WORLD ENERGY COUNCIL

2022 WORLD ENERGY ISSUES MONITOR

APPENDICES

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

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WORLD ENERGY ISSUES MONITOR 2022

The World Energy Issues Monitor provides a snapshot of what keeps CEOs, Ministers and experts awake at night in nearly 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 13th iteration of the World Energy Issues Monitor is based on insights of nearly 2,200 energy leaders in 91 countries to provide 51 national assessments across six world regions.

World Energy Issues Monitor 2022, published by the World Energy Council.

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APPENDIX 1

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, produced in conjunction with the Council´s project partner, Arup, 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 social media platforms.

APPENDIX 2

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 2,200 energy leaders from 91 countries.

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

- ***Impact*** – When you consider the critical choices you face in adapting the energy system to the evolving needs of your country, how important is this issue on a scale of very low to very high?

- ***Uncertainty*** – Based on your perception of where your country's energy system might be in 2040, how would you rate the level of uncertainty around this issue on a scale of very low to very high?

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 weighted average of the impact and uncertainty for each issue based on seniority level (the higher the level, the higher the weight). Issues' scores reflect a weighted average of individual responses. 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 of country scores 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.

APPENDIX 3

ISSUES & DEFINITIONS

Below is the list of 25 energy issues included in the Issues Survey, and their respective definitions:

GLOBAL TRENDS AND MACROECONOMICS

This section focuses on global trends and macroeconomic issues including geopolitics, economic growth, regional integration and commodity pricing.

1. Geopolitics: The influence of regional and/or international affairs on the country's ability to coordinate regional and global energy action.

2. Economic Growth: The effects of changes in economic growth levels on the country's energy market.

3. Regional Integration: Collaboration between national and regional energy policy makers to implement energy policies, interconnection and trade.

4. Commodity Prices: The effects of commodity price changes on the country's energy market. Specifically:
a) Oil and gas;
b) Coal;
c) Non-fuel raw materials (e.g., rare earth metals, cobalt, lithium, steel, aluminium, copper, iron).

ENVIRONMENT

This section focuses on environmental issues, including climate change, energy efficiency, resource availability and the circular economy.

5. Climate Change Management: Adaptation and mitigation measures to manage the impacts of climate change. These 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, reforestation and afforestation, etc.);
b) Carbon Abatement or Removal (e.g., industry fuel switching, electrification, use of carbon capture technologies, etc.);
c) Climate Policy (e.g., net-zero targets, carbon pricing, emission trading schemes).

6. Energy Efficiency: Measures (rules/operations/technologies) to optimise energy consumption.

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

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

9. Innovative Transport: The integration of more environment-friendly transportation options (e.g., green aviation, green shopping, electric vehicles, natural gas and fuel cell vehicles, self-driving vehicles, car sharing, bike lanes, etc.).

ENERGY TECHNOLOGIES

This section focuses on energy technology issues, including hydrogen, renewables, nuclear, electric storage, digitalisation and cyber security.

10. Hydrogen: Its potential to play a role in a country's energy system.

11. Renewable Energies: The potential growth of renewable energy sources, especially solar PV, wind and biofuels.

12. Nuclear: The outlook for nuclear as part of the country's energy mix.

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

14. Digitalisation: The integration of disruptive digital technology to improve energy security, equity and sustainability. These include:
a) Big data, cloud computing, machine learning and artificial intelligence;
b) The Internet-of-Things, smart grids and blockchains.

15. Cyber Security Risk: Cyber threats to energy operating systems and networks.

POLICY AND BUSINESS

This section focuses on energy policy and business issues, including market design, trade and investment.

16. Market Design and Regulations: Frameworks and rules for the participation of private and public actors in the country's energy value chain.

17. Cross-Border Trade: The trade frameworks between countries and the policy context for foreign investment.

18. Support Mechanisms: Measures that keep prices for customers below market levels or, for suppliers, above market levels, or reduce costs for customers and suppliers.

19. Investor Environment: The influence of conditions such as access to capital, interest rates, exchange rates, currency stability and competition on investors' willingness to operate in the country.

SOCIAL DYNAMICS

This section focuses on social dynamics issues, including demand-side impact, energy access and equity.

20. Demand Pull: The role of consumers' choices or preferences in shaping demand, driving technology developments and stimulating innovation.

21. Demographic Patterns: The influence of demographic changes (e.g., population growth rate, migration, urbanisation, etc.) on energy consumption and quality of energy access.

22. Decentralised Systems: Distributed Energy Resources (DER) that deliver energy to local customers (e.g., microgrids, energy communities).

23. Future of Work: Availability of skilled workforce in relation to new business practices (e.g., remote working, four-day week, automation).

24. Quality Energy Access: Availability of sufficient, safe and reliable energy supply, which can enable prosperous modern livelihoods (e.g., use of modern electrical appliances, use of energy for revenue generation).

25. Affordability: The proportion of household income spent on electricity, heating/cooling, cooking and road fuels.

APPENDIX 4

FREQUENTLY ASKED QUESTIONS

Q1 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.

Q2 WHAT TIMEFRAME SHOULD BE CONSIDERED WHEN READING THE ISSUES MONITOR?

Respondents to the 2021 Issues survey considered the post-COP26 timeframe (November 2021) when completing the survey for the 2022 World Energy Issues Monitor.

Q3 WHO TAKES PART IN THE SURVEY?

For the 2022 World Energy Issues Monitor, we have had nearly 2,200 responses from 91 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.

Q4 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 as to ensure representation from industry.

Q5 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 World Energy Issues Monitor 2022 publication can be found at: https://www.worldenergy.org/publications

The online tool, presenting global, regional and country results can be found at: https://www.im.worldenergy.org

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