Nuclear Power for Big Tech

Why in News?

Google announced the “first corporate agreement” to buy nuclear energy from multiple small modular reactors (SMR).

What is the need for nuclear power in tech companies?

- **Artificial Intelligence** - Training AI models and keeping them online requires a huge amount of energy.

  A ChatGPT query needs nearly 10 times as much electricity to process as a Google search.

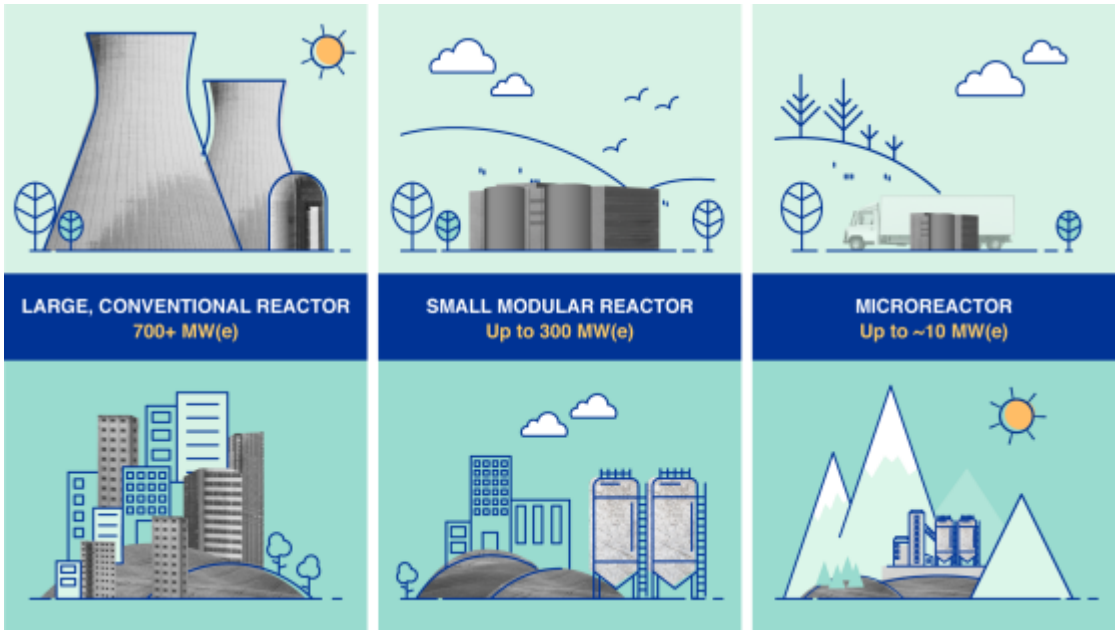
- **Increasing Demand** - AI market is expected to grow at 25-35 %.
- **Managing Data Centers** - Maintaining growing data centres are energy-hungry tasks.

  At present, data centers worldwide consume 1-2% of overall power, but this percentage will likely rise to 3-4% by the end of the decade.

- **Reduce GHG Emission** – Relying on fossil fuels emits huge amount of greenhouse gases.

  Google admitted that its total global greenhouse gas emissions rose by 13% in 2023 year-over-year.

What are the benefits of small modular reactors ?



- **Small Modular Reactors** - SMRs are advanced nuclear reactors designed to be smaller and more flexible than traditional large reactors.
- **Size and Capacity** - SMRs have a power output of up to 300 MW (electric) per unit, which is about one-third the capacity of traditional reactors.
- **Lower costs** – They have lower building and operational costs.
- **Compact Designs** – They can function in areas unable to withstand larger or older nuclear power plants that require huge volumes of water.
- **Safer** - Components of SMR can be manufactured in a factory and then assembled closer to where power is needed, reducing the safety risks compared to their larger, more complex predecessors.
- **Reliable** – Nuclear energy can be availed round the clock without **supply** chain and feed interruption.
- **Clean Energy** – Nuclear energy is carbon free and do not directly emit greenhouse gases.
- **Better Power Output** – Nuclear energy has high power intensity than any other renewable sources.
- **Faster Deployment** - Smaller sizes and modular designs further help the tech giant in faster deployment cycles.

What are the challenges in adopting nuclear energy ?

- **High Initial Costs** - Building nuclear power plants requires significant capital investment, making it a costly option compared to other energy sources.
- **Regulatory Hurdles** - Obtaining regulatory approvals for nuclear projects can be a lengthy and complex process, involving stringent safety and environmental standards.
- **Public Perception** – Nuclear energy projects are often met with opposition from public and civil society groups.
- **Technological Complexity** - Operating and maintaining nuclear reactors require highly skilled personnel and advanced technology, adding to the operational challenges
- **Waste Management** - Handling and disposing of nuclear waste is a major challenge due to its long-term radioactivity and potential environmental hazards.

- **Long Construction Time** - Nuclear plants take a long time to construct, often a decade or more, which can delay the benefits of the investment.
- **Reputation problem** - Public memory of past nuclear accidents and crises that span generations.
- For example, Ukraine's Chernobyl explosion (1986) and Japan's Fukushima accident (2011) resulted in extensive environmental destruction that lasted for years.
- **Natural Disaster Threat** – Fukushima Incident demonstrates how natural disasters beyond human control such as a tsunami can lead to a devastating nuclear accident.
- **Earthquake Threat** - Nuclear infrastructures are highly vulnerable to earthquakes.

What lies ahead?

- Continued investment in advanced nuclear technologies for enhanced safety, efficiency, and flexibility compared to traditional reactors.
- Collaboration between governments, private companies, and research institutions can accelerate the development and deployment of nuclear technologies.
- Streamlining regulatory processes and providing clear guidelines can help reduce the time and cost associated with nuclear projects.
- Educating the public about the benefits and safety of nuclear power can help build support for nuclear projects.

References

1. The Hindu | Big Tech scouting for nuclear power
2. Finshot | Nuclear for AI