Nuclear energy can unshackle the chains of coal geopolitics

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In October 2021, India pledged to achieve a 'net zero' emission target by 2070 at the global platform of United Nations Climate Change Conference, Glasgow (COP 26). To achieve this target, India needs to sharply cut down on its coal based thermal power plants that are responsible for 75 percent of the country's total power output. 85 percent of the thermal plants depend on burning coal for power generation which accounts for 80 percent of industrial emissions of sulfur- and nitrous-oxides.

This is not an encouraging scenario from the perspective of the carbon neutrality pledge. These gases contribute to a majority of air pollutants along with particulate matter of 2.5-micron diameters **($PM_{2.5}$)** which is also a byproduct of coal burning. As per the World Bank Report of 2019, around 1.4 billion people (100 percent of India's population) are exposed to unhealthy concentrations of **$PM_{2.5}$.**

One of the major concerns faced by India is the economic fluctuations in the global coal market. Power shortages because of low coal inventories have been a constant issue since the last few years. During September- October 2021, this crisis was acute, owing to the impact of the geopolitical tensions centered around the AUKUS deal. Australia, US, and UK entered in a tripartite defense partnership to augment Australia's defense capability by transferring nuclear powered submarine building technology.

This deal impacted the geopolitical balance between the US, China and its allies in Southeast Asia and the Pacific. Australia was the largest supplier of coal to China accounting for around 8.68 million tonnes supply in July 2020. Since 2020, the Chinese ban on Australian imports has made Indonesian coal costlier in the international market. India would previously buy thermal grade coal from international markets during the monsoon months, as most of the nation's open cast coal mines get submerged, making mining difficult and the sudden hike in coal around 2021 due to AUKUS, was alarming for the thermal power sector.

Power cuts became frequent as power plants reserves ran dry, and was further amplified by India's pledge of carbon neutrality at COP 26 amidst this international coal crisis. This indicated the nation's strong will to shake off its dependency on the international coal market as well as reducing emissions.

Repeating similar issues, currently India is going through another coal shortage for its thermal power plants. Global coal prices are at their peak now with a cost of $400 per tons which may put the nation through another undesirable bout of power cuts. Historically, there have been phases when coal prices fluctuate in the global market for different reasons- geopolitical being the foremost.

During the times of Iraq-Iran war and Gulf war (1978 – 1984), coal prices increased drastically. In 2002, these prices stabilized to $50-$60 per tons for steam coal and $70-$80 per tons for coking coal. But with the Covid lockdown and geopolitical tensions, the coal market again started fluctuating around 2019-20.

The option to unshackle the bonds of coal geopolitics and price fluctuations is to free India from the clutches of coal based thermal energy. One of the best alternatives can be nuclear energy. The cost of any power is assessed through Levelized cost of Energy (LCOE). This equates the lifetime coast of operations for a power plant including maintenance cost and total cost of produced energy during the period.

Nuclear energy is at present the cheapest and carbon neutral alternative to fossil fuel based thermal power. Projected Costs of Generating Electricity reported that LCOE of nuclear energy will range between $55 and $95 per MWh in 2025. Apparently, this seems to be more than LCOE of other renewable alternatives such as- onshore wind power with more than 1 MW capacity ($80-$110/MWh), large scale solar energy ($40-$80/MWh).

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But this figure drops down to mere 40$/MWh for nuclear power plants operating for a long duration. Hydroelectric power grids are equally competitive to nuclear power but are again influenced by regional geopolitics or river water resources of a nation. Coal based energy will have higher LCOE ($100/MWh) than nuclear in future, which could be a major economic incentive for India to transition towards nuclear power.

The maximum LCOE associated with nuclear power lies in the initial construction cost ($2,157 to $6,920 per kW), which also drops significantly after long term operation ($391 to $629 per kW). Recent technological advancements and introduction of small-scale nuclear reactors also aids in reducing the overall LCOE of nuclear energy. Small modular reactors (SMR's) have greater scalability and low LCOE and can be a solution to India's energy vacuum.

SMR can produce 300 MWe equivalent or less energy. Companies across the world are rolling out new models of SMR because of its demand in the global energy market. Twin large reactors can cost around 10 billion dollars and offer less control over the grid. Ten 100 MW units (SMR's) will be cheap to install and give more control of the grid than a unit of 1 GW. Hence, premier energy companies like Rosatom are focusing on supplying SMR's to nations across the globe.

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If India wants to unshackle its dependency on international coal market fluctuations and achieve the 2070's target of 'zero emission', nuclear power is the way forward. This can reduce the power cuts during the rainy months and free the nation from investing in procuring coal at higher costs from the international market when the nation's open cast mines are inaccessible. This will also be more economically beneficial for the nation as small-scale nuclear reactors have lesser LCOE, compared to other renewable alternatives.

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