

The G20's energy transition can be led by an all-round consensus

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Energy forms the backbone of modern economies and is fundamental to economic development and prosperity. This is one of the major reasons for present geo-political arrangements, even as a world economy shaken by a pandemic and surging inflation has had to contend with a tragic conflict in Ukraine and its aftermath of rising energy costs and declining energy security. The energy sector, still largely dominated by fossil fuels in energy production, transformation and use, is responsible for around three-quarters of global greenhouse gas (GHG) emissions and 90% of carbon dioxide (CO₂) emissions.

Energy has been a critical element of the G20 agenda since 2009 for a sustainable global economy. G20 member countries that are signatories to the Paris Agreement account for about 75% of global energy demand and 80% of global greenhouse gas emissions, and thus bear significant responsibility in playing a strategic role while pushing for a future of cleaner energy. The Energy Ministers Communiqué issued during Italy's 2021 presidency announced a target of net-zero carbon emissions and this goal was reiterated during Indonesia's 2022 presidency as well. An energy transition will play a critical role in India achieving its net zero target by 2070 and holds the key to averting the worst effects of climate change, perhaps the greatest challenge humankind has faced. This calls for nothing less than a complete transformation of how we produce, transport and consume energy. In short, we need a complete energy transition.

Energy production: Even though renewable energy production doubled in the past decade and its share of total primary energy consumption has grown from 10% in 2015 to 13% in 2021, the use of fossil fuels is also expanding to meet growing demand for energy; it grew by 10% from 2015 to 2021. As per BP's 2022 statistical review of world energy, the highest growth in renewable capacity was seen in lower middle-income countries (solar 1,298%; wind 134%; and hydro 24%), followed by upper middle-income countries (solar 702%; wind-239%; and hydro 14%) and then high-income countries (solar 163%; wind 72%; and hydro 1%).

Hence, to close a gap between the current emissions trajectory and a path towards capping global average temperatures at 1.5 ° Celsius above pre-industrial levels, the production of clean and green energy is vital. The deployment of renewable energy capacities in the energy mix must almost triple over the coming decade, to 500 Gigawatts (GW) annually, from an average of about 180GW from 2015 to 2021. India is the world's third largest producer of renewable energy, with about 43% of its installed capacity (roughly 175GW) being renewable. But renewable energy on its own cannot solve a pressing issue of energy generation, as intermittency and grid stabilization are important factors which need to be addressed.

Energy storage technologies will play a key role in ensuring continuous supply of renewable energy, by reducing peak energy needs, and help us deal with the problem of intermittency and improve overall grid management. New advances in storage technology, such as electrochemical (primarily battery technologies like sodium-ion and flow batteries), mechanical (pumped hydro, flywheel), chemical (hydrogen or derived bio-fuels, ammonia) and electrical (super-capacitors and cryogenic super-conducting magnets), will provide long-term energy-storage solutions. Unlocking economies of scale is a prerequisite for integrating high levels of variable renewable energy sources, which will not be possible without the development, transfer and deployment of a full range of emerging technologies in energy storage through collaborative actions to realize a cost-effective and time-bound transition along with the development of a diversified renewable-energy supply chain.

Energy transportation: As per an Intergovernmental Panel on Climate Change (IPCC) analysis, the world's big CO₂-emitting sectors are energy systems (34%), industry (24%), agriculture (22%), transport (15%) and buildings (6%). Despite being home to over 1.4 billion people, India's contribution to the world's cumulative emissions is less than 4% and our annual per capita emissions are about one-third of the global average, as India is the only G20 nation that is well ahead of its climate-change mitigation targets.

Decarbonizing the economy is the need of the hour, and it requires more cohesive action now towards transforming hard-to-abate sectors, including power, transportation, fertilizers, cement, steel, real estate, aviation and agriculture. Hydrogen will offer a solution for industrial and transport needs that are hard to meet through direct electrification, mitigating close to 12%

and 26% of CO₂ emissions, respectively, according to an IRENA 1.5° Celsius scenario. India presently contributes about 10% to global hydrogen demand and there is strong desire to shift to green fuels including biofuels, green hydrogen and green ammonia, as these are important for a transition to a low-carbon future (they're 'fuels for future'). This will not only result in an energy basket diversified for environmental benefits, but also energy security and reduced import dependency in hard-to-abate sectors, especially transport and industry.

Global demand of 100 million metric tonnes (MMT) for green hydrogen and its derivatives is projected by 2030, of which about 10% could be satisfied by India. To achieve this, there is a critical need to scale up the production and deployment of high-performance electrolyzers from the existing 2-4GW per annum capacity to 25-30GW per annum in the next 3-5 years, while counting on emerging technologies and developing green hydrogen hubs. Also, in order to maximize the opportunity in green hydrogen and facilitate the development of a vibrant export market, there is a need to address cost economics, ensure that regulations are in place, and see that adequate private and public finance is provided, with the required supply-chain arrangements and necessary back-up infrastructure to go with it.

As India has set its sights on becoming energy independent by 2047 and achieving net zero CO₂ emissions by 2070, we recognize the critical role of green hydrogen. With its vast renewable energy resources, India has an opportunity to produce green hydrogen for the world.

Energy consumption: Sustainable energy consumption also has a major role to play in the energy transition. Through 'Lifestyle for Environment' (LiFE), a mantra given by Prime Minister Narendra Modi at the CoP-26 summit that is also now a G20 priority, there is an urgency to bring about a paradigm shift from mindless and destructive consumption to mindful and deliberate utilization of resources. Mission LiFE has had an enthusiastic response from world leaders, who have lauded India's initiative of blending its spiritual idea of "*Vasudhaiva kutumbakam*" (the world is a family) to drive a green transformation and also the motto of India's G20 presidency, "One Earth One Planet One Future". Under India's presidency, LiFE has acquired added momentum as it wins support from the international community and those aspiring for a healthy, green and sustainable lifestyle, and is poised to

become a global mantra against climate change.

Finally, as most countries grapple with the challenge of maintaining energy security based on their requirements and national circumstances, the development of affordable and secure channels of energy access to fuel economic growth and improve the living standards of people is imperative even as an energy transition progresses. While a shift to clean energy is critical to restrict global warming, it is equally important to remain cognizant of the social and economic impact of any such transition. The movement away from fossil fuels needs to be orderly, time-bound and in accordance with nationally defined development priorities. It must recognize both “existing dependencies” and “existing deprivations.”

These are the authors' personal views.