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ONE EARTH • ONE FAMILY • ONE FUTURE

G20 Energy Transitions Ministers' Meeting
Outcome Document and Chair's Summary

Goa, India

22 July, 2023



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All G20 Ministers responsible for Energy agreed to paragraphs 1-20, paragraph 28-29, and Annex- I "G20 High Level Voluntary Principles on Hydrogen". Paragraphs 21-27 are the Chair's Summary issued under the responsibility of the Chair.

1. We, the G20 Energy Ministers, met under India's G20 Presidency, with the theme '**One Earth, One Family, One Future**' in Goa, India, on 22 July 2023, with the aim to share, collaborate and build on the sense of responsibility and solidarity amongst the G20 members in accelerating the clean, sustainable, just, affordable and inclusive energy transitions, following various pathways, as a means of enabling secure, sustainable, equitable, shared and inclusive growth.

2. We firmly believe that energy security, energy access, market stability, and energy affordability need to be advanced simultaneously while advancing energy transitions, in pursuit of economic growth and prosperity, and ensuring access to modern energy for all, leaving no one behind. We also recognize the urgent need for advancing energy transitions, through various pathways, for contributing towards achieving our sustainable development goals as well as global net zero green-house gas emissions/carbon neutrality by or around mid-century. Mindful of our leadership role, we reaffirm our steadfast commitments, in pursuit of the objective of UNFCCC, to tackle climate change by strengthening the full and effective implementation of the Paris Agreement and its temperature goal, reflecting equity and the principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances. We also take into account the best available science, circular approaches, socioeconomic, economic, technological, market developments and promoting the most efficient solutions.



Energy Security and Diversified Supply Chains

3. We stress the importance of ensuring that the growing global energy demand is matched by sustainable and affordable energy supplies. We aim to advance technological collaboration and cooperation amongst G20 members, other international partners and multilateral institutions to strengthen energy systems with a view to ensuring energy security and stabilizing energy markets. In this context, we emphasize on the importance of maintaining uninterrupted flows of energy from various sources, suppliers and routes exploring paths to enhanced energy security and markets stability, including through inclusive investments to meet the growing energy demand, in line with our sustainable development and climate goals, while promoting open, competitive, non-discriminatory, and free international energy markets. We attach importance to promotion of dialogue between consumers and producers as well as global cooperation in the business sector, and the need for adequate energy investments towards sustainable, affordable, reliable, resilient, and cleaner energy systems.

4. We acknowledge that certain minerals, materials and technologies are critical for energy transitions and there is a need to maintain reliable, responsible and sustainable supply chains of such critical minerals and materials, as well as semiconductors and related technologies complying with the principles of market economy and international trade rules while respecting the sovereign rights of countries. In this regard, we support voluntary and mutually agreed technology diffusion, skill development, beneficiation at source and increased flow of finance to address the lack of capital, human or technical resources; to produce them sustainably and with a view to enhance local value creation through beneficiation. We support research and development for increasing efficiencies, increasing scale of beneficiation at source, promoting circularity, and enabling sustainable alternatives to maintain, supply chain balances of such minerals and materials. We reiterate the need to reduce the potential negative impacts on people and the environment and intend to leverage multilateral cooperation as well as cooperation between the G20 members. In this regard, we take note of the



Presidency documents: “Voluntary High-Level Principles for Collaboration on Critical Minerals for Energy Transitions” (Annex A) and the report “Addressing Vulnerabilities in the Supply Chain of Critical Minerals”.

5. We also recognize the role of grid interconnections, resilient energy infrastructure and regional/cross-border power systems integration, where applicable, in enhancing energy security, fostering economic growth, and facilitating universal energy access for all, in affordable, reliable and sustainable manner. In particular, we recognize that expanded and modernized electricity networks will be essential to scale up the deployment of zero and low emission technologies including renewables. This entails enhanced voluntary international cooperation in coordinated planning, mutually agreed information sharing, joint research and development, technical assistance, technology development and harmonization of regulatory frameworks for design, planning and system operations. In this regard, we take note of Presidency’s initiative to connect different regional grids through interconnections to transfer renewable energy power. We call for increased public and private investments, noting the important role of International Finance Institutions including Multilateral Development Banks (MDBs) in supporting developing countries to exploit the full benefits of regional/cross-border interconnections, where deemed appropriate.

Universal Energy Access

6. We highlight that access to affordable, reliable, sustainable and modern energy for all is a moral imperative and a basic human need. We intend to expand on the achievements of previous G20 Presidencies and prioritize and take actions to pursue our shared objectives of attaining SDG7 targets through enhancing international cooperation and investment in technologies and accelerating progress on clean cooking, electricity access and eradicating energy poverty. We commit to provide support for all sections of society to ensure that no one is left behind.



Just, Affordable, and Inclusive Energy Transition Pathways

7. Recognizing the need to pursue clean, sustainable, just, affordable and inclusive energy transitions, we acknowledge the need for economic diversification including by promoting various approaches and investments in new industries, technologies and businesses, workforce transformation through reskilling and up-skilling to create avenues of employment and support the diversification of economies to maximize positive and minimize negative socio-economic impacts of energy transitions. We aim to enhance collaborations and partnerships to promote zero and, low emission technologies, economic activities, creation of new jobs and social dialogue to address the needs of workers from effected sectors, Indigenous Peoples and local communities, women, youth, children, migrants and persons with disabilities, persons living in poverty and other vulnerable situations. We will also support and encourage a stronger focus on women empowerment and gender equality in energy transitions at all levels.

Energy Efficiency and Responsible Consumption

8. We acknowledge the role of energy efficiency and energy savings, as the “first fuel” and the importance of national energy efficiency and energy savings policies in not only driving the energy transitions, but also contributing to sustainable job creation, reducing energy cost for households, and ensuring energy security. We strive to strengthen global efforts on energy efficiency through international engagements such as the G20 Energy Efficiency Leading Programme (EELP), Energy Efficiency Hub, Clean Energy Ministerial (CEM), among others, for sharing best practices, voluntary and mutually agreed knowledge sharing and technology transfer/co-development, promoting circular approaches, and will focus on evolving an effective roadmap on a voluntary basis, for achieving the SDG 7.3 target of doubling the global rate of improvement in energy efficiency within this decade taking into account, national circumstances. We aim to accelerate the implementation of various energy efficiency and energy savings policies and measures such as adoption of super-efficient appliances, optimizing demand for cooling and heating, and scaling up of commercially available energy



efficiency technologies in line with national circumstances. In this regard, we note the “Voluntary Action Plan on Doubling the Rate of Energy Efficiency Improvement by 2030” (Annex B) prepared by the Indian Presidency.

9. We also recognize that individual actions and sustainable behavioral choices can play a major role in energy conservation. We intend to build upon the efforts by the past Presidencies to emphasize that energy efficiency and affordability gains go hand in hand with efforts relating to responsible consumption that would incentivize and empower sustainable consumer choices. We acknowledge that greater awareness and capacity building for all categories of consumers and coordinated measures are needed to incentivize sustainable consumption patterns. In this endeavour, we welcome the Presidency’s initiative on Lifestyles for Sustainable Development.

10. We Recognizing that mitigating GHG emissions from energy intensive industry sector is critical to achieving global net zero/carbon neutrality by or around mid-century in line with national circumstances, we reiterate the need to make concerted efforts to innovate, develop, and deploy available transformative technologies, identifying cost-effective solutions to manage and reduce emissions intensity in line with national circumstances Furthermore, we stress the importance of effective and efficient policy frameworks and approaches including the development of demand side energy policies and leveraging public and private financing to promote both technological and non-technological solutions. We encourage non-discriminatory technology collaboration on voluntary basis and on mutually agreed terms for hastening energy transition pathways.

ADDRESSING TECHNOLOGY GAPS FOR ENERGY TRANSITIONS

11. We realize the role of continuous breakthroughs, adoption and scaling up of already available low and zero emission technologies including those that reduce, abate and remove GHG emissions, and rapid development and commercialization of promising new energy technology solutions for accelerating energy transitions in a sustainable and inclusive manner and



support the non-discriminatory collaboration and mutually agreed voluntary transfer of necessary technologies for enabling such transitions.

12. We reiterate the significance of accelerating the pace and scale of commercial deployment of mature clean energy technologies including solar, wind, hydropower including pumped storage, geothermal, bioenergy, heat pumps, CCUS and, nuclear energy for those countries that opt to use it. We also acknowledge the need for acceleration of development and deployment of other emerging and new technologies such as electrolyzers, bioenergy with carbon capture and storage (BECCS), direct air capture (DAC), high efficiency fuel cells, ACC battery storage, and sustainable advanced biofuels, as well as, small modular reactors (SMRs) for those countries that opt to use it, in accelerating the energy transitions, as per national priorities and circumstances.

13. Affordability and accessibility of existing, emerging and new technologies is a key issue especially for developing economies and, therefore, we recognize the need for supportive regional, multilateral, bilateral and public-private frameworks to strengthen the development, deployment and the voluntary and mutually agreed sharing of these technologies in a non-discriminatory manner.

14. We recognize the significant role of initiatives that support efforts to develop, demonstrate and deploy clean and sustainable energy technologies and solutions and other efforts for innovation. We aim to strengthen technology development, respective national regulatory frameworks, innovation, research capacities, scaling up investments and bridge technological gaps for emerging and developing economies in a non-discriminatory and more cooperative, affordable, and secure manner. We will pursue, on a voluntary basis, opportunities to strengthen cooperation and collaborative efforts with relevant international organizations and other fora including: the Clean Energy Ministerial (CEM), Mission Innovation (MI), RD20 among others, to advance R&D, deployment and dissemination of clean and sustainable energy technologies. In this regard, we take note of the convening of the joint plenary of 14th CEM and 8th MI Ministerial organized



on the sidelines of the Presidency, which we believe will strengthen and contribute significantly to advance the cooperation amongst G20 members to accelerate the realization of common goals towards energy transitions.

15. The countries that opt to use civil nuclear energy reaffirm its role in providing clean energy contributing to GHG emissions reduction, achieving SDG 7 goal and energy security, ensuring safety and resilient infrastructure and contributing to baseload power and grid flexibility along with non-electrical applications such as industrial heating and hydrogen production. These countries plan to collaborate, on voluntary and, mutually agreed terms, in research, innovation, development & deployment of civil nuclear technologies including advanced and Small Modular Reactors (SMRs), which are being readied for deployment and building resilient nuclear supply chains, including nuclear fuel, through public and private partnership, where appropriate and in accordance with national legislations and upholding IAEA's high standards of nuclear safety, security and safeguards. These countries intend to promote responsible nuclear decommissioning and radioactive waste and spent fuel management and mobilizing investments, and share knowledge and best practices, through strengthening international cooperation to promote nuclear safety globally. These countries will engage actively in cultivating a skilled and diverse workforce for the future, exchanging knowledge and best practices for advancement of energy transitions through civil nuclear technologies including advanced and Small Modular Reactors (SMRs).

Fuels for Future

16. We recognize the importance of exploring, diversifying, adopting, and advancing sustainable biofuels and hydrogen produced from zero and low emission technologies, and its derivatives such as ammonia, for contributing towards the energy transitions, enhancing energy security, and addressing GHG emissions. We underscore the importance of supporting national policies that stimulate further advancements and deployments of various technologies, ensure sustainable feedstock sourcing, enhance productivity, and accelerate market development. We acknowledge the need to strengthen



collaborative research, facilitate voluntary and mutually agreed technology transfer/co-development and financing needs for advancing the adoption of sustainable fuels for future, encouraging knowledge sharing on sustainable practices and in this regard, note the work of multilateral initiatives.

17. We aim to support acceleration of production, utilization, as well as development of transparent and resilient global markets for hydrogen produced from zero and low emission technologies and its derivatives such as ammonia by developing voluntary and mutually agreed harmonizing standards as well as mutually recognized, and interoperable certification schemes. To realize this, we affirm the “G20 High Level Voluntary Principles on Hydrogen” (Annex I) to build a sustainable and equitable global hydrogen ecosystem that benefits all nations. We recognize that cooperation among G20 members would be crucial to accelerate technology development and large-scale deployment of hydrogen and its derivatives such as ammonia, while reducing costs. In this regard, we note, the Presidency’s initiative to establish, the Green Hydrogen Innovation Centre steered by ISA.

18. We recognize the potential opportunity of working together for further deployment and development of sustainable biofuels as one of the options, for advancing the energy transitions. We support international cooperation on sustainable biofuels and bioenergy, as well as on innovative technologies for sector coupling. We further support the role of bioenergy and biofuels among the 4Rs framework (Reduce, Reuse, Recycle and Remove) in realizing the energy transitions. We take note of the Presidency’s initiative to establish a ‘Global Biofuels Alliance’. We intend to work to facilitate, inter alia, cooperation, on a voluntary basis, in intensifying the use of sustainable biofuels through strengthening collaboration between producers, consumers & interested countries, bolstering biofuels markets and encouraging the development of standards in the sector, emphasizing adherence to sustainability principles, strengthening markets, facilitating sustainable global biofuels trade, development of concrete policy lesson-sharing and establishing provisions of technical support in collaboration with international biofuels organizations.



Access to Low-Cost Financing for Energy Transitions

19. We stress upon expediting the voluntary transfer on mutually agreed terms /and/or/co-development and adoption of clean, sustainable and low carbon/emission energy technologies, which are often capital-intensive and necessitate low-cost financing from various sources. G20 will work towards facilitating access to low-cost finance for existing as well as new and emerging clean and sustainable energy technologies for supporting the energy transitions. We note the report on “Low-cost Financing for the Energy Transition” prepared under the Indian Presidency and its estimation that the world needs an annual investment of over USD 4 trillion, with a high share of renewable energy in the primary energy mix. We reiterate that access to low-cost financing, particularly for developing countries, is pivotal for accelerating the efforts towards energy transitions while ensuring energy access, energy security, affordability and market stability.

20. To ensure accelerated energy transitions, we recognize the need for international finance institutions and multilateral development banks to enhance and develop new mechanisms and products to promote access to low-cost financing in line with their mandates and governance framework as well as to scale up the mobilization of private finance for this purpose. We recognize the importance of increasing finance from a variety of sources including public and private, bilateral and multilateral arrangements. We aim to share best practices, risk mitigation strategies, and foster international cooperation for low-cost financing solutions. In this context, we note the “Voluntary Action Plan for Lowering the cost of Finance for Energy Transitions” prepared by the Indian Presidency (Annex C).



Chair's Summary

21. G20 has a leadership role to work collaboratively and to take actions to accelerate energy transitions while ensuring energy security as well as contributing to meeting our sustainable development goals and climate Commitments. As we pursue Sustainable Development Goal 7, the world is currently faced with multidimensional challenges characterized by the related vulnerabilities including in energy security, high volatility, use of energy as a coercive tool, disruptions in energy markets and their associated impacts, economic slowdown and continuing socio-economic challenges following the COVID-19 pandemic which has underscored the urgent need to strengthen market stability, reliability, and resilience of energy systems as well as critical energy infrastructure.

22. There is a crucial need of finding solutions, pathways and approaches, to enhance energy security, achieve market stability, and ensure universal energy access. The need to prevent disruptions, and avoid excessive volatility in energy markets to avert any potential risks to our economic and energy outlook, was stressed. The need was recognized to promote open, transparent, stable, competitive, and non-discriminatory international energy markets; ensure transparent, resilient, undisrupted, sustainable, inclusive, and diversified supply chains; and advance a wide variety of options, technologies and leveraging synergies as we pursue actions to accelerate the energy transitions. The need to strengthen national, regional and cross-border critical energy infrastructure was also emphasized.

23. The role of renewables in the energy mix, as a solution contributing to universal energy access, and the need to enhance cooperation, collaborations, financing, capacity building, technical assistance, partnerships, and technology sharing on voluntary and mutually agreed terms, taking into account different national circumstances, are critical. In this context, the Indian Presidency reports - “Decentralized Renewable Energy for SDG7: Compendium of Global Good Practices” and “The Roadmap for Promoting Solar Energy for Universal Energy Access,” which outline useful solutions to



accelerate energy access for relevant regions by sharing best practices, advancing enabling frameworks, enhancing capacity building, and promoting technological innovation, were noted. The adoption of decentralized renewable energy to empower citizens as prosumers to promote renewable energy community, create new economic opportunities and accelerate energy transitions, was also noted. The role of renewable energy technologies in the energy mix, where access through the grid is not commercially viable or available, and support the expansion of renewable energy in interested countries, that may require assistance from international institutions, was recognized. The Presidency's "Voluntary Action Plan for Promoting Renewable Energy to Accelerate Universal Energy Access" (Annex D) to further renewable energy deployment globally, was noted.

24. It was noted that accelerated deployment of zero and low-emission technologies including renewables play an important role in achieving energy transitions. It was also noted that the current rate of grid-based technologies deployment globally may be insufficient to achieve universal energy access. To that end, and in line with different national circumstances, including natural potential and where strong early efforts have already been delivered, there is a need to scale up the deployment of renewable energy at an accelerated pace, address challenges including power systems flexibility, remove the barriers hindering their deployment, and bring down costs while noting the significance of our voluntary contributions towards efforts to triple the aforementioned energy technologies capacity globally, through existing targets and policies in line with national circumstances, by 2030. Similar ambition with respect to other zero and net zero technologies, including abatement and removal technologies, was voiced. The need to continue to support energy systems stability during the transition to low carbon emission systems, such as through the use of flexible energy sources alongside the development of technological solutions needed for grid stability, was recognized.

25. The energy sector's contribution to global GHG emissions is significant. Given that fossil fuels currently continue to play a significant role in the global energy mix, eradication of energy poverty, and in meeting the



growing energy demand, the importance of making efforts towards phase down of unabated fossil fuels, in line with different national circumstances was emphasized by some members while others had different views on the matter that abatement and removal technologies will address such concerns. These efforts must be built upon safe, stable, diverse and reliable supplies of various existing, new and emerging clean and renewable energy options, aiding towards low emissions development. In this respect, the significance of rapidly deploying various clean energy sources, including renewable energy, in achieving global net zero/carbon neutrality by or around mid-century in line with different national circumstances, along with adequate support to developing countries, was emphasized.

26. The importance of climate finance and making financial flows consistent with a pathway towards low greenhouse gas emissions and climate-resilience in the context of sustainable development and efforts to eradicate poverty, while enhancing international cooperation, was stressed. Developed countries were urged to fulfill their commitments to deliver on the goal of jointly mobilizing USD 100 billion per year by 2020 and through to 2025 in the context of meaningful mitigation action, with transparency on implementation. In this context, mobilization of international public and private finance to support inclusive and sustainable energy development is key.

27. ^{1,2}The war in Ukraine has further adversely impacted the global economy. There was a discussion on the issue. We reiterated our national positions as expressed in other fora, including the UN Security Council and the UN General Assembly, which, in Resolution No. ES-11/1 dated 2 March 2022, as adopted by majority vote (141 votes for, 5 against, 35 abstentions, 12 absent) deplores in the strongest terms the aggression by the Russian Federation against Ukraine and demands its complete and unconditional

¹ Russia recognizes the status of this document as Chair's Summary in particular due to inclusion of Paragraph 27, in addition to paragraphs 21-26. Russia agrees with rest of the text. Russia has expressed its distinct view on the situation in Ukraine, geopolitical tensions and sanctions during the meeting.

² China stated that G20 is not the right platform to address security issues and opposed the inclusion of the geopolitical related content.



withdrawal from the territory of Ukraine. Most members strongly condemned the war in Ukraine and stressed it is causing immense human suffering and exacerbating existing fragilities in the global economy – constraining growth, increasing inflation, disrupting supply chains, heightening energy and food insecurity, and elevating financial stability risks. There were other views and different assessments of the situation and sanctions. Recognizing that the G20 is not the forum to resolve security issues, we acknowledge that security issues can have significant consequences for the global economy.

28. It is essential to uphold international law and the multilateral system that safeguards peace and stability. This includes defending all the Purposes and Principles enshrined in the Charter of the United Nations and adhering to international humanitarian law, including the protection of civilians and infrastructure in armed conflicts. The use or threat of use of nuclear weapons is inadmissible. The peaceful resolution of conflicts, efforts to address crises, as well as diplomacy and dialogue, are vital. Today's era must not be of war.

29. We express our sincere appreciation to the Indian Presidency for its unwavering dedication, exceptional leadership, and hard work through 2023. We thank all the G20 members, invited guests, and partner IOs for their immense contributions. We further look forward to the continuation of our efforts to work towards our collective ambition of energy transitions in 2024 under the Presidency of Brazil.

Annex I: G20 High Level Voluntary Principles on Hydrogen

Annex A: Voluntary High Level Principles for Collaboration on Critical Minerals for Energy Transitions

Annex B: Voluntary Action Plan on Doubling the Rate of Energy Efficiency Improvement by 2030

Annex C: Voluntary Action Plan for Promoting Renewable Energy to Accelerate Universal Energy Access

Annex D: Voluntary Action Plan for Lowering the cost of Finance for Energy Transitions



Annex I

G20 High Level Voluntary Principles on Hydrogen

We intend to support voluntary principles to enable emission reduction, in all sectors, and work towards addressing sustainability aspects. This will contribute to achieving global net zero GHG emissions/carbon, neutrality goals by accelerating measures towards the production, utilization, and trade of hydrogen produced from zero and low emission technologies and its derivatives such as ammonia. For this purpose, we welcome the following five high-level guiding voluntary principles on Hydrogen:

1. Encourage collaboration on the development of national standards and work towards globally harmonized approach to certification for hydrogen produced from zero and low emission technologies and its derivatives such as ammonia.
2. Promote free and fair trade of hydrogen produced from zero and low emission technologies and its derivatives such as ammonia in line with WTO rules, supported by resilient and diversified supply chains.
3. Accelerate technological innovation, business models, and R&D collaboration to enhance international cooperation.
4. Promote investments, mobilize finance, and develop infrastructure for enhancing the production, utilization, and global trade of hydrogen produced from zero and low emission technologies and its derivatives such as ammonia.
5. Support and enable voluntary information sharing, cooperation, dialogue, knowledge exchange, and capacity building



on hydrogen produced from zero and low emission technologies and its derivatives such as ammonia, with an aim to contribute to net zero GHG emissions/carbon neutral pathways, including through the development of regional and international initiatives and institutions.

