

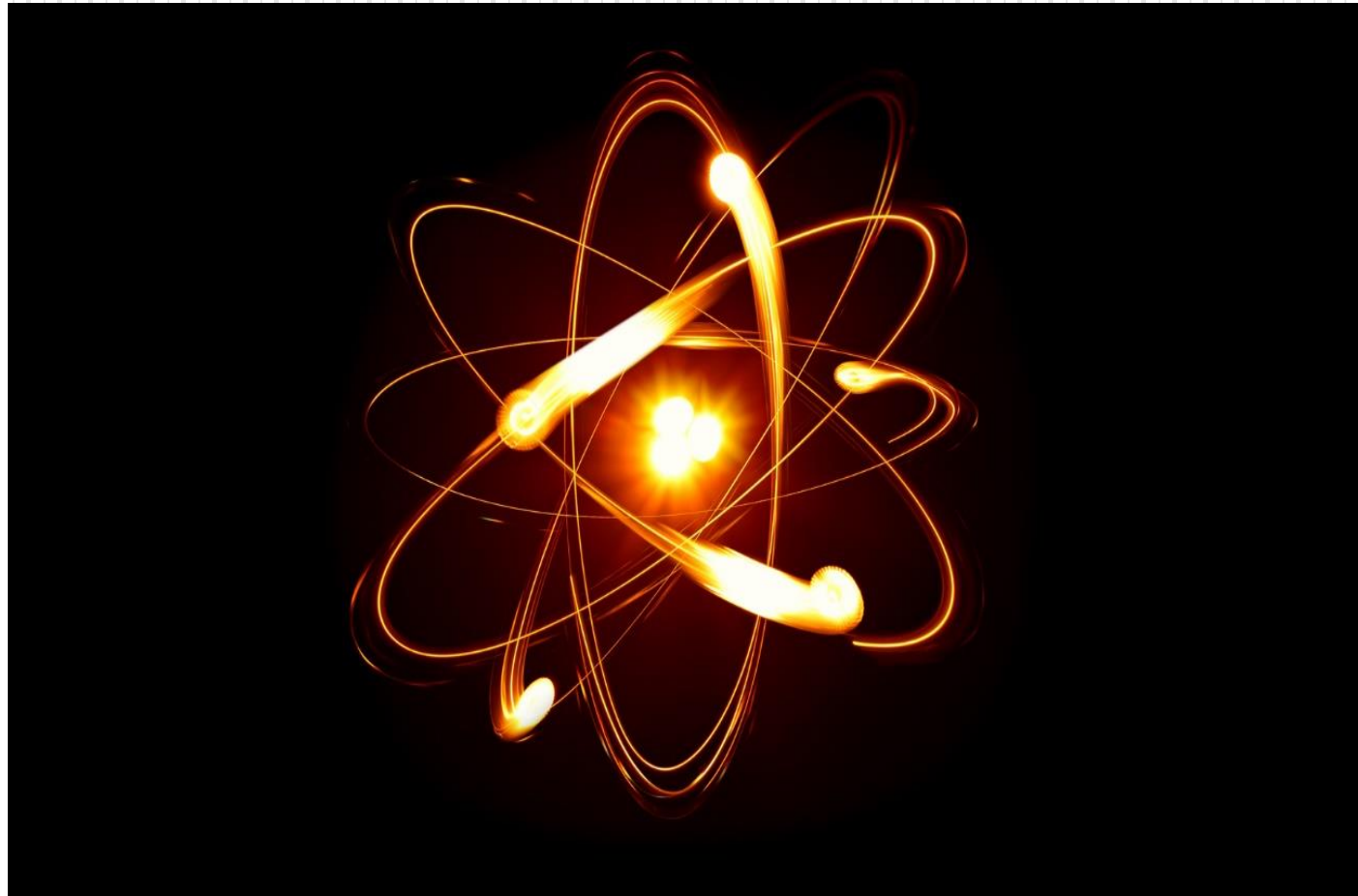
Virtuoso Infotech Pvt. Ltd.



About Virtuoso Infotech

- Fastest growing IT firm; Offers the flexibility of a small firm and robustness of over 30 years experience collectively within the leadership team.
- Technology expertise & passionate team.
- Successful client engagements across India, USA, UK, Australia and Argentina.
- Handle enterprise solutions that involve **30,000 active users**, more than 20 servers, **data volume as big as 5 million entries per day**.

Nuclear Inventions



- Prathamesh Khadamkar

Agenda

- Introduction
- Nuclear fusion and fission reactions
- Nuclear weapons
- Nuclear power plants
- Nuclear submarines
- Pros and cons of nuclear energy

Introduction

- **Nuclear Reactions** : A process in which the structure and energy content of an atomic nucleus is changed by interaction with another nucleus or particles.
- **Nuclear Energy** : The energy released during nuclear fission or fusion.
- **Nuclear Power** : The power that is released during nuclear reactions which can be used to converted into electric power.

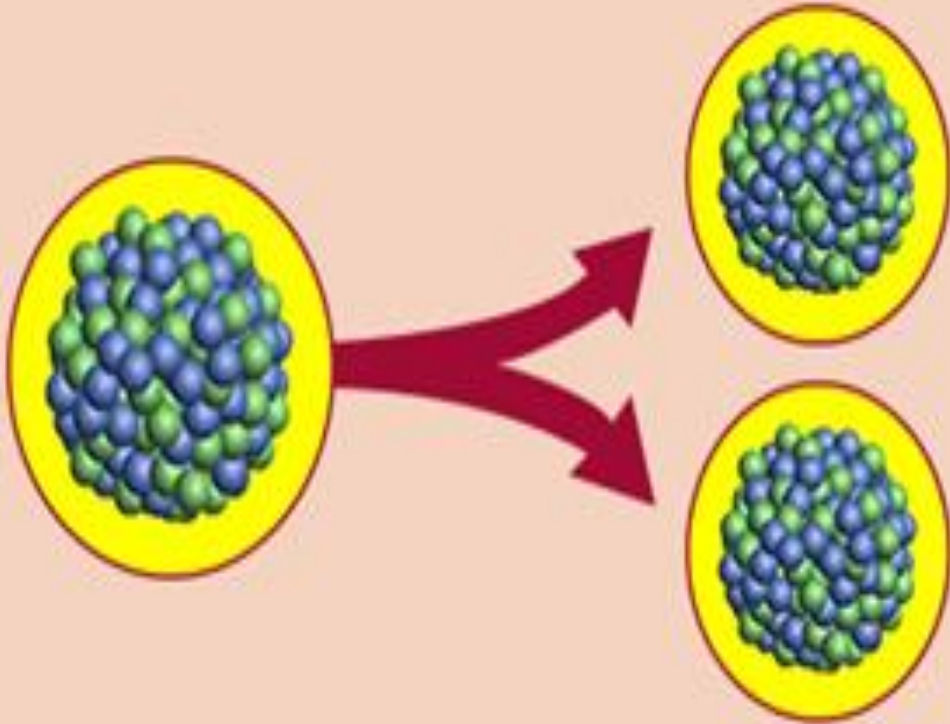
Nuclear Fusion

- Fusion is the fusing of lighter nuclei into a heavier nucleus.
- It requires a lot of energy to bring the protons close enough to overcome their electrostatic repulsion.
- The energy released by fusion is many times greater than the energy released by nuclear fission.

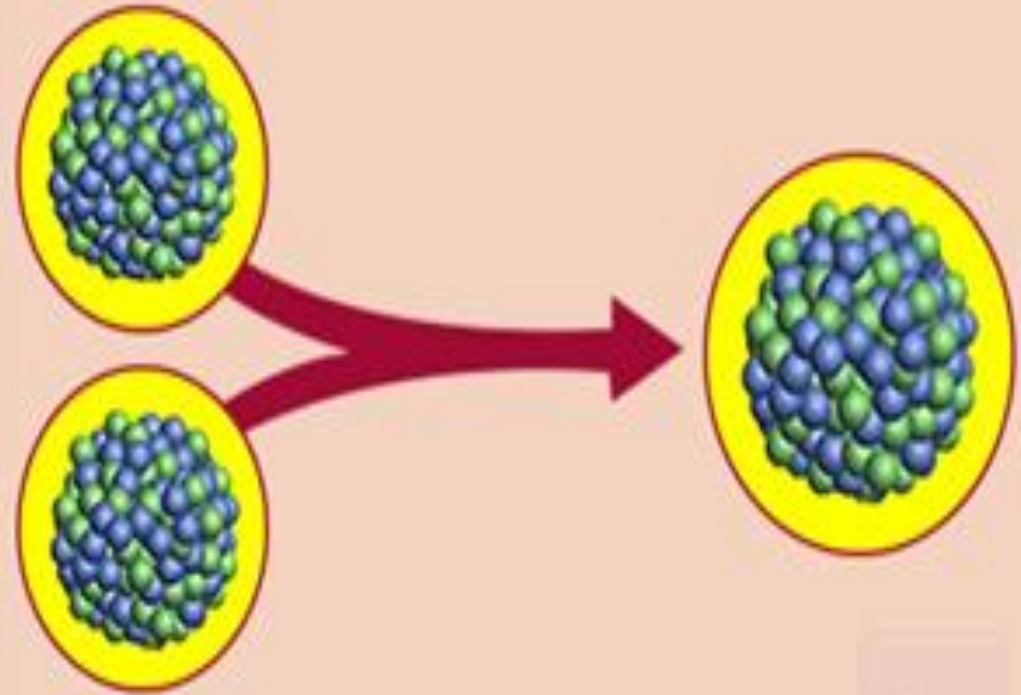
Nuclear Fission

- Fission is the splitting of a heavy nucleus into lighter nuclei.
- Does not require a lot of energy.
- The energy released by fission is many times greater than the energy released by a chemical reaction.

Difference Between Nuclear Fission and Nuclear Fusion



Nuclear Fission



Nuclear Fusion

Nuclear Weapon

- Device designed to release energy in an explosive manner as a result of nuclear fission, nuclear fusion, or a combination of the two processes.
- Fission weapons are commonly referred to as atomic bombs.
- Fusion weapons are also referred to as thermonuclear bombs or, more commonly, hydrogen bombs.

Nuclear Club

United States

Total nuclear weapons: 6,550

Total nuclear tests: 1,030

First tested: July 1945

Most recent test: September 1992

France

Total nuclear weapons: 300

Total nuclear tests: 210

First tested: February 1960

Most recent test: January 1996

Russia

Total nuclear weapons: 6,800

Total nuclear tests: 715

First tested: August 1949

Most recent test: October 1990

India

Total nuclear weapons: 130

Total nuclear tests: 3

First tested: May 1974

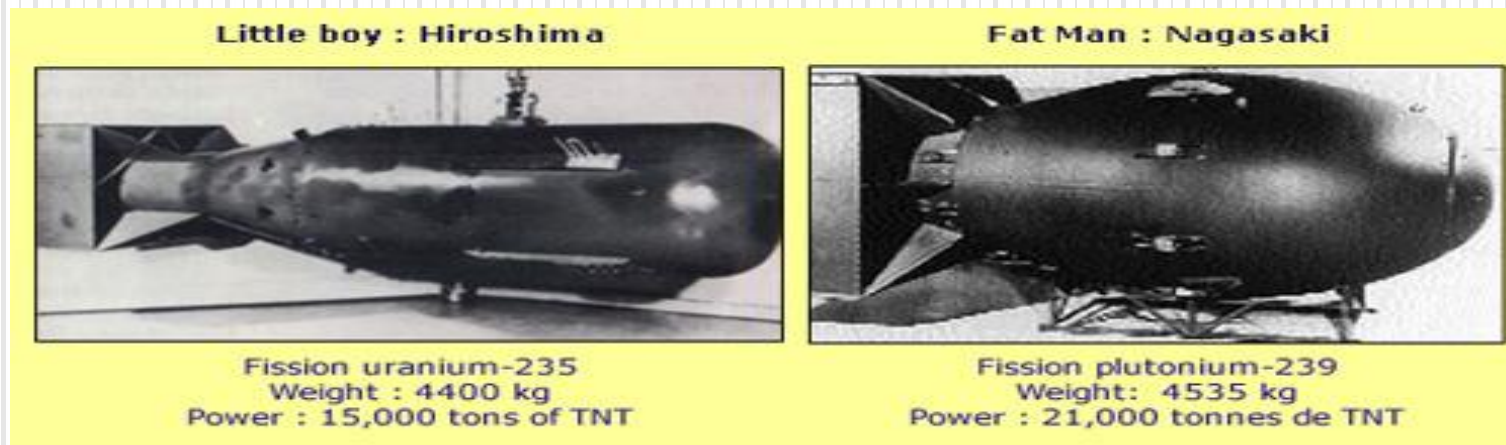
Most recent test: May 1998

Nuclear History

- The first nuclear weapon was made by “Federation of American Scientist” during world war 2.
- J. Robert Oppenhiemer was appointed as the main in charge of the “MANHATTAN PROJECT”.
- Two bombs made were named as ‘LITTLE BOY’ and ‘FAT MAN’.
- First bomb fired for test detonation is done under ‘Trinity Project’.
- In nuclear warfare, nuclear bombs were used for two times, both by U.S.

Nuclear History

- On 6th August, 1945 an uranium based gun-type atom bomb called as 'LITTLE BOY' was fired on Japanese city 'Hiroshima'.
- On 9th August, 1945 a plutonium based implosion – type bomb named as 'FAT MAN' was fired on another Japanese city 'Nagasaki'.
- Both bombs were named so due to their shapes.



Nuclear Weapon in India

- India is among those countries of world who have constructed nuclear weapons along with 5 other permanent countries.
- India's nuclear weapon program was started in March 1944 under leadership of Dr. H.J. Bhabha, when he founded the 'Institute Of Fundamental Research'.
- Nuclear policy of India is no first use policy, it only pursue a 'retaliation policy'.

Pokharan - I

- The first nuclear weapon was successfully test fired on 18th May 1974 in Pokharan code named as 'Smiling Buddha' and called a 'peaceful nuclear explosion'.
- With the Smiling Buddha, India became the world's sixth nuclear power after the United States, Soviet Union, Britain, France and China to successfully test out a nuclear bomb.
- Raja Ramanna expanded and supervised scientific research on nuclear weapons and was the first directing officer of a small team of scientists that supervised and carried out the tests
- A team of 75 scientists and engineers, led by Raja Ramanna, PK Iyengar, Rajagopala Chidambaram and others had worked on it from 1967 to 1974.

Pokharan - II

- On May 13, 1998, India secretly conducted a series of underground nuclear tests with five bombs in Pokhran, Rajasthan.
- Pokhran-II (AKA Operation Shakti-98), was the name assigned to the series of tests that comprised one fusion bomb and four fission bombs.
- Later India was declared as a full-fledged nuclear state and these weapons were for “National security”.
- CIA failed to identify that these tests were going to take place and it was considered as “The biggest failure of our intelligence in the past ten years or more”.

Nuclear Weapon – Pokharan II

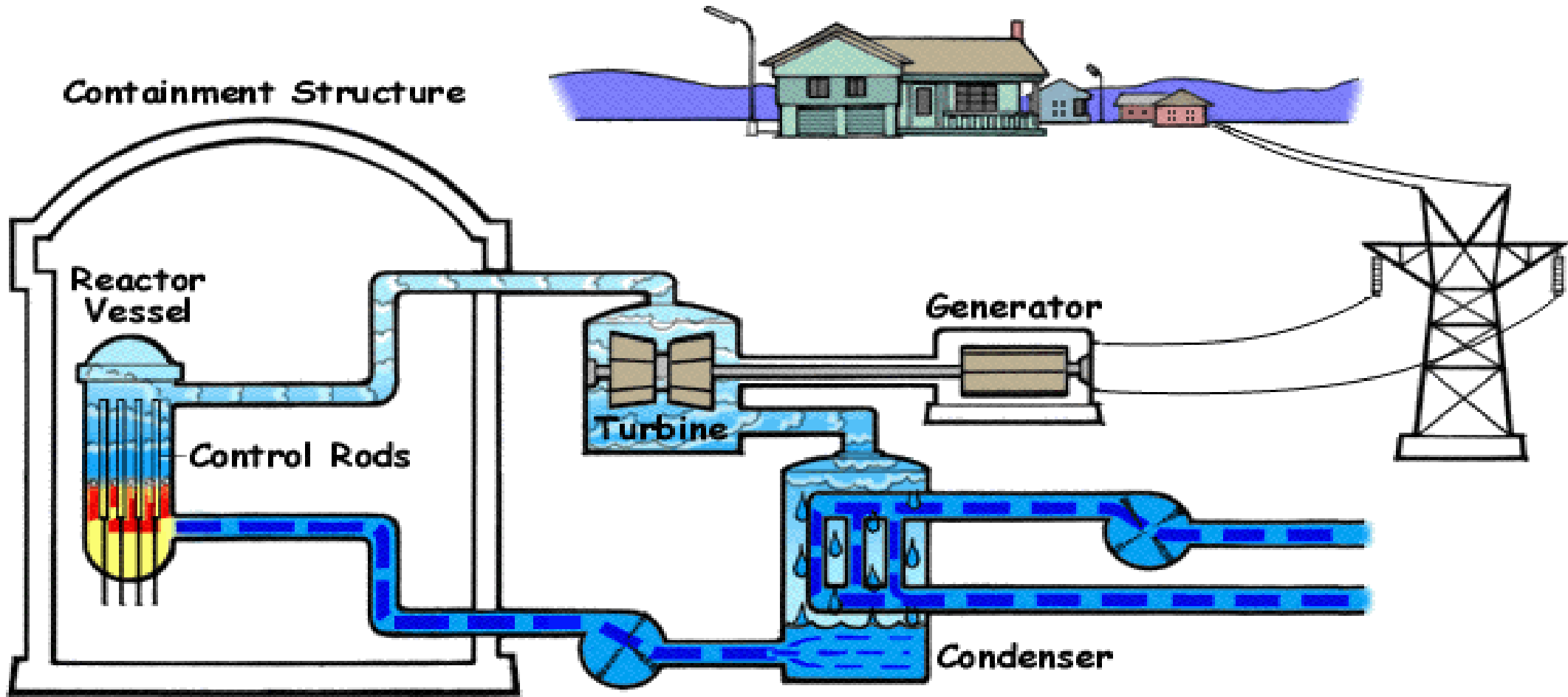


Image tweeted by @SpokespersonMoD

Difference between Nuclear Plant and Bomb

- In a nuclear bomb, the chain reaction isn't controlled, and that's what makes nuclear weapons so terrifyingly destructive.
- The entire chain reaction happens in a fraction of a second, with one splitting atom producing two, four, eight, sixteen, and so on, releasing a massive amount of energy in the blink of an eye.
- In nuclear power plants, the chain reactions are very carefully controlled so they proceed at a relatively slow rate, just enough to sustain themselves, releasing energy very steadily over a period time.
- There is no runaway, uncontrolled chain reaction in a nuclear power plant.

Working of a Nuclear Power Plant



Nuclear Power Plant

- On June 26, 1954, at Obninsk, Russia, the nuclear power plant APS-1 with a net electrical output of 5 MW was connected to the power grid, the world's first nuclear power plant that generated electricity for commercial use.
- On 28th Oct 1969, The Tarapur Atomic Power Station (TAPS) located in the Thane District of Maharashtra begun as India's first atomic power project, the Indian Government decided to utilize boiling water reactors (BWRs) for the plant.
- It was the first commercial nuclear power station built in India with an initial power of 210 MW of electricity.

Nuclear Power Plant - Tarapur



Nuclear Submarine

- A submarine that is powered by nuclear energy that can travel both above and below the surface of the sea.
- Consider for a moment how difficult it is to design a seaworthy vessel that can travel to great depths beneath the surface, launch ballistic missiles while underwater and maintain the life functions of a full crew onboard.
- On Jan 21 1954, US developed the world's first nuclear-powered submarine: the Nautilus. It had a practically unlimited range and could stay underwater for great lengths of time because it didn't have to surface to recharge electric batteries.

Arihant – class submarine

- INS Arihant is India's first nuclear-powered submarine. It was launched at the Indian Navy's dockyard in Visakhapatnam.
- The name Arihant derives from two words – 'Ari' meaning enemy and 'Hanth' meaning destroy.
- It weighs 6,000t. At a length of 110m and breadth of 11m, Arihant is the longest in the Indian Navy's fleet of submarines and can accommodate a crew of 95. It can reach a speed of 12kt-15kt on surface and up to 24kt when submerged.
- Arihant will be able to stay under water for long periods undetected due to the nuclear-powered 80MW pressurized water reactor (PWR).

Nuclear submarine - Arihant



Pros of Nuclear Energy

- Low Pollution.
- Low Operating Costs.
- Reliability.
- More proficient than Fossil Fuels.

Cons of Nuclear Energy

- Environmental Impact.
- Radioactive Waste Disposal.
- Uranium is Finite.
- Nuclear Accidents.
- Hot Target for Militants.

Thank You!

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