The vulnerabilities of nuclear reactors

(Mains GS 3 : Achievements of Indians in Science & Technology; Indigenization of Technology and Developing New Technology & Disaster and Disaster Management.)

Context:

The world was reminded recently that nuclear technology is hazardous in the incident when a fire broke out near the Zaporizhzhia nuclear plant in Ukraine (Europe's largest) during the course of a military battle.

Expanding nuclear power:

- On March 11, 2011, multiple reactors at the Fukushima Daiichi nuclear plant suffered severe accidents after an earthquake and a tsunami.
- Those reactors were quickly "shut down" following the earthquake but their radioactive cores continued producing heat and eventually melted down because the tsunami knocked out the cooling system.
- The aftershocks of the Fukushima disaster were felt beyond Japan and led to a slump in nuclear energy in most of the world.
- However, some policymakers still insist on expanding nuclear power, ostensibly in response to climate-change concerns.

New king of electricity:

- On December 15, 2021, the Indian government informed Parliament that it plans to build “10 indigenous reactors in fleet mode” and had granted “in principle approval” for 28 additional reactors, including 24 to be imported from France, the U.S. and Russia.
- Given the post-Fukushima global and national trends in the nuclear industry, such a policy seems misguided as nuclear power is neither an economical source of electricity nor a viable route to meeting India’s climate goals.
- In contrast, renewable-energy technologies have become cheaper and as per the International Energy Agency solar energy is the “new king of electricity”.

Safety concerns :

- Safety concerns following the Fukushima accident have led to protests against each planned reactor reflected from the example of Gujrat as in March 2018 “locals turned against” the Mithivirdi nuclear project after the Fukushima disaster.
- Contrary to the condescending opinion held by some nucleocrats, peoples’ concerns are not based on an irrational fear of nuclear energy rather local citizens understand that a nuclear disaster might leave large swathes of land uninhabitable (as in Chernobyl) or require a prohibitively expensive clean-up (as in Fukushima).
- In a densely populated country such as India, land is at a premium and emergency health care is far from uniformly available.

Climate concerns:

- Climate change will increase the risk of nuclear reactor accidents as the day after the fire at the Zaporizhzhia nuclear plant, a wildfire approached the Hanul nuclear power plant in South Korea and President Moon Jae-in ordered “all-out efforts” to avoid an accident at the reactors there.
- In 2020, a windstorm caused the Duane Arnold nuclear plant in the U.S. to cease operations.
- The frequency of such extreme weather events is likely to increase in the future, therefore, nuclear power is not the right choice to “adapt” to climate change, which requires resilience in power systems.
- It is also not the appropriate choice for mitigating India’s carbon emissions since it cannot be deployed at the necessary scale.

Conclusion:

Given the inherent vulnerabilities of nuclear reactors and their high costs, it would be best for the Government to unambiguously cancel its plans for a nuclear expansion.