

# Nuclear Power : Environmently benign, clean and green power

*No power is costlier than 'no power'*

- Dr. Homi Jehangir Bhabha

Owing to faster growth and increasing population, electricity demand in India is increasing rapidly. Presently coal provides 68% of the electricity, gas 8%, and hydro 14%. Relying on fossil fuels and hydel power projects won't be enough to satisfy constant and ever-growing needs, because per capita electricity consumption in the country is

expected to reach 5000-6000 kWh by 2050.

The non-renewable

energy sources like coal, gas, oil etc. are limited. Energy security for such a huge country can only be provided by a diversified portfolio, which must include nuclear power. India has to choose its own mix of power generation. We have coal deposits in the Eastern regions. The



Hall of Nuclear Power spread over an area of 700m<sup>2</sup>, explains principles involved, energy generation methods, fuel processing, public safety etc.

this hall will certainly dispel many myths associated with the nuclear power like safety from radiation, waste fuel disposal etc. from visitors' mind.

Exhibits in the introductory section explain current status of electricity generation and available options. Here visitors also get opportunity to be a

Visitors can also get acquainted with the basic nuclear power generation processes including production of heavy water, required for Pressurized Heavy Water Reactors (PHWR).

In the exhibition visitors can undertake a



virtual tour to a typical atomic power plant where common people are not allowed due to security & safety reasons. The film also shows philosophy of defence-in-depth & safety barriers to prevent leakage of radiations due to any major natural or man-made calamity or failure of the system. The entire nuclear reaction can be shut down with-in few seconds bringing the reaction and radiation level under control.

Radiation is our natural constant

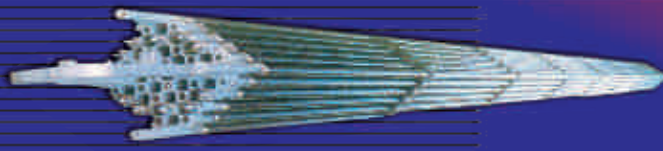
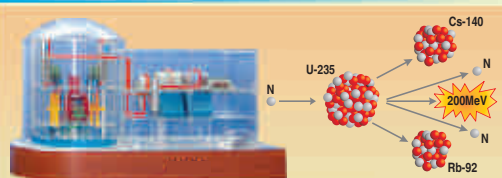
Dr. Homi Jehangir Bhabha, father of India's nuclear programme, drew a 3-stage nuclear power programme as early as 1959. The exhibition also pays a tribute to Dr. Bhabha, the architect of peaceful applications of nuclear energy in India. Dr. Bhabha's childhood, education, research and various faces as an artist, musician and scientist have been depicted here.

The exclusion zones created around the



Some concerns regarding the radiation safety and the waste disposal are there in the minds of people. There are exhibits to explain how these concerns are taken care of, with the advanced technologies and safe design practices.

The exhibition also provides an opportunity to the visitors to learn their under



This is the Boiling Water Reactor fuel bundle having 140 kg of uranium and is sufficient to meet one month's electricity requirement of 1,20,000



**More about Nuclear Energy :**

- Nuclear energy comes from mass-to-energy conversions based on Albert Einstein's famous equation  $E = mc^2$ . Henri Becquerel was the first to discover nuclear energy in 1896.
- Nuclear energy in 1896. Enrico Fermi in 1942 first showed that fission can be controlled opening a gateway for enormous source of energy for power generation.
- The fission of an atom of uranium produces 10 million times the energy produced by the combustion of an atom of carbon from coal.
- One ton of uranium produces more energy than is produced by several million tons of coal.
- Nuclear energy from a reactor is used to generate heat for boiling water, produce steam, and drive a steam turbine.
- As of Jan 2011, 442 nuclear power plants with total capacity of about 375 Gigawatts are in operation in 30 countries.
- Nuclear waste remains radioactive for 13 million years. Hence its disposal needs special care.
- The International Nuclear Event Scale (INES), developed by the International Atomic Energy Agency (IAEA), is used to communicate the

**Applications :**

There are innumerable benefits of nuclear energy. Besides power generation it is used for food irradiation, disease diagnosis, radiotherapy, agriculture etc. Intangible benefits include the sense of confidence that our nuclear capability has induced in our scientists. It is also a testimony to our ability to achieve self reliance in a field in which we have been traditionally dependent on others.



**Space Exploration**  
Sojourner used  $\alpha$ -particles to identify chemical elements present in Martian rocks. On Earth, nuclear

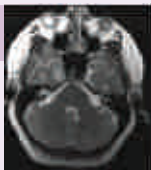
**Radioactive Dating**

Radioactive isotopes such as  $^{14}_6\text{C}$  are used to date objects that

of artifacts, scientists determined that Stonehenge was built nearly 4000 years

**Magnetic Resonance Imaging**

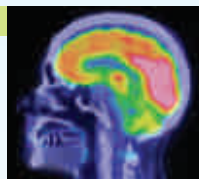
Magnetic Resonance Imaging (MRI) makes use of atomic transitions involving the magnetic field



This technique accurately maps the

**Nuclear Medicine**

Radioactive isotopes, such as  $^{99m}_{43}\text{Tc}$ ,  $^{60}_{27}\text{Co}$  and  $^{131}_{53}\text{I}$ , are commonly used in the diagnosis and treatment of diseases.



Positron Emission Tomography (PET) to generate images of brain activity.



**Smoke Detector**

Many smoke detectors use a small amount of  $\alpha$ -particles to ionize the air. Smoke entering the detector reduces the current and sets

**Why Nuclear Power Gallery at NSC, Mumbai**

Generally on debatable issues people show concerns to policy makers who need to take crucial decisions. Science Centres provide a platform to scientists, policy makers, and public for interacting face to face on such issues. Therefore, these can provide right advice bridging the gap between science & society. Mumbai is the birth place of Dr. Homi Jehangir Bhabha and also the host to



**NEHRU SCIENCE CENTRE**

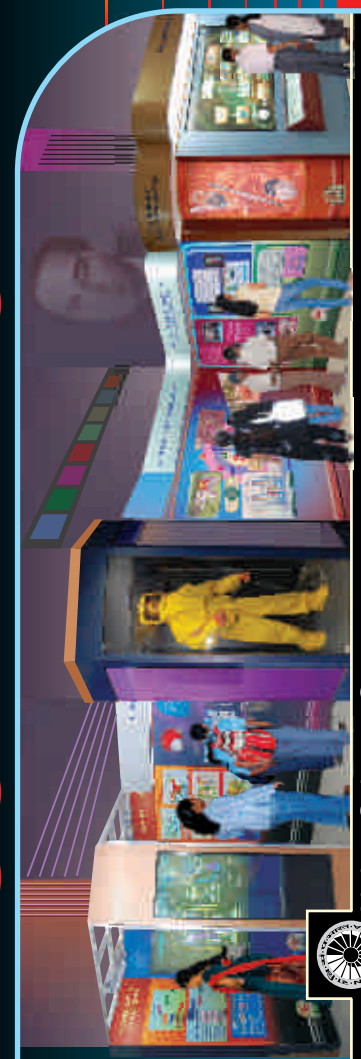
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Project Supported By



**Nuclear Power Corporation of India Limited**  
(A Government of India Enterprise)

HALL OF **NUCLEAR POWER**



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