVID, the pandemic has affirmed to energy leaders the need to accelerate energy transition to low carbon. In response, several Asian countries including Japan, Korea, New Zealand, and Hong Kong have announced net-zero targets by 2050, with China committing to zero carbon by 2060. Falling costs of clean energy technologies are supporting the transition with Asian investors and utilities increasingly starting to shift their focus from traditional generation sources to renewables. At the same time, there is a pragmatic recognition that carbon abatement is becoming more important given the continued need for fossil fuels, which play an important role meeting increasing demand in a rapidly growing region. For example, Hong Kong has a net-zero target for 2050 and will initially reduce its emissions by replacing coal power plants with natural gas that will require Carbon Capture Utilisation and Storage (CCUS) in the longer term to meet the target. The anticipated continued use of fossil fuels is raising questions for Asian energy leaders about how CCUS can be economically and effectively deployed. While some countries have the technical capability, others are better suited for CCUS deployment, so some form of regional collaboration may be critical to enable its implementation.

2. Market design is seen as a key enabler, although there are differing perspective on potential evolution

Reduced energy demand during the pandemic has exacerbated existing challenges for incorporating large levels of variable renewable generation into the power grid, with some system operators declaring 'force majeure' to cut off renewable generation from the grid. Current energy market design and regulatory frameworks can also limit the uptake of new technologies where revised rules could make the economics more favourable while reducing the risk of higher prices for end consumers. Investment remains essential as supply quality continues to be a substantive issue for many countries.

3. Potential power grid opportunities

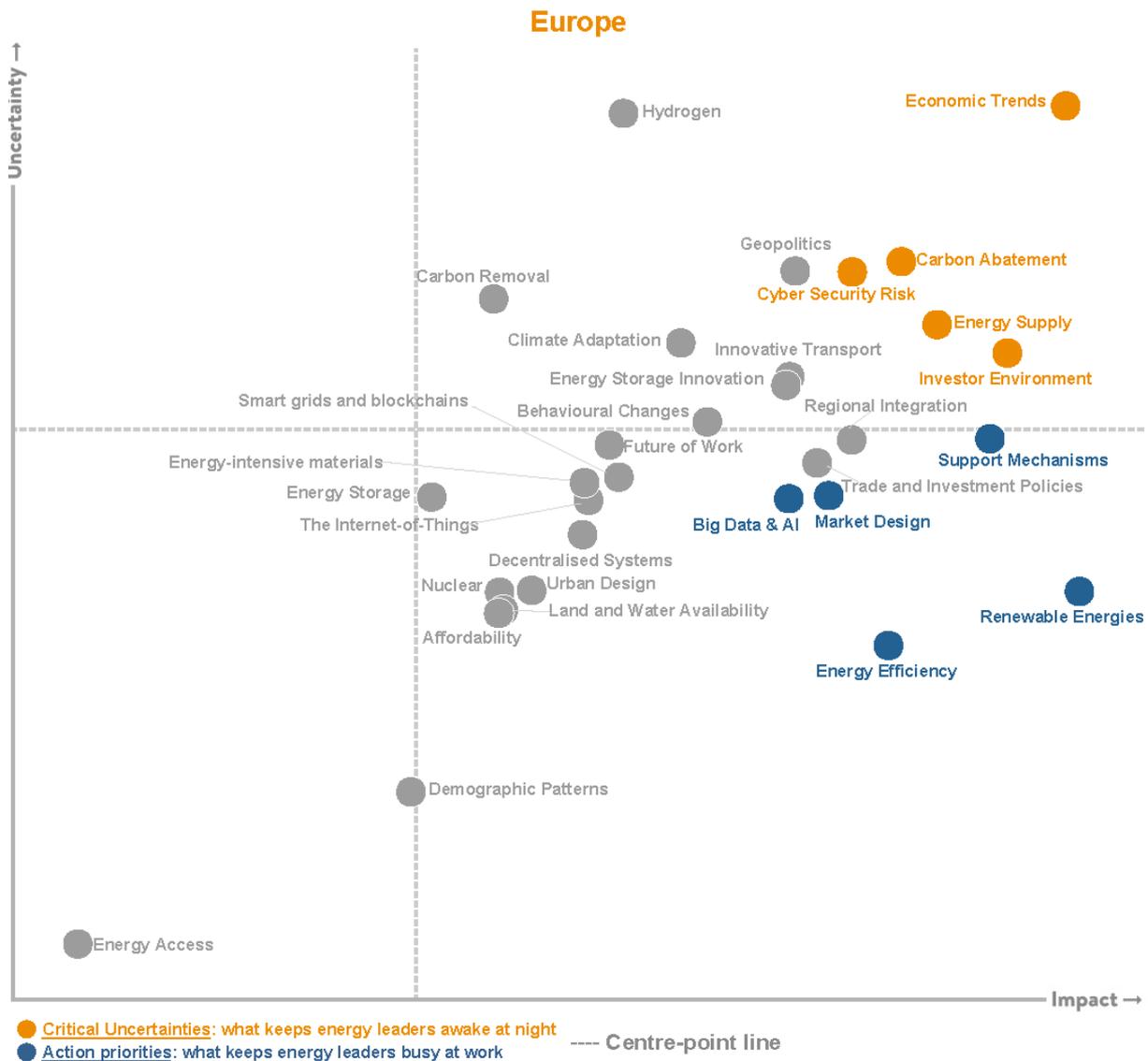
Low levels of power grid interconnection across Asia leads to more fragmented and nationally focused solutions, but there could be some scope of greater localised cooperation, notably among the southeast Asian countries. Many countries anticipate greater investment in smart grids with more demand-response mechanisms, where learning from and with regional neighbours could be help share best practice faster.

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EUROPE

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Across Europe, the pandemic’s influence on the energy agenda has varied between countries. As elsewhere, **economic trends** are the top critical uncertainty with the pandemic causing significant economic challenges that could affect the pace and shape of energy transition. At the same time, there is broad consensus about using pandemic economic recovery measures to support ambitious climate goals.

The European region has been, and continues to be, hit hard by the global COVID-19 pandemic and it is therefore not surprising that this is reflected in this year’s Issues Monitor. **Economic trends** is elevated both in uncertainty and impact and surfaces as the top Critical Uncertainty. As countries continue to struggle to contain the health effects of the pandemic, it is evident that the economic and societal impacts of the crisis are severe and deeply disrupting.

For the energy sector in Europe, the key question is whether the momentum will be seized to implement or boost an ambitious transformational agenda towards decarbonisation, or whether there will be a pause or even reverse (see *COVID-19 Post-Crisis Scenarios*, World Energy Council). A stable **policy environment** and an otherwise favourable **investor climate** are essential for mobilising necessary investments for energy transition. While frameworks such as the EU Green Deal have been welcomed as providing policy guidance, the global economic downturn and fall in energy demand create uncertainty among energy leaders in Europe as to whether investments may be postponed or even re-directed to other sectors in the economy. For energy-exporting countries like Russia, the volatility in oil and gas prices causes additional concerns. Governments across the European region are therefore stepping in with plans that aim to boost necessary investments. For example, Austria, France, Spain and the UK have indicated that their economic recovery packages will include ambitious ‘green transformation plans’ with significant funds earmarked for this purpose (see *World Energy Issues Monitor 2021 Country Commentaries*). ‘Green and innovative recovery’ is also at the heart of the extensive EU recovery package that was agreed at the end of last year.

In view of such ambitions, increasing the share of **renewable energies** in the overall energy mix remains the top Action Priority in the European region, closely followed by improving **energy efficiency**. What keeps energy leaders busy at work is the concern of how to best achieve these objectives. It is illustrative of this point that **support mechanisms, market design** and **digitalisation**, that can be seen as ‘enablers’ for these issues, appear as other action priorities.

Regionally integrated **energy markets**, supported by increased physical energy interconnection capacity between countries, are seen as crucial for optimal integration of renewable energies into the system and efficient electricity trading across borders, as well as for addressing issues related to energy security. Regional market integration projects therefore remain a priority across the continent, with the ‘Western Balkan 6’ initiative in the context of the Energy Community as an example. Countries are also adopting various **support mechanisms** to increase the deployment of renewables into the energy system, ranging from direct subsidies to instruments such as auctions. Getting the design right remains important as unbalanced or protracted use of such mechanisms may lead to unwanted distortive effects.

Countries choose the energy mix and decarbonisation strategies that best suit national circumstances. **Nuclear energy** for example remains an important part of a low-carbon energy mix in multiple countries, including Bulgaria, Finland, France, Hungary, Romania, Russia, Slovenia and Turkey, with nuclear generation capacity being increased in some places. What is clear is that **hydrogen** has grown significantly in impact since last years’ *Issues Monitor*, as it is regarded as solution for certain hard-to-abate sectors, such as high-temperature industrial processes. The adoption of the EU Hydrogen Strategy this year, as well as dedicated hydrogen strategies in multiple countries including Germany, The Netherlands, Portugal and Spain, illustrate the increasing interest in hydrogen’s potential. The hydrogen innovation tipping point will require finding economic uses where scaling-up and creating a market are essential. International collaboration is key for both and initiatives to create ‘hydrogen supply backbones’ across multiple countries, potentially stretching into Northern Africa, are under development.

Across the European region, improving **energy efficiency** is seen as a key Action Priority where much progress can and needs to be made. For the EU, for example, buildings are responsible for around 40% of energy consumption and 36% of greenhouse gas emissions (2020 Report on the State of the Energy Union). Also, in Russia, energy efficiency measures are an important pillar in coming to a reduction of 40-50% GDP carbon intensity by 2040 (see *Russia Country Commentary*, *World Energy Issues Monitor 2021*).

The application of **digital technologies**, including **smart grids, smart meters and energy management systems, block chain and ‘big data’**, is a central aspect of an efficient, decentralised and future-proof energy system. At the same time, it is recognised that with increased use of such technologies comes



vulnerability to digital disruptions and the misuse of data – intended or unintended. **Cyber security** is therefore elevated as a top critical uncertainty, with 74% of respondents to the resilience section of the Issues Survey considering that the level of preparedness in Europe against such risks is in the range of ‘medium’ to ‘very low’.

The **role of the consumer** as a key actor in energy transition has come to the front prominently. Not only have consumers increasingly become ‘prosumers’ of electricity, there is also greater awareness among policy circles that **consumer behaviour** will be key for successful energy transition. Digitalisation of the energy system will only work if consumers are willing to apply new technologies at the household level. ‘Not-in-my-backyard’ attitudes severely impact large-scale rollout of energy techniques such as onshore wind. Debates about affordability and burden-sharing can make or break societal support for the energy transition. **Humanising energy** will therefore remain a key aspect of the transition in years to come.

TESTING PERSPECTIVES WITH THE COUNCIL'S EUROPE COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's European energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. European climate ambitions being reinforced by post-pandemic recovery plans

The European region had an ambitious climate agenda that predated the pandemic, both within and beyond the European Union for net-zero or carbon-neutral targets by 2050. The pandemic has not reset this agenda but has supported its practical implementation, with many pandemic recovery plans focusing on better energy transition to meet the 2050 targets. Many countries are targeting ‘green recovery’ policies, with the European Commission supporting a package of measures under the green new deal banner. But the climate focus is not limited to the European Union countries, with the delayed COP26 raising ambition for the UK as the host, and for Russia looking to explore carbon neutrality and see how it can continue to utilise its existing energy assets in the lower carbon future. There are also divergent views on how to meet the 2050 targets, whether net-zero or carbon-neutral and on the potential roles for differing technologies such as nuclear and hydrogen.

2. The pandemic amplifies the need for just transition

Across the region, the pandemic has exposed some deep-rooted societal unevenness with increasing concerns about affordability and ensuring the whole of society can benefit from energy transition. With many poorer households being harder hit financially by the pandemic, energy leaders are increasingly aware of the importance of addressing energy poverty amongst European consumers. Within the EU, the European Commission's Just Transition Mechanism is providing targeted support for some €150 billion over the period 2021-2027 in the most affected EU regions, to alleviate the socio-economic impact of the transition.

3. Market design needs to evolve to better incorporate innovative technologies and business models

Many European region countries have adopted ambitious net-zero targets that will rely upon their energy markets being able to incorporate effectively new technologies and business models that will need the existing regulatory frameworks and market design to be updated. For instance, the UK 2020 Energy White Paper envisages that by 2050, clean electricity could meet over half of the country's final energy demand with increased use in light vehicles and home heating that will require a new approach to how the energy market would be designed, managed and regulated. This debate is beginning in several countries as they consider how best to secure the necessary investments for energy transition.

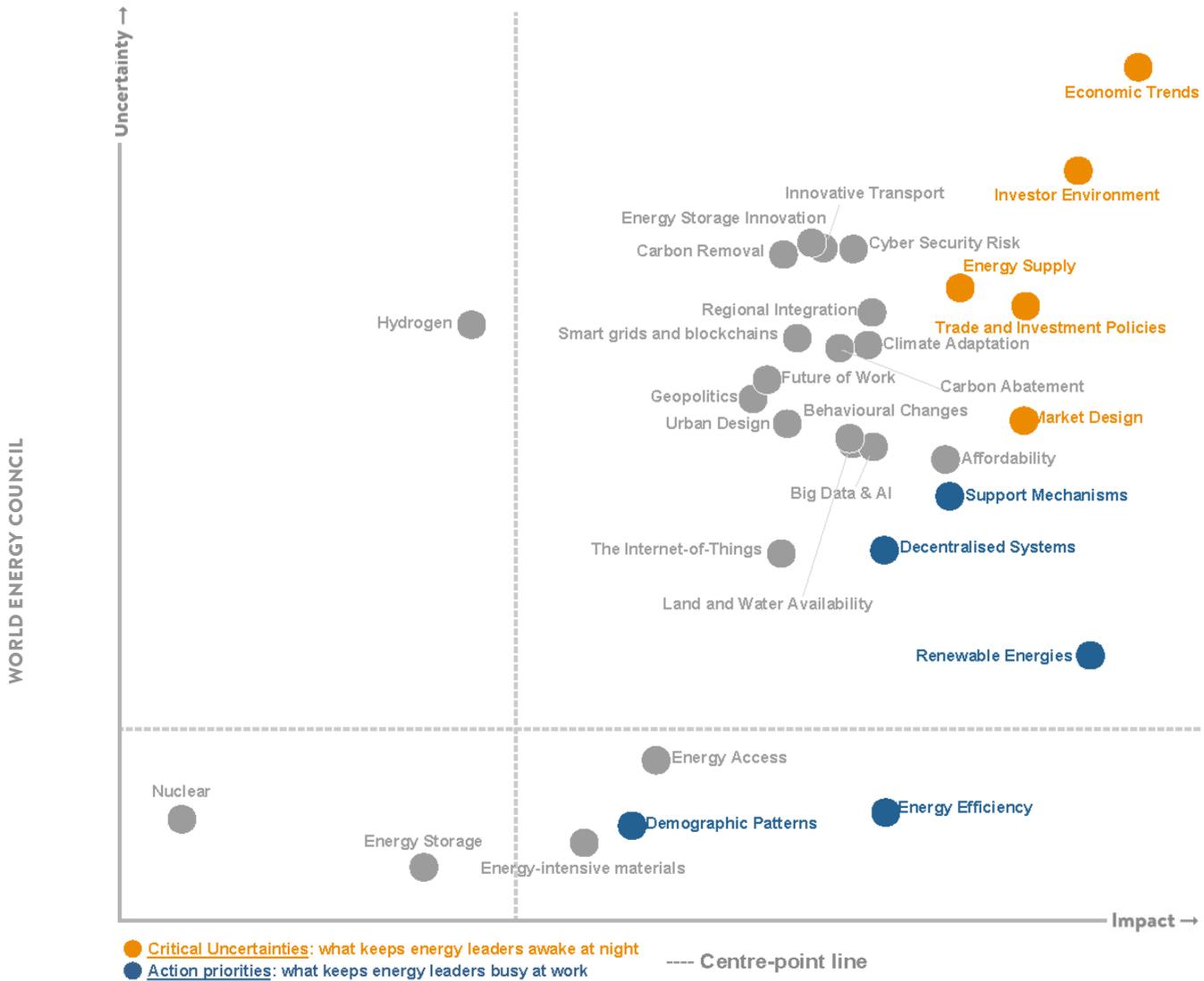
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LATIN AMERICA AND CARIBBEAN

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Latin America and the Caribbean



Countries in the Latin America and Caribbean (LAC) region were impacted later by the pandemic but have been hard hit due to their weaker economic resilience. Like most other regions, **economic trends** is the key critical uncertainty for energy leaders. While this certainly reflects concerns arising from the pandemic, it also reflects more deep-rooted challenges with several countries in the region facing substantial economic pressures prior to the pandemic. The second highest critical uncertainty is **investor environment**, which similarly reflects both long- and short-term concerns for recovery from the pandemic in the immediate future and longer-term challenges to secure the necessary investment for energy transition.

The critical uncertainty for energy leaders of **energy supply** covers both short- and long-term concerns while also reflecting differing issues for producers and consumers. There is the immediate short-term concern for hydrocarbon producers facing reduced demand and lower prices due to the pandemic that



also raise longer questions about potential demand destruction. Short-term concerns relate to securing supply during the pandemic and also include securing access to key components for energy assets, although the energy sector has provided to be remarkable resilient by keeping supplies flowing and the “lights on”.

The last two critical uncertainties of **trade & investment policies** and **market design** relate to longer-term concerns for the region’s energy leaders to enable effective energy transition. The trade & investment policies issue clearly relates to investor environment and securing investment for transition. The concern about market design relates to being able to incorporate new technologies and business models within the energy system and also to securing investment to enable transition. While not previously highlighted as a key critical uncertainty, last year market design was highly rated on its uncertainty and impact, and so reflects a longer standing concern. Market design is also not too far from becoming an action priority for the LAC region.

There is also a degree of continuity among the key Action Priorities for LAC with **renewable energies** and **energy efficiencies** focusing the region’s energy leaders at work as in previous years. This stems from the falling costs for renewables supporting their continued uptake. The action priority of **decentralised systems** can relate to renewable energies for more remote access or more distributed generation. The issue of **demographic patterns** is linked to a long-term critical uncertainty for energy supply about how changing populations can be supplied with energy and how their consumption may differ to current usage. These four action priorities are longstanding areas for focus that are unlikely to have be reset in the short-term due to the pandemic.

The final action priority issue is **support mechanisms**, which can have both short- and long- term aspects. The short-term perspective can link to the pandemic with support mechanisms to help mitigate the economic impacts. While there have been some innovative approaches (e.g. in Colombia where richer customers have help pay bills for the poor), the region’s weaker economic resilience would imply that the focus here may be more long-term about encouraging new technologies linking to market redesign and encouraging investment.

Across the LAC region, there is a long history of social movements wanting to ensure that the countries’ citizens are involved as stakeholders in the decision-making process for issues that affect them. This includes interest in discussing energy transition with a more bottom-up push for an active role in energy supply issues. This bottom-up push has encouraged governments and the energy sector to consider end-user access and supply security for better long-term solutions for local communities.

Although most countries took measures to prevent the spread of the pandemic, the impact has hit the region hard, with the collapse of tourism and stagnating economies leading to soaring unemployment rates in countries with weak social security safety nets. The pandemic’s impact on the region is likely to be felt for several years and has widened already large social disparities. Uncertainty about the longer-term impact on demand will make it harder to secure the private investment essential to upgrade the energy system for transition. But the region’s economic concerns predate the pandemic with high levels of public debt that have further exacerbated the challenges. The continued use of fuel subsidies by some LAC countries is increasingly unaffordable and needs to be better targeted but can be politically difficult to address.

Despite the economic challenges, the region remains pragmatic, with energy leaders keen to explore how market design can help secure investment to deploy new technologies and new business models. Innovative approaches are being considered including fiscal swaps, subsidy swaps or green bonds to remove economic restrictions and secure inward investment to enable the funding and deployment of new energy technologies

The region has rich potential in natural resources and potential for renewables but needs clear legal and policy frameworks to succeed. Across the region, there has been an increase in renewables and a fall

in investment in conventional plants, with coal expected to be phased out by 2040. Chile has a recent boom in renewable energy with nearly 5,000 MW under construction to meet 70% of power demand by 2030 from renewable energy sources and 95% by 2050. Costa Rica has already reached 90% of its total electricity demand from renewables. Renewables are becoming cost competitive without support and prompting concerns for regulators about balancing higher levels of supply-side intermittency with demand side management to open questions about market design.

The LAC region has weak public transport systems that lead to a greater reliance upon private vehicles and more pollution/emissions from transport. With their power systems already being low-carbon and with the lack of widespread heavy industrial basis to reduce emissions, the LAC countries need to focus on transport emissions to meet their climate change aspirations. Action is beginning at the city-level with cities such as Santiago, Medellin and Montevideo, considering sustainable and long-term visions that include the smart use of energy with innovative transport solutions.

With its diverse geography that ranges from the Amazon rainforest, to the deserts and the Andes mountains, energy integration and interconnection is more challenging and difficult in the region. This leads to a greater focus on decentralised systems on remote communities and local resilience where power cables and pipelines can be disrupted.

TESTING PERSPECTIVES WITH THE COUNCIL'S LAC COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's LAC energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. Pandemic exacerbated existing socio-economic challenges but has encouraged renewed motivation to tackle social unevenness

The LAC region was already facing socio-economic challenges prior to the pandemic with high levels of national debt and on-going protests about energy prices. The pandemic re-exposed the region's weaker social support mechanisms and fragile economic resilience but has prompted a revival of bottom-up community action to try to address these deep-seated challenges with innovative solutions.

2. Need to reshape market design to encourage innovation

LAC is increasing its wind and solar generation capacity on top of an already green electricity mix heavily based on hydropower. Incorporating more variable generation will require redesigning the existing market design to be more flexible and decentralised, while also enabling new services and market participants. Given the region's reliance upon private finance, further work is needed to encourage inward investment, exploring financial mechanisms such as fiscal swaps and green bonds. There also needs to be a rebalance of support mechanisms for new technologies and vulnerable customers.

3. Innovative transport could provide focal point for regional action

With an already largely decarbonised power system and the lack of a heavy industrial base with high emissions, the region needs to focus on reducing emissions in other areas to meet its climate goals. Transport emissions in the LAC region are high with weak public transport systems in large cities making innovation in clean urban transport a priority for region. The region's large cities of Lima, Santiago, São Paulo and Buenos Aires have massive populations with significant poverty and have not been able to implement efficient and clean public transport systems. The sustainable cities movement and innovative transport agenda aims to address this problem. The need for cleaner and more efficient transportation is recognised across the region, but challenges remain to enable the grid infrastructure and address finances where fuel taxation can account for 40% of state revenues in some countries.

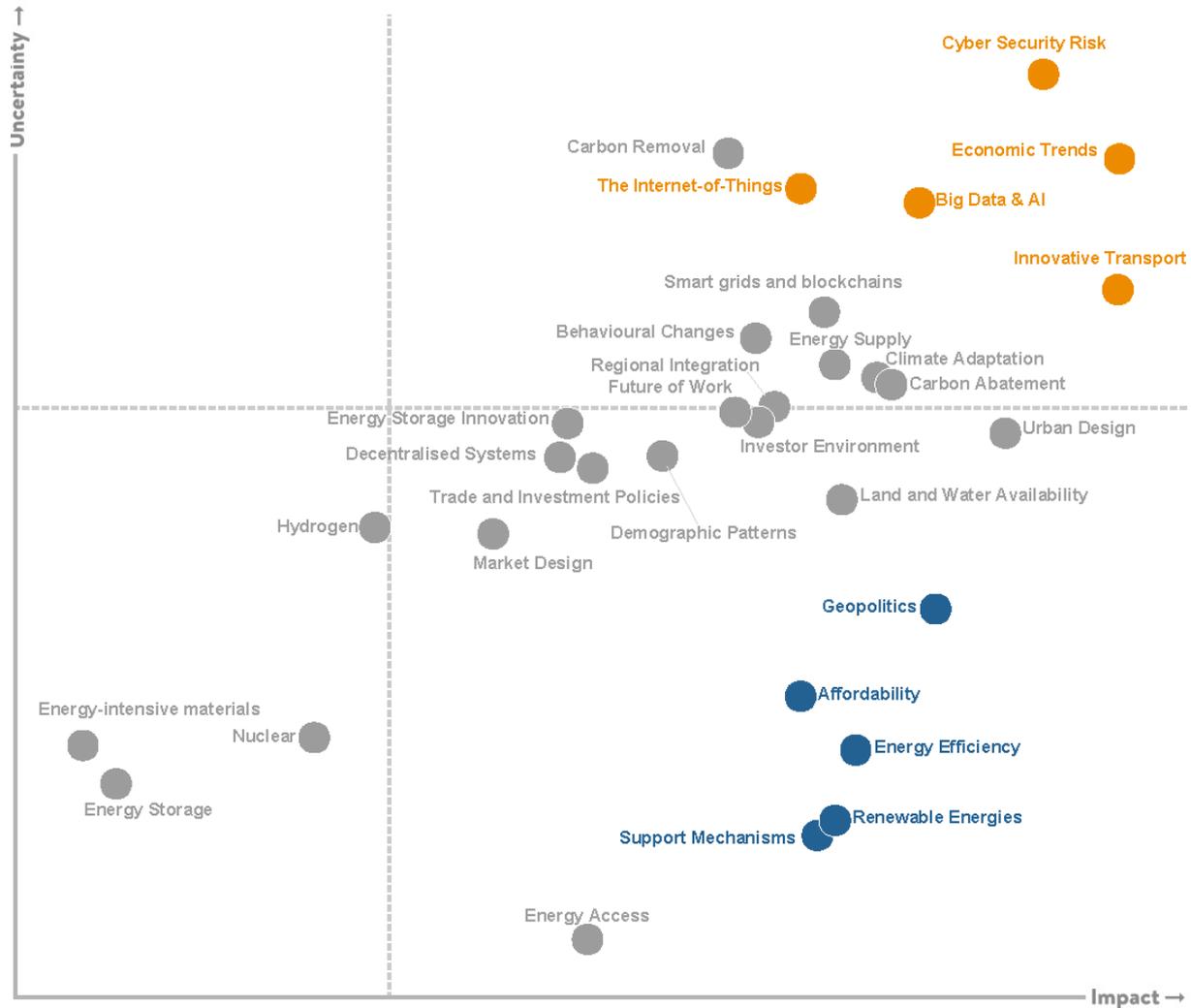
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MIDDLE EAST & GULF STATES

WORLD ENERGY ISSUES MONITOR | 2021

Middle East and Gulf States



● **Critical Uncertainties:** what keeps energy leaders awake at night
● **Action priorities:** what keeps energy leaders busy at work
 ---- Centre-point line

WORLD ENERGY ISSUES MONITOR 2021

The global shocks in energy demand, which led to unprecedented oil price crashes in 2020 have had a significant impact on those countries that rely economically on oil production. However, many Middle East producer countries are already well aware of these economic risks and have begun efforts to diversify their economies to be less reliant upon oil and gas revenues. The pandemic has therefore reinvigorated the energy agenda of the Middle East and Gulf States region by reaffirming their existing plans to diversify their economies and accelerate transition. There is a strong ongoing impetus for innovation to enable new energy transition solutions that will contribute to economic diversification and establish a circular carbon economy with Carbon Capture Utilisation and Storage (CCUS) for energy transition.

The economies of the Middle East and Gulf States suffered from the dual shocks of a global **economic downturn** caused by the COVID-19 pandemic and the collapse in oil prices, which shrank revenues in 2020 and raised debt levels as governments borrowed to manage deficits. The impact was uneven across the

region, but it highlighted the urgent need for economic reform and a move away from the region's over-dependence on hydrocarbons as a main source of state income. This changed perception can be seen in a shift of Action Priorities and Critical Uncertainties that were laid bare by the health emergency and differ from the previous year's priorities and areas of primary concern to policy makers. The World Bank expected the economies of the Middle East and North Africa region to contract by 5.2% in 2020, with only a partial recovery in 2021. Public debt is seen rising significantly from a projected 45% of GDP in 2019 to 58% in 2022. (World Bank: MENA Economic Update: Trading Together – Reviving Middle East and North Africa Regional Integration in the Post-COVID Era, October 2020).

Of the Critical Uncertainties identified in this survey, **economic trends** emerged as a new area of concern. This reflects mounting pressure on a number of countries in the region to increase spending to manage the health crisis and introduce fiscal measures to support their economies. This strained the economies of some countries such as Iraq, Kuwait, Oman and Bahrain to the point that Iraq struggled to meet public sector salaries at the end of 2020. Saudi Arabia, the region's biggest oil producer and exporter, trebled value added tax, which helped to boost non-oil income. The UAE, which has a more diversified economy than the other Gulf states, suffered from the drop in tourism, air travel and the slowdown caused by COVID-19. The pace of growth in the near term will depend on a recovery in these key sectors.

The disruptive influence of the pandemic on all economic activity may accelerate the process of **decarbonisation** and the drive to more sustainable energy systems, a process that has been off to a slow start in all but a handful of countries in the MEGS region. In 2020, the Organization of the Petroleum Exporting Countries (OPEC) said it expects oil demand to peak before the middle of the century. This has provided impetus to decarbonise the oil and gas sectors and develop a circular carbon economy, starting with wider adoption of (CCUS) technology to deliver carbon-neutral fuels to consumers. Saudi Arabia and the UAE have also embraced the concept of a circular carbon economy to reduce, reuse, recycle and remove CO₂ from the energy produced, while developing alternative fuels, including **renewable energy**, **nuclear power** and green and blue **hydrogen**. All these are reflected in the Action Priorities identified by Saudi Arabia and the UAE in the Issues Survey. Qatar, the world's largest exporter of Liquefied Natural Gas (LNG), is investing in technology to reduce methane emissions from gas production to export carbon neutral LNG to the market, amid growing pressure on gas producers to lower methane emissions, which are increasingly being tracked by satellite technology.

Saudi Arabia will be home to the largest green **hydrogen** facility at its futuristic city of Neom to be produced from 4 GW of wind and solar power. Neom will be a fully digitalised city running on renewable energy, which raises the issue of **cyber security**, already a concern for several of the MEGS countries that are highly digitalised. A number of drone attacks on Saudi oil and gas installations are an example of the heightened cyber security risks that have become a major area of concern and uncertainty.

In 2020, the UAE became the first Arab nation to start up a **nuclear** power plant at Barakah, which will provide 25% of the country's electricity needs when fully operational. The additional capacity helped the UAE maintain power system reliability during the pandemic and ensured uninterrupted energy supply. Although none of the MEGS countries have produced a green recovery package, the UAE has taken the lead by planning ahead, and is in the process of preparing a policy framework to 2071 while, at the same time, raising its target for the share of renewables in the energy mix in a revised submission to the UNFCCC. It intends to reduce greenhouse gas emissions by 70 million mt by 2030 and is on track to attain its clean energy target of 14 GW by 2030 from 2.4 GW in 2020. To meet this, the UAE has invested \$40 billion in clean power projects locally, but future investments will depend on a rebound in energy prices, which remains uncertain as some projects might face delays.

Both the UAE and Saudi Arabia, which has stepped up their efforts to deploy renewable energy, have achieved record low prices in recent bids for wind and solar projects, which are now competitive with natural gas and even coal. The UAE will become home to the largest single-site concentrated solar power (CSP) project in the world with a capacity of 700 MW at an LCOE of USD0.07/kwh. These low costs will encourage development of an affordable **hydrogen economy** in both Saudi Arabia and the UAE, a new



addition to Action Priorities in the MEGS regional agenda. The other key Action Priorities for the MEGS region are **energy efficiency** to reduce consumption, particularly in countries like Iraq and Kuwait, where energy prices remain heavily subsidised although no longer sustainable in a low oil price environment.

Geopolitical risk emerges again as it did the previous year as a main Action Priority and remains a perennial area of concern given the risks associated with lower fiscal buffers that may delay some key infrastructure investment and development projects. This highlights the need to encourage more private investment in the economies of the MEGS region as a way of creating new jobs outside the state sector, which remains the biggest employer in much of the region.

One of the countries in the region that faces the biggest geopolitical risk is Lebanon, where poverty levels were rising even before the massive explosion at Beirut port, which devastated large parts of the capital and exposed deep political divisions in the country. Hopes that offshore gas exploration would yield positive results were dashed when the first exploration well showed the presence of a hydrocarbon system but no reservoirs. In contrast, Iraq, the second largest producer in OPEC after Saudi Arabia, has suffered from the collapse in oil prices in 2020 and lower production as part of a collective agreement by OPEC and other producers led by Russia to cut oil supply in order to balance markets. The country found itself ending 2020 struggling to meet public sector salaries and pensions because it relies almost exclusively on oil exports for nearly all its budget revenues and the economy has not been diversified away from oil.

TESTING PERSPECTIVES WITH THE COUNCIL'S MEGS COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's MEGS energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. The pandemic has reaffirmed the regional energy agenda to diversify reliance on hydrocarbons

The region's energy producers already had plans to diversify their economies and reduce their reliance upon hydrocarbon revenues. The pandemic's impact reducing demand in the short term and longer-term concerns about demand destruction combined with lower oil prices helped to reaffirm these existing diversification plans. During its pandemic lockdown, Saudi Arabia pressed ahead with the rollout of its smart meter programme, which should be complete in early 2021.

2. Clean technologies can enable the continued use of existing energy assets

Energy producers in the region have been exploring the circular carbon economy to enable the continued clean use of hydrocarbon fuels during energy transition. Using CCUS with existing hydrocarbon assets together with the 4 R framework of 'Reducing, Reusing, Recycling and Repurposing' can help move towards a circular carbon economy aligned with other countries' net-zero ambition for energy transition. This is leading to strong incentives for energy innovation with the region exploring opportunities to become a major supplier of hydrogen.

3. Consumer engagement is the next big challenge

As the region transitions to a diversified energy mix, there is an awareness that consumer engagement will need to be prioritised over other stakeholders. End-users in the Middle East and Gulf States have been historically absent from the energy dialogue, with consumer tariffs traditionally being highly subsidised, blunting any consumer incentive to constrain demand. With efforts to diversify the region's reliance upon hydrocarbon revenues, fuel subsidies will increasingly need to be targeted towards the economically stressed. Diversifying the region's energy mix will also require a new engagement with consumers about their end-use, especially if demand management tools are to be implemented.

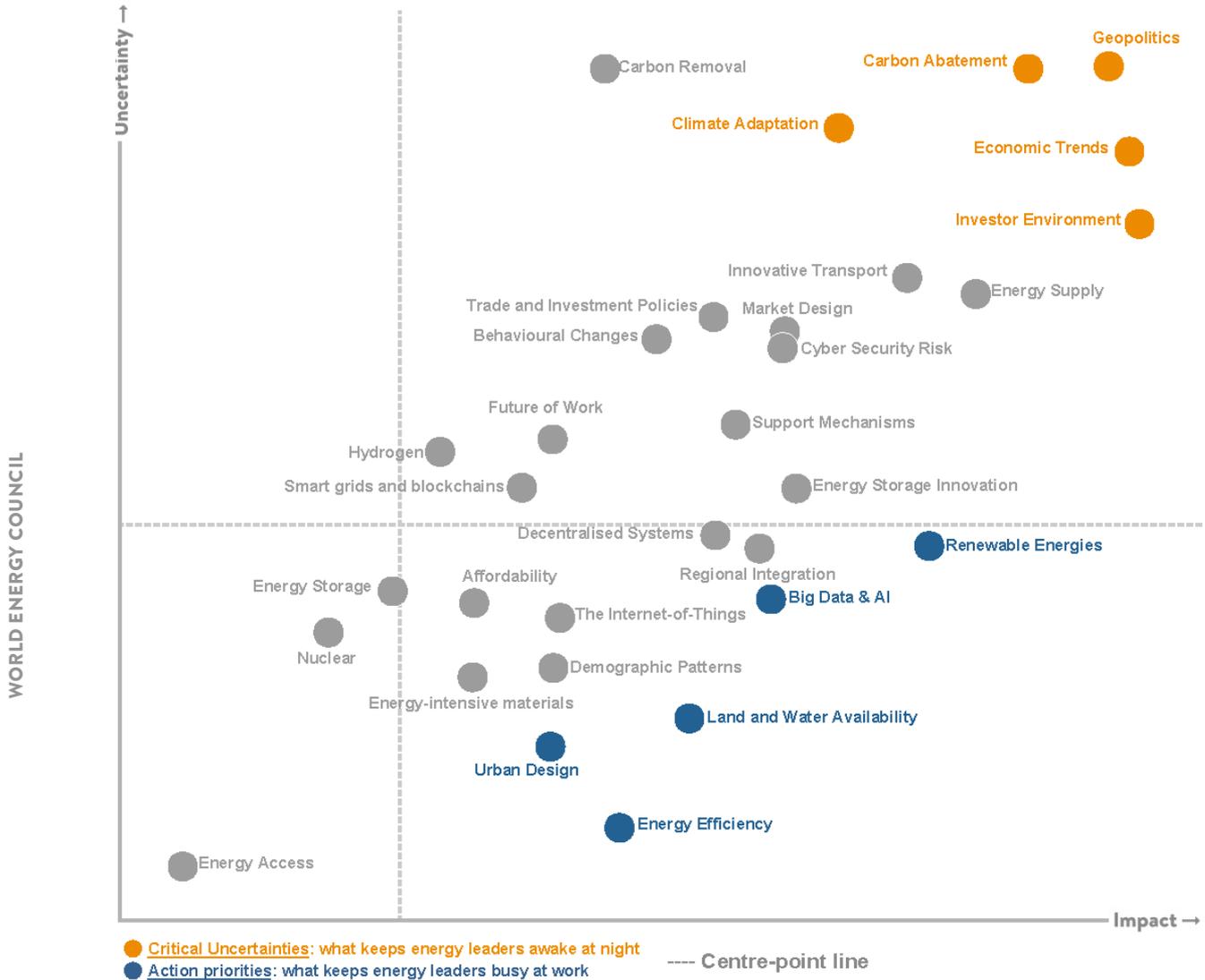
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NORTH AMERICA

WORLD ENERGY ISSUES MONITOR | 2021

North America



The North American Issues map differs from the other regions with **geopolitics** being the highest critical uncertainty, significantly above economic trends, which leads elsewhere. This concerns stems from the original survey being conducted in the build-up to the US Presidential election, but also continues the trend from the previous year when US politics was also the key critical uncertainty.

The pandemic has also caused significant suffering in North America with **economic trends** and **investor environment** being critical uncertainties, reflecting the pandemic context that is evident in other regions. The three North America countries are all significant hydrocarbon producers and have been affected by lower prices and reduced energy demand. The two other critical uncertainties of **climate adaption** and **carbon abatement** reflect some practical solutions for mitigating climate change, while also recognising the split in US politics, with Donald Trump’s administration withdrawing the US from the Paris Agreement and Joe Biden already committing to re-join it.



There is a degree of continuity with the Action Priorities with North American energy leaders continuing to focus on **renewable energies** and **energy efficiency** as in previous years. Ever falling costs for renewables has led to continued growth within the North American energy systems. But the situation is not universal with Mexico moving in a different direction by using more of its domestically produced oil in its power system while reducing renewables.

Big data & AI is another action priority reflecting the region's longstanding digital innovation that has been accelerated during the pandemic, with increased remote working and more digital solutions being deployed to mitigate the impact of the pandemic. The final two action priorities are **urban design** linked to innovation and **land & water availability**, which reflect some practical issues for energy production (e.g. hydro power or oil shale production) but could also highlight concerns following the significant wildfires in California.

The US Presidential Election clearly loomed large in the minds of North America's energy leaders with the very divergent directions for a continued Trump administration or a new Biden administration eager to re-engage on **climate concerns** that have very different implications for energy policy. The election of Joe Biden is now causing a fundamental reset of US politics with implications that extend far beyond the US. Most immediately on becoming President, Biden made good on his campaign pledge to re-join the Paris Agreement. He has also targeted the US becoming carbon-free by 2035 and achieving net-zero emissions by 2050 that will create a new set of opportunities and challenges for the energy community. One early shift in tone became apparent when President Biden blocked the Keystone XL pipeline previously supported by the Trump administration to export Canadian heavy oils to the US. But the US remains polarised and Biden's room for manoeuvre with Congress may be limited to resetting the tone and direction with the practical changes resulting from investment decisions taken by corporate America.

To a lesser extent, Canada and Mexico are also experiencing some polarisation of the energy transition discussion. In Canada, perspectives differ between the federal government, which is supportive of action on **climate change**, and provinces with oil production keen to maintain employment, while the First Nations want to stop new pipelines across their territories. Mexico's federal government is viewing energy with a more historical perspective, focusing on oil as strengthening energy sovereignty while putting less attention on climate change.

The pandemic has also had a significant impact on North America. All three countries are significant oil producers and have been affected by the fall in demand and lower prices. In common with other producers, there are concerns about whether there has been any permanent demand destruction with investment on new production capacity being postponed. While oil majors across the world have seen significant losses, North American oil majors seem to follow a divergent path by doubling down on hydrocarbon investments and buying up rivals. In contrast, European oil majors are transforming themselves into International Energy Companies by investing in gas and renewables. Mexico has sought to use more of its oil domestically for power generation to secure national oil production, albeit at the expense of displacing renewable electricity and challenging its electricity supply security. This has polarised perspectives within Mexico with the private energy sector and local government supportive of energy transition aligned to the climate change agenda.

Although the energy industry has ensured continuity of operations during the pandemic, there have been concerns about the sector's resilience to future systemic shocks and extreme weather events. **Digitalisation** has helped mitigate some of the pandemic's economic impacts but raised concerns about cyber security where there is a perception that there have been more attacks. The region's strong drive to innovate seeks to build upon digitalisation through the action priorities of **big data & AI**, **urban design**, and **innovative transport**. Big data, automation, digitalisation are being combined within a push for innovative transport of EVs and self-driving vehicles. The energy sector is also innovating using technologies to increase operational efficiencies (e.g. solar PV systems replacing diesel generation in drilling sites, installation of remote-control systems, etc.).

TESTING PERSPECTIVES WITH THE COUNCIL'S NORTH AMERICA COMMUNITY

The emerging findings for the Action Priorities and Critical Uncertainties were tested with the Council's North American energy community during a digital workshop in February 2021. The workshop supported the emerging findings while drawing out three overarching themes to summarise the region's current energy landscape:

1. US political reset permeates the region and beyond

The US Presidential election reflected a political reset more broadly while clarifying the policy direction for the energy sector. The return of the US to the climate change agenda provides renewed impetus to the COP26 negotiations later this year, with the Biden administration targeting net-zero by 2050. But US politics remain deeply polarised and Biden may need to focus on signalling direction rather than legislation. Biden's initial focus will be on the domestic pandemic recovery where there is some support to address societal problems exposed by the pandemic and to use the recovery to "build back better". The US political reset may also help Canada resolve its climate change tensions and persuade Mexico to re-engage.

2. Increasing contrast of North American Big Oil strategies

The pandemic has hit the finances of the oil industry heavily, with reduced demand and lower prices leading to significant losses and falling share prices. At the same time, the oil sector is being increasingly challenged by investors about its exposure to climate change risks, and this is prompting differing strategic responses from North American International Oil Companies (IOCs) to the European IOCs. While European companies like Shell, Equinor and BP have been increasing their clean energy portfolio and transforming themselves into International Energy Companies (IECs), US companies such as ExxonMobil, Chevron and ConocoPhillips have been increasing their shale oil assets in North America.

3. Strong drive for innovation coming from adjacent sectors

The pandemic has not slowed down innovation with advances in big data & AI from the technology sector feeding into the development of autonomous vehicles, with technology, vehicle manufacturers and energy companies cooperating and competing. At the same time, the big technology firms are becoming increasingly vocal about clean energy and supporting innovative breakthroughs. The challenge will be to boost innovation and accelerate transition whilst paying close attention to the humanising agenda to ensure a just energy transition that avoids leaving any communities behind.

For further details, please visit the [Issues Monitor Online Tool](#) where you can find and customise results for countries and regions, and download individual country narratives.



INTERACTIVE ISSUES MONITOR ONLINE TOOL

The World Energy Issues Monitor provides unique global, regional and national perspectives which can be used in combination with our other Insights tools such as the Energy Trilemma, Scenarios and Innovation Insights to inform energy transitions dialogue and decision making.

The [Issues Monitor Online Tool](#) presents in one place dynamic map views of the 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, time, or by highlighting of specific energy issues.

- The geographical views can 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, etc.
- Where specific narratives explaining the country data exist, they are included in the tool.
- Customised maps can be downloaded and shared on Twitter.

METHODOLOGY

The Council's World Energy Issues Survey identifies the strategic energy landscape of countries and regions in the world, through an analysis of 25 energy 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 2,500 energy leaders from 109 countries.

The Issues Survey uses two questions/dimensions to assess the issues:

- **Impact** – How energy leaders perceive the potential impact of issues on the energy sector in their country. This impact may be positive or negative.
- **Uncertainty** – How energy leaders rate the level of uncertainty around their country's ability to manage the impact of such issues.

The survey rates each issue for each question using the range of very low (1), low (2), medium (3), high (4) and very high (5) and designates a number for each, respectively. Once all Issues Survey responses have been collected, then the process of generating maps can begin.

To create an Issues Map, a minimum of 25 responses are needed to provide a good perspective of the energy landscape. National Issues Maps are built based on a simple average of the impact and uncertainty for each issue and plotting these values on a scatterplot, where the X axis denotes the value for impact and the Y axis denotes the value for uncertainty.

Regional and global Issue Maps are built based on a weighted average using energy consumption, production and national income per capita. This helps to avoid over or under representation of countries when building a regional or global energy picture. Every year, the data for consumption, production and income are updated to ensure fair and up to date representation.

ISSUES & DEFINITIONS

GLOBAL TRENDS AND MACROECONOMICS

- 1. Geopolitics:** The influence of geopolitics as a barrier to coordinated regional and global energy action.
- 2. Economic Trends:** The effects of economic growth (or lack thereof) on energy markets.
- 3. Regional Integration:** Collaboration between national and regional energy policy makers to manage allocation of energy resources (e.g. interconnectors, pipelines, trade platforms).
- 4. Commodity Prices:** Price volatility is a feature of commodities markets and may pose risks to stability of energy supply and investments. Can be associated with:
 - a) Energy supply (e.g. oil, gas)
 - b) Energy storage (e.g. cobalt, lithium)
 - c) Energy-intensive materials (e.g. steel, aluminium, copper, iron)

SOCIAL DYNAMICS

- 5. Behavioural Changes:** The role of evolving social norms (on the way energy is used) and of consumers' lifestyle choices in shaping demand, driving technology life cycles and stimulating innovation.
- 6. Demographic Patterns:** The influence of demographic changes (e.g. population growth or contraction, migration, urbanisation, etc.) on energy access, demand and consumption.
- 7. Future of Work:** Availability of skilled workforce and new business practices (e.g. remote working, four- day week, automation).
- 8. Energy Access:** Lack of access to basic energy or modern energy services.
- 9. Affordability:** Cost to energy users and the share of household budgets spent on energy, including heating fuels, electricity and gasoline.

NEW TECHNOLOGIES

- 10. Digitalisation:** The application of disruptive digital technology to improve energy security, equity and sustainability. Include the use of:
 - a) Big data, machine learning and artificial intelligence
 - b) The Internet-of-Things
 - c) Smart grids and blockchains
- 11. Cyber Security Risk:** Security of digital energy operating systems and networks.
- 12. Decentralised Systems:** Energy supply systems that deliver energy to one or more local customers and are connected either directly or via a small local network.



ENERGY POLICY AND BUSINESS ENVIRONMENT

13. Energy Storage Innovation: Progress toward energy storage solutions to support a diversified energy system, including flexibility, grid services, integration of renewables, sector coupling, etc.

14. Market Design: Enabling energy to be bought and sold in a manner that is transparent, regular and acceptable to all market participants.

15. Trade and Investment Policies: The legal framework between countries and the policy context for foreign investment.

16. Energy Efficiency: Measures (designs/operations/ technologies) to reduce energy consumption.

17. Support Mechanisms: Subsidies, Feed-in Tariffs and other mechanisms that support the growth of specific energy sources.

18. Hydrogen: Its potential to play a role in future energy systems.

19. Nuclear: The outlook for nuclear as part of the regional and global energy mix.

20. Renewable Energies: Potential growth of renewable energy sources, especially solar PV and wind.

21. Investor Environment: The influence of conditions such as access to capital, interest rates, exchange rates, currency stability and competition on investors' willingness to invest.

ENVIRONMENT

22. Climate Change Management: Adaptation and mitigation measures to manage the impacts of climate change. Typically include:

- a)** Climate Adaptation (e.g. make better use of scarce water resources, build coastal dams and flood defences, switch to drought tolerant crops etc.)
- b)** Carbon Abatement (e.g. fuel switching, electric mobility, higher efficiency conversion technology, etc.)
- c)** Carbon Removal (e.g. CCUS, BECCS, DACCS, reforestation and afforestation, enhanced coastal weathering, etc.)

23. Land and Water Resource Availability: The access to and availability of land and water for the supply, transport and distribution of energy.

24. Urban Design: Management of waste, water, energy and transportation to deliver resource-efficient urbanisation at scale.

25. Innovative Transport: Growing integration of more environmentally friendly transportation options (e.g. electric vehicles, hybrid and natural gas vehicles, self-driving vehicles, car sharing, bike lanes, etc.).

FREQUENTLY ASKED QUESTIONS

Q.1 WHAT IS THE PURPOSE OF THE WORLD ENERGY ISSUES MONITOR?

The World Energy Issues Monitor is one of the four Energy Transition Insights Tools of the World Energy Council. It is a horizon scanning resource that provides valuable insights on the energy landscape and emerging trends for energy leaders. These insights are based on the perspectives of decision makers involved in developing strategies and planning for the future of the energy sector. It is important to note that the Issues Monitor's insights are based on an annual survey of energy leaders' perspectives and not on hard data. Quantitative analysis is provided through the Trilemma and Scenarios insights tools. Issues Maps provide common definitions for the uncertainties faced by energy leaders in formulating policy and the priorities that drive their decisions on the national, regional and global levels. These insights can serve as an advance warning system, so issues that arise can be tackled proactively in a timely manner while also allowing for the exchange of ideas and experiences through the World Energy Council's global network.

Q.2 WHAT IS NEW IN THE ISSUES SURVEY THIS YEAR?

(1) A revised set of 25 core issues (down from 46) has been identified and organised under 5 new categories; (2) Revised definitions of issues with clearer language translated into the 6 UN languages - English, French, Spanish, Russian, Arabic and Chinese (3) The 'Urgency' dimension has been replaced by a new approach to identify the top 3 issues that leaders consider the highest priorities - the urgency dimension was supposed to be reflected in the size of bubbles although this never worked as intended and so has been dropped; (4) A new section to map perceptions of risks and opportunities has been created to capture further insights on national transitions; and (5) A re-designed questionnaire using the Council's brand guidelines and providing greater accessibility.

Q.3 HOW DO THE CHANGES IN THE SURVEY AFFECT TIME-TRACKING?

Key issues have been maintained to preserve the time-tracking ability of the tool (e.g.: Regional Integration, Commodity Prices, Energy Access, Affordability, Digitalisation, Decentralised Systems, Market Design, Energy Efficiency, Hydrogen, Nuclear, Renewable Energies).

Q.4 WHAT TIMEFRAME SHOULD BE CONSIDERED WHEN READING THE ISSUES MONITOR?

Respondents to the 2020 Issues Survey considered the timeframe January-August 2020 when completing the survey for the 2021 World Energy Issues Monitor.

Q.5 WHO TAKES PART IN THE SURVEY?

For the 2021 World Energy Issues Monitor, we have had over 2,500 responses from 108 countries. The majority of responses to the survey is completed by decision makers. In general, high level executives in the energy sector are the target audience.

Q.6 HOW MANY RESPONSES ARE NEEDED TO HAVE A NATIONAL ISSUES MAP?

The minimum survey responses required to produce a national issues map is 25 responses. There is no limit to the number of responses submitted, but the majority must come from C-level/ Board or Senior Management. Members are strongly encouraged to secure a diversity of sector representation among respondents as well to ensure representation from industry.

Q.7 WHERE CAN I FIND THE RESULTS?

The results are published once a year and can be downloaded for free from the Council's website.

The main World Energy Issues Monitor 2021 publication:
<https://www.worldenergy.org/publications>

The online tool, presenting global, regional and country results:
<http://www.im.worldenergy.org/>

ACKNOWLEDGEMENTS

The project team would like to thank the individuals who informed the project's approach, supplied information, provided ideas, and reviewed drafts. Their support and insights have made a major contribution to the development of the report.

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