ISSUE BRIEF

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ASSESSING GLOBAL NUCLEAR ENERGY TRENDS

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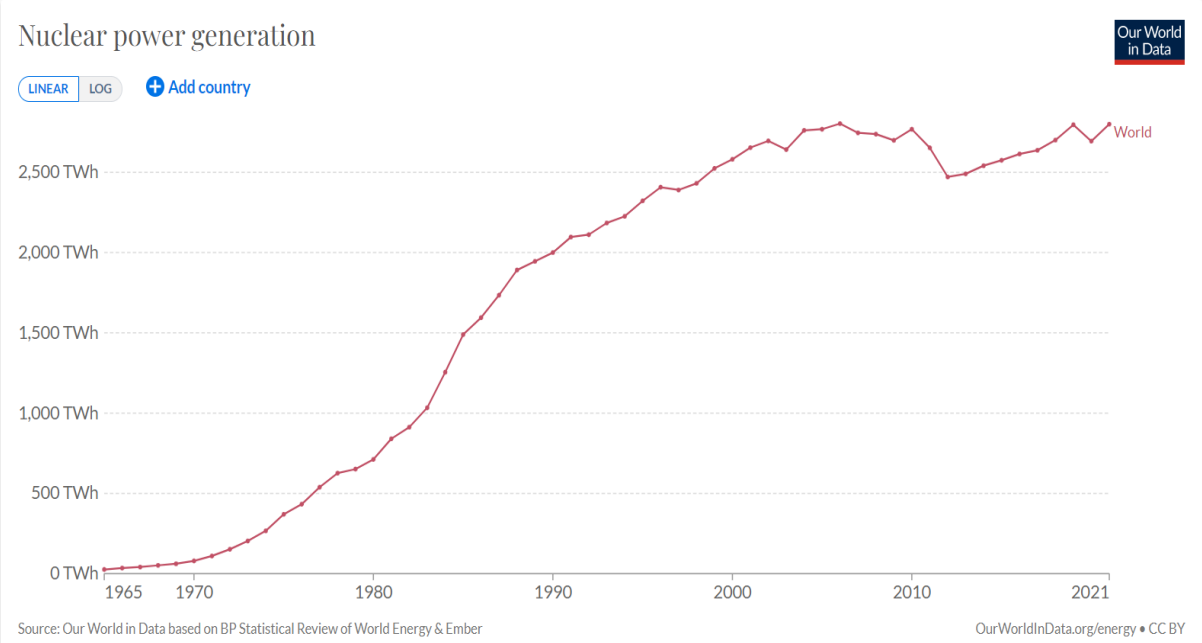
Two recent developments have brought a renewed focus on nuclear energy and other sources of renewable energy. One is the disastrous consequences of Climate Change and the second one is the global energy crisis brought on by the Ukraine conflict and the disruption of energy supplies from Russia. Many countries are rethinking their nuclear energy policies. There are renewed debates on expanding nuclear energy potential. There are many advantages to nuclear energy generation but there are also some reservations about relying too much on nuclear energy.

The world is attempting to transition its energy generation away from fossil fuels toward low-carbon sources of energy. There are several renewable energy sources - hydropower, wind, solar and nuclear power. Nuclear energy is a very attractive option since it emits very little CO2 per unit of energy production. It also causes less air pollution compared to fossil fuels. While a lot of countries across the world are increasing their share of nuclear energy, others are still skeptical over the safety and security of nuclear power plant operations. It is thus prudent to look at the global nuclear energy trends, opportunities and challenges.

According to International Atomic Energy Agency (IAEA) figures, by the end of 2021, 437 nuclear power reactors were operational across the world with a total net installed power capacity of 389.5

GW(e). Another 56 reactors with a total capacity of 58.1 GW(e) were under construction.[1] In comparison with 2020, total electricity production from all energy sources increased by 7 per cent and electricity production from nuclear power reactors increased about 4 per cent to 2653 TW·h. Nuclear power accounted for 9.8 per cent of the total global energy generation mix in 2021.[2]

Global generation of nuclear energy



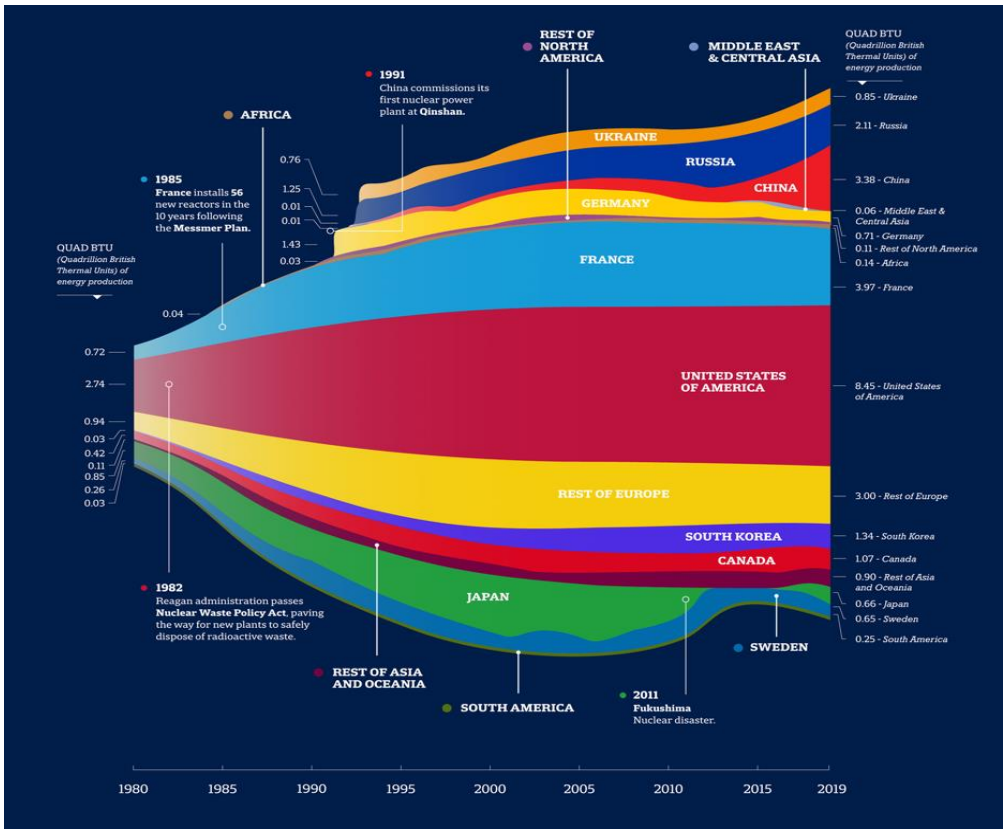
Nuclear energy has been around since the 1960s. Nuclear energy saw massive growth from 1970 to the 1990s. There was a sharp decline in nuclear power generation in the wake of the Fukushima accident as a result of the tsunami in 2011 as countries took plants offline due to safety concerns. However, in recent years there has been an increase in the nuclear energy trend. The United States is one of the biggest producers of nuclear energy, followed by France, China, Russia, Japan, Canada and South Korea.[3]

1 "Energy, Electricity and Nuclear Power Estimates for the Period up to 2050," International Atomic Energy Agency, Edition 2022, https://www.iaea.org/publications/14786/energy-electricity-and-nuclear-power-estimates-for-the-period-up-to-2050.

2 Ibid.

3 "Charted: 40 Years of Global Energy Production, by Country," Sep 24, 2022, https://www.visualcapitalist.com/wp-content/uploads/2022/09/Biggest-Producers-of-Nuclear-Energy.html.

40 Years of Global Nuclear Power Production

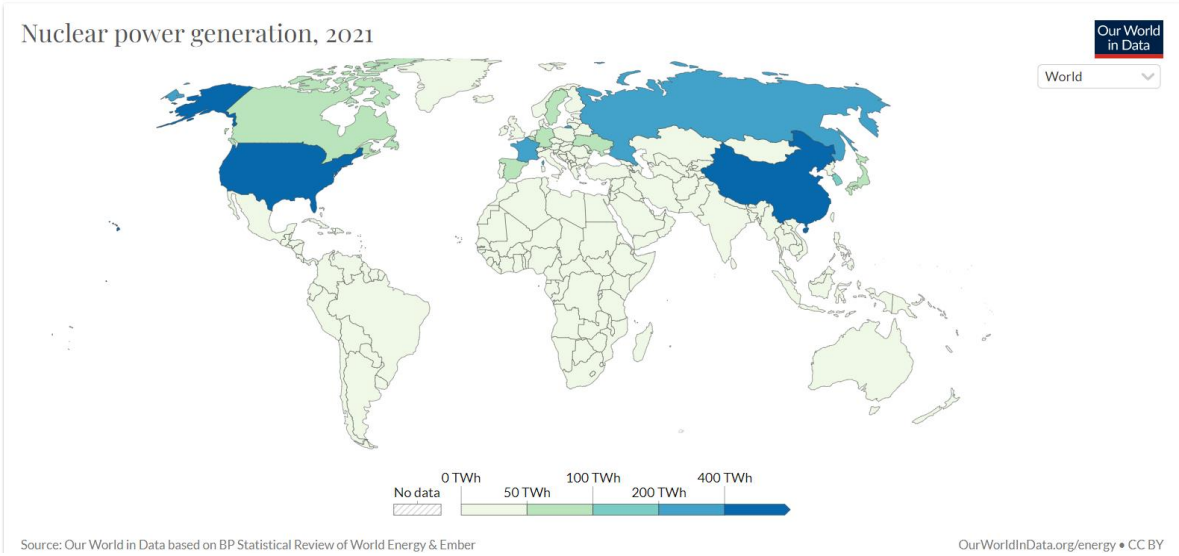


Source: "Charted: 40 Years of Global Energy Production, by Country," Sep 24, 2022, https://www.visualcapitalist.com/wp-content/uploads/2022/09/Biggest-Producers-of-Nuclear-Energy.html

Pakistan has six nuclear power plants (NPP) producing about 12.5 per cent of the total energy production in the country from July 2021 – June 2022. The gross power generation capacity of NPPs stood at 3530 MW which supplied 12,885 million of electricity to the National grid from 1st July 2021 to 31st March 2022.[4] Pakistan is working on a seventh power plant and aims to increase its share of power generation to 8800 MW by 2030 and to 40,000 MW by 2050.

4 "Energy" in *Pakistan Economic Survey 2021-22,* Government of Pakistan, Finance Ministry, p. 266

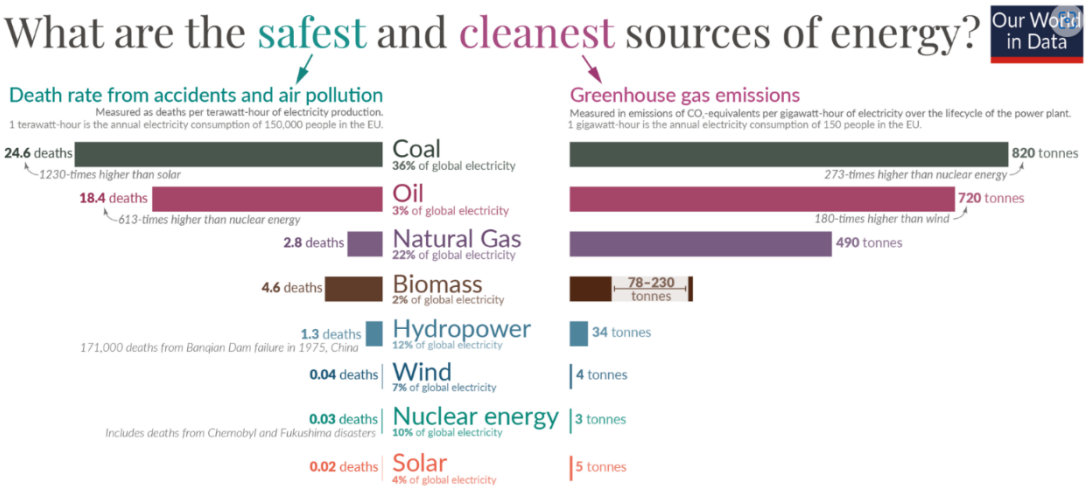
Nuclear energy generation by country



Given the challenges of Climate Change and the disastrous consequences that the world is facing, it is imperative that a move towards cleaner and greener energy generation is made. Pakistan has faced the consequences of Climate Change itself in the last few months in terms of over 1400 lives lost and millions of dollars in damages to property and infrastructure as a result of floods. This is a Climate Change disaster personified. If steps are not taken to reduce carbon footprint and reverse the rise in global temperatures, then there would be many more calamities like the one unleashed by the floods in Pakistan in the years to come.

Coal is the dirtiest fuel since it emits most greenhouse gasses. Oil and gas are next. Hydro, solar, wind and nuclear are cleaner sources of energy. Nuclear energy is one of the cleanest sources of energy generation. At present, the global energy mix is dominated by fossil fuels like coal, oil and gas which account for around 60 per cent.[5] To stop the march of Climate Change, the world needs to transition away from fossil fuels to renewables and nuclear energy. The latter are better in terms of less air pollution generation as well as the least deaths caused in the energy generation process. This transition will not only protect future generations but it will also come with huge health benefits for the current ones.

5 Hannah Ritchie, Max Roser and Pablo Rosado, "Energy," https://ourworldindata.org/nuclear-energy.



Source: Hannah Ritchie, Max Roser and Pablo Rosado, "Nuclear Energy," https://ourworldindata.org/nuclear-energy.

In the wake of the Ukraine conflict and the resulting energy crisis in Europe across the world, countries are again turning towards nuclear power. Europe's reliance on Russian oil and gas created an energy crisis and Europe is making moves to wean itself off of Russian oil and gas. Nuclear power is becoming more popular. Japan is among the countries reconsidering nuclear energy where the Fukushima accident led to the suspension of many nuclear reactors. In August 2022, Japanese Prime Minister, Fumio Kishida, called for a push to revive the nuclear power industry in the country as well as proposed building new nuclear power plants. Other countries like Belgium have delayed plans to scrap nuclear energy in 2025 by a decade.[6] In April 2022, the UK announced plans to approve eight more nuclear reactors on existing sites as part of the country's new energy strategy that aims to boost energy independence and tackle rising energy prices.[7] Many countries are looking to increase their nuclear power generation capacity including China, the Czech Republic, Pakistan, India, Poland, Britain, France and the US. Currently, nuclear power is used in 32 countries supplying nearly 10 per cent of the world's electricity production, the IAEA has raised its nuclear power generation projections in September 2022 for the first time since the 2011 disaster. The installed capacity is projected to double by 2050.[8]

These are all good indicators that will help deal with the dual challenge of energy crisis and mitigation of the scourge of Climate Change. However, this is just the first step. There is much more that needs to be done to reduce the carbon footprint of the world. None knows better than Pakistan

6 "Energy Crisis Pushes Nuclear Comeback Worldwide," France 24, Aug 27, 2022, https://www.france24.com/en/live-news/20220827-energy-crisis-pushes-nuclear-comeback-worldwide

7 "Energy strategy: UK Plans Eight New Nuclear Reactors to Boost Production," *BBC News*, April 7, 2022, https://www.bbc.com/news/business-61010605

8 "Energy Crisis Pushes Nuclear Comeback Worldwide."

that the increase in global temperatures and Climate Change bring untold disasters and misery to the people. It is time to take steps for greener energy production and mitigation of Climate Change to secure our future generations. Nuclear energy is a relatively safe, cheap, renewable energy source that could be the answer to Climate Change and global energy crunch woes.