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King Abdullah Petroleum Studies and Research Center

Will COP26 Recognize a Role for Nuclear Energy in the Clean Energy Mix?

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About KAPSARC

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment across all types of energy. KAPSARC's mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

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Next month, the 2021 United Nations Climate Change Conference (COP26), hosted by the United Kingdom, will discuss the big challenge facing the world's governments, which is how to limit the average rise in global temperatures above pre-industrial levels to below 1.5–2 degrees Celsius, as stipulated in the Paris Agreement and Sustainable Development Goal No. 13 (climate action). At the same time, however, the Parties to the Agreement face diverse challenges due to their unique social, economic and environmental contexts. There is an urgent need for evidence-informed, equitable, 'common but differentiated responsibility' policies that take into account the effects of 'response measures.' Cost-effective steps must be taken to transition to a carbon-neutral global energy mix with net-zero carbon dioxide (CO_2) emissions by 2050 or soon after.

Nuclear energy has played an important role in reducing emissions from electricity generation since its introduction for commercial use. Without an enhanced role for nuclear power, the goal of avoiding unacceptable changes in the global climate will be very difficult to achieve. Over the past 50 years, nuclear power has avoided about 76 gigatonnes (Gt) of CO_2 emissions. This equates to about two years of current global emissions. An additional 5.5 Gt of CO_2 emissions per year would be produced by 2050 if nuclear power was replaced by modern coal-fired power plants (without CO_2 capture and storage), or 2.9 Gt per year if replaced by natural gas. Doubling the capacity of nuclear electric power globally from about 400 gigawatts (GW) today to about 800 GW in 2050 would prevent these additional emissions.

Despite the clear environmental benefits of nuclear energy, with essentially no CO_2 emissions, its role has not yet been recognized in COP decisions as an effective measure to mitigate climate change. Nor is it explicitly mentioned in the Paris Agreement or the United Nations Sustainable Development Goals. This is attributed to the dominant influence of environmental groups demanding a future entirely dependent on renewable energy. It is also due to opposition from influential European countries that have passed laws prohibiting the use of nuclear energy and have begun to abandon their nuclear plants (such as Germany) in response to pressure from influential segments of their populations. These groups view nuclear power plants, and their associated nuclear fuel cycle facilities, as posing high risks to the public and the environment, particularly due to catastrophic accidents such as the Chernobyl and Fukushima disasters of 1986 and 2011, respectively. However, the reality of nuclear power is quite different. Nuclear plants and renewable energy plants offer, by far, the lowest health risks per unit of electricity production. Although Chernobyl and Fukushima caused significant pollution and much health and economic damage, there were few deaths because of Chernobyl's emissions, and Fukushima caused no deaths directly (according to the World Health Organization's and the International Atomic Energy Agency's (IAEA's) assessments).

This piece is based in part on the following:

Adnan Shihab-Eldin, H-Holger Rogner, Robert J. Budnitz, Charles McCombie, Noura Y. Mansouri and Robert N. Schock. 2021. "Keeping the Nuclear Option Open." KAPSARC Discussion Paper, forthcoming.

———. 2021. "Keeping the Nuclear Energy Option Open." *Oxford Energy Forum* : *COP26—Examining the balance between ambitious pledges and realistic expectations* the Oxford Institute for Energy Studies (OIES), 129: 45-49.

———. 2020. "Does a climate-constrained world need nuclear energy?" Policy Brief. Think-20 (T20) Saudi Arabia.

The industry's experience of operating hundreds of reactors over seven decades shows that the safety of nuclear power plants has tangibly improved, and the probability of a serious accident has been reduced significantly. An accident that releases dangerous radioactivity is not impossible, but neither is it impossible that other industries (for example, chemical and aviation) could suffer serious accidents.

At the G20 Riyadh 2020 Summit, G20 countries endorsed the idea of the circular carbon economy (CCE). It was launched by Saudi Arabia as a comprehensive and integrated framework to reach carbon neutrality in the future energy mix. Nuclear energy constitutes one of its main pillars, in addition to energy efficiency, renewable energy and clean hydrocarbon technologies. Furthermore, the statements of ministers and senior officials at the recently concluded IAEA annual general conference this year included strong and extraordinary acknowledgment of and support for nuclear energy, and the importance of maintaining its role as a safe, tested and mature source in generating carbon-free electricity. The statements also stressed the need for the COP to discuss the feasibility of expanding the use of nuclear energy in addressing climate change, especially through the use of small modular reactors (SMRs). SMRs are currently being developed and have technical and economic advantages over large-scale reactors, and are generally considered safer. Some countries, such as Russia, have already begun to produce and commercialize early versions.

Many influential industrial countries, such as the United States (U.S.), France and the United Kingdom, in addition to China, India, Russia, South Korea and many developing countries, will seek to have COP26 discuss how to facilitate the expansion of nuclear energy use as a key source of clean electricity generation. However, a few influential European countries, such as Germany and Italy, were, until the beginning of this year, adamant in their opposition to any mention of the role of nuclear energy or clean hydrocarbon energy in the discussions and decisions of the COP. But there are positive indications that this opposition is abating, especially after several European countries and U.S. states – such as California – have had an increase in the severity and frequency of natural disasters such as floods and hurricanes that are attributed to climate change. It is no longer forbidden for politicians in those countries to raise the possibility of a return to nuclear energy, as happened recently in Italy and Germany, after parliamentary elections in both countries. However, these countries, alongside other countries and most environmental activists, are still betting that the main role – if not the only role for some – in reaching carbon neutrality is to deploy renewable energy technologies. This is despite fundamental technical and economic obstacles that currently prevent the share of renewables in national electricity grids from exceeding about 30% of capacity. These obstacles include the weak intensity of renewable energy flow and its intermittent availability, according to the time of day and weather. In order to exceed the 30% ceiling of renewables in national grids, it is necessary to resort to energy storage systems with huge capacities, which are currently expensive. Another option is to maintain alternative plants (gas or coal-fired, for example), which would be ready for service when the renewable resources needed for electricity generation are unavailable. This helps to balance the intermittency of renewable energy and ensure the flexibility of the electrical grid. These two options raise the cost of producing electricity substantially.

It is noteworthy that some oil-exporting countries in the Gulf have developed ambitious plans to cooperate with the IAEA and the atomic energy authorities of the developed countries to benefit from nuclear energy. The United Arab Emirates (UAE) succeeded in implementing an integrated and comprehensive

plan, drawn up in 2007, to build four reactors at the Barakah site in cooperation with South Korea and relevant companies. The country now has two operational reactors with a capacity of approximately 1,500 megawatts each. It is expected that Saudi Arabia will soon solicit bids to start implementing its program to build two nuclear power plants with a capacity of up to 3.5 GW. Kuwait has attempted to pioneer similar plans since the 1970s. It developed a plan to build a pilot plant with a capacity of 50 MWs in 1978, but the project was canceled after bidding. Two other attempts were canceled, one in the mid-1980s and the other in 2009–2011 for local reasons, as is often the case in many major projects. The hope was to launch a joint Gulf program based on a proposal submitted by Kuwait to the Gulf Summit in 2007, but it did not receive the required support. The UAE and Saudi programs may form a nucleus for reviving this joint program.

Assessment reports from international energy organizations and studies from independent global research centers confirm the possibility of reaping the climate benefits of nuclear energy without significant negative impacts on safety, security, or energy costs. However, this requires countries to adopt policies and measures for the use of nuclear energy in their national electricity grids. Specifically, three main points must be achieved to advance its use nationally and globally, namely: (1) it needs to be accepted politically, and by large segments of the population, as an effective greenhouse gas mitigation technology; (ii) its positive economic performance needs to become more consistent globally; and (3) its record of safe operations needs to be acknowledged, maintained, and continuously advanced. In addition, widespread acknowledgment that deep geological disposal of nuclear waste can be accomplished safely is required.

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