Frequently Asked Questions on the India –US Agreement for Co-operation concerning Peaceful Uses of Nuclear Energy

Why is it called 123 Agreement?

The bilateral "Agreement for Co-operation between the Government of India and the Government of the United States of America concerning Peaceful Uses of Nuclear Energy" has been done in view of the requirement for the US side under Section 123 of its Atomic Energy Act 1954. Hence it is also popularly known as the 123 Agreement.

What are benefits to India from doing this agreement?

The Agreement would end technology denial regimes against India that have been in place for three decades and end India's nuclear isolation. It will open the doors for India to have civil nuclear cooperation as an equal partner with the USA and the rest of the world. It will enable us to meet the twin challenges of energy security and environmental sustainability. It will also have major spin-offs for the development of our industries, both public and private. At the same time, it will bring India the recognition it deserves thanks to the outstanding achievements of our scientists.

Does it affect our independent foreign policy?

There is no question of India ever compromising, in any manner, our independent foreign policy. The Agreement also clearly mentions this. The conduct of foreign policy determined solely by our national interests is our sovereign right. We shall retain our strategic autonomy.

Does it mean India will have to sign CTBT/ FMCT?

The Agreement entails no obligations for India to sign CTBT/ FMCT.

We, however, remain committed to a voluntary, unilateral moratorium on nuclear testing. We are also committed to negotiate a Fissile Material Cut-off Treaty (FMCT) in the Conference on Disarmament. India is willing to join only a non-discriminatory, multilaterally negotiated, and internationally verifiable FMCT subject to it meeting our national security interests.

What happens to India's stand on Iran?

The 123 Agreement is about cooperation for peaceful uses of nuclear energy. It has no reference to any extraneous issue.

Is it linked to any other issue, such as purchase by India, of aircrafts?

The Agreement is not linked to any extraneous commitment or obligation on India's part.

Have PM's commitment to Parliament been fulfilled?

Commitments made by Prime Minster to Parliament, including in his statement to Rajya Sabha on August 17, 2006, have been fully adhered to.

What happens to our independent 3 stage nuclear power programme?

India's' indigenous three stage nuclear programme does not get affected by this agreement. Its full autonomy has been preserved.

Does the agreement mean India has to give up its nuclear weapons programme?

The agreement has no effect whatsoever India's nuclear weapons programme in any way. However, India, as a responsible nuclear state, would continue to observe its voluntary moratorium on testing and its policies of credible minimum deterrence and no first use.

Does the Agreement mean India will have to give up its right to do nuclear testing in future, if so necessitated by circumstances?

Our right to test in future, if it is necessary in India's national interest, does not get affected by this Agreement. There is no mention of testing in this Agreement. However, However, India, as a responsible nuclear state, would continue to observe its voluntary unilateral moratorium on testing and its policies of credible minimum deterrence and no first use.

Have we given up our adherence to the principle of nuclear disarmament?

India has a long-standing commitment to the ideas of nuclear disarmament and our refusal to participate in any arms race, including a nuclear arms race. Our commitment to universal, non-discriminatory and total elimination of nuclear weapons remains undiminished.

Some people have criticized the Agreement as a setback to global non-proliferation effort?

Pending global nuclear disarmament, India has maintained an impeccable non-proliferation record. As a responsible nuclear power, India will not be the source of proliferation of sensitive technologies. We stand for the strengthening of the non-proliferation regime as the infirmities in this regime have affected our security interests. We will work together with the international community to advance our common objective of non-proliferation. We believe the Agreement is good for India, and good for the world.

What happens to various provisions of the Hyde Act which are of concern?

The Hyde Act is a law of the US that is applicable to the US Administration. The US Administration has categorically assured us that the Hyde Act enables the United States to fulfill all of the commitments it made to India in the July 18 and March 2 Joint Statements. India's commitments and obligations would only be those mentioned in the bilateral 123 Agreement.

Does India get the right to reprocess spent fuel?

We view our right to reprocess as a key element of a closed fuel cycle. Our right to reprocess US origin spent fuel has been secured upfront in this Agreement.

Do we get enrichment and reprocessing technology from US?

The United States has a longstanding policy of not supplying to any country enrichment, reprocessing and heavy water production facilities. This Agreement provides for such transfers to India only through an amendment. We hope transfers will become possible as cooperation develops and expands in the future.

Would our indigenous R & D effort be affected?

Our indigenous R &D effort would continue unhindered and unaffected.

How can the Agreement end?

Either party may seek termination by giving 6 months notice at the end of initial 40 year period or at the end of any subsequent 10 year period.

Either party also have a right to terminate this Agreement on 1 years written notice, giving reasons for seeking termination. An elaborate multi-layered consultation process has been included with regard to any future events that may be cited as a reason by either Party to seek cessation of cooperation or termination of the Agreement.

In the Agreement, there is no provision that states that US cooperation with India will be subject to an annual certification process.

What happens to fuel supplies for nuclear reactors if the Agreement is terminated?

The detailed fuel supply assurances provided in the Separation Plan are reflected in full in the Agreement. The Agreement also reflects India's right to take "corrective measures" to ensure the uninterrupted operation of its reactors.

Is the text of the Agreement available?

The text of the Agreement is available to the public on the websites on Ministry of External Affairs at www.mea.gov.in

II. India's Three Stage Nuclear Programme

What is India's Three Stage nuclear power programme?

India's three stage nuclear programme has been under development in consideration of judicious utilisation of our limited reserves of Uranium and vast Thorium reserves.

Stage one uses Pressurized Heavy Water Reactors (PHWRs). Natural uranium (natural uranium is 0.7 percent U-235, which is fissile, and the rest is U-238) is the primary fuel. Heavy water (deuterium oxide**,** D_2O) is used as moderator and coolant.

In the **second stage**, the spent fuel from stage one is reprocessed in a reprocessing facility, where Plutonium-239 is separated. Plutonium is also a weapons material.

Pu-239 then becomes the main fissile element, the fuel core, in what are known as fast breeder reactors (FBR). These are known as breeder reactors because the U-238 "blanket" surrounding the fuel core will undergo nuclear transmutation to produce more PU-239, which in turn will be used to create energy.

The stage also envisages the use of Thorium (Th-232) as another blanket. Th-232 also undergoes neutron capture reactions, creating another uranium isotope, U-233. It is this isotope which will be used in the third stage of the programme. Thorium by itself is not a fissile material, and cannot be used directly to produce nuclear energy.

Advanced heavy water reactor (AHWR), which use plutonium based fuel, are to be used to shorten the period of reaching full scale utilisation of our thorium reserves. The AHWR is thus the first element of the third stage. A prototype AHWR is under development.

In the **third phase**, in addition to the U-233 created from the second phase, breeder reactors fuelled by U-233, with Th-232 blankets, will be used to generate more U-233.

III. Common Nuclear Energy Terms:

Uranium: A radioactive element with the atomic number 92 and, as found in natural ores, an atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (0.72 percent of natural uranium), which is fissile, and uranium-238 (99.28 percent of natural uranium),

which is fissionable by fast neutrons and is fertile. Natural uranium also includes a minute amount of uranium-234.

Enriched Uranium: Uranium containing a greater mass percentage of uranium-235 than 0.72%.

Low Enriched Uranium (LEU): Enriched uranium containing less than 20% of the isotope 235U. LEU is considered a special fissionable material and an indirect use material.

High Enriched Uranium (HEU): Uranium containing 20% or more of the isotope 235U. HEU is considered a special fissionable material and a direct use material.

Depleted Uranium: Uranium containing a lesser mass percentage of uranium-235 than in natural uranium.

Plutonium (Pu): A heavy, radioactive, manmade metallic element with atomic number 94. Its most important isotope is fissile plutonium-239, which is produced by neutron irradiation of uranium-238. It exists in only trace amounts in nature

Source Material : Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight 1/20 of one percent (0.05 percent) or more of (1) uranium, (2) thorium, or (3) any combination thereof. Source material does not include special nuclear material.

Fissile Material : Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning. Namely, any material fissionable by thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

Special nuclear material: Plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235.

Byproduct : Byproduct is (1) any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material (as in a reactor); and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from ore.

Nuclear Fuel: Fissionable nuclear material in the form of fabricated elements for loading into the reactor core of a civil nuclear power plant or research reactor**.**

Spent nuclear fuel: Fuel that has been removed from a nuclear reactor because it can no longer sustain power production for economic or other reasons.

Fuel reprocessing: The processing of reactor fuel to separate the unused fissionable material from waste material.

Safeguards : Nuclear safeguards are measures to verify that civil nuclear materials are properly accounted for and are not diverted to undeclared uses. The measures include nuclear materials accountancy, containment and surveillance.

As used by the International Atomic Energy Agency (IAEA), verifying that the "peaceful use" commitments made in binding non-proliferation agreements, both bilateral and multilateral, are honored.

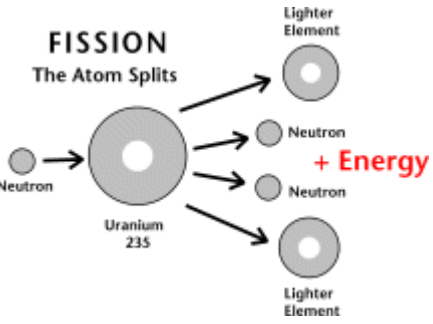
Protocol Additional to Safeguards Agreements (Additional Protocol) : Agreements with the IAEA made by States that specify the additional authority necessary for the IAEA to fully implement its obligations under comprehensive safeguards agreements pursuant to the NPT. Additional protocols contain measures to improve the efficiency and strengthen the effectiveness of the IAEA safeguards system. The main features of the additional protocol are the requirements that States provide (i) information beyond that required for nuclear

materials accountancy, e.g. on nuclear fuel cycle-related R&D, specified manufacturing activities (e.g. centrifuge manufacture) and exports and imports of certain non-nuclear material and equipment; and (ii) extended access to the IAEA to check this reporting.

IV. Nuclear Power Generation

How is nuclear power produced?

Nuclear energy is energy in the nucleus (core) of an atom. Atoms are tiny particles that make up every object in the universe. There is enormous energy in the bonds that hold atoms together. Nuclear energy can be used to make electricity. But first the energy must be released. It can be released from atoms in two ways: nuclear fusion and nuclear fission.



In **nuclear fusion**, energy is released when atoms are combined or fused together to form a larger atom. This is how the sun produces energy.

In **nuclear fission**, atoms are split apart to form smaller atoms, releasing energy. Nuclear power plants use nuclear fission to produce electricity.

The **fuel** most widely used by nuclear plants for nuclear fission is uranium. Uranium is nonrenewable, though it is a common metal found in rocks all over the world. Nuclear plants use a certain kind of uranium, U-235, as fuel because its atoms are easily split apart. Though uranium is quite common, about 100 times more common than silver, U-235 is relatively rare. Once uranium is mined the U-235 must be extracted and processed before it can be used as a fuel.

During nuclear fission, a small particle called a neutron hits the uranium atom and it splits, releasing a great amount of energy as heat and radiation. More neutrons are also released. These neutrons go on to bombard other uranium atoms, and the process repeats itself over and over again. This is called a chain reaction.

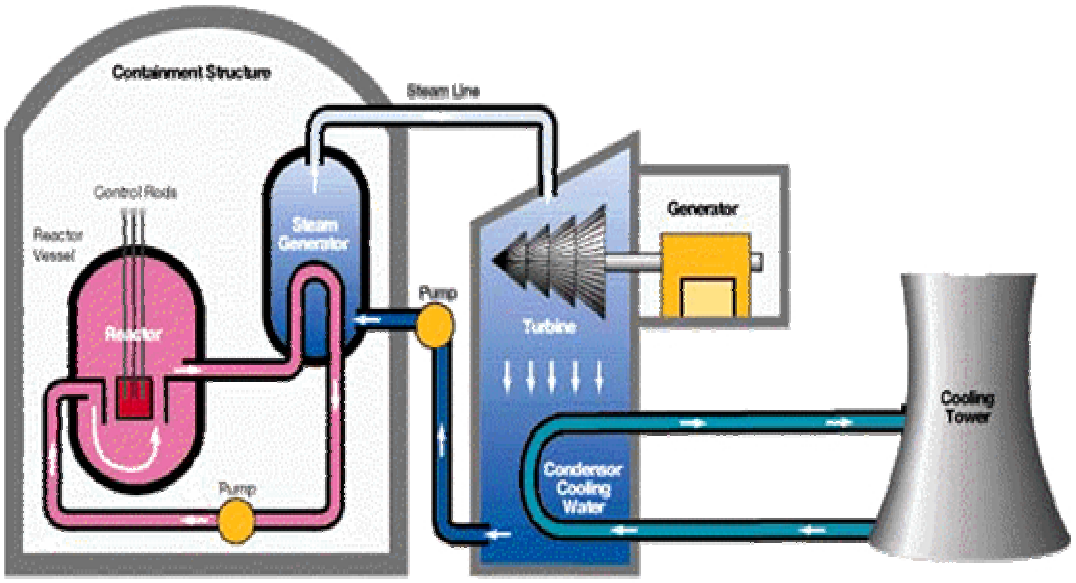
Most power plants burn fuel to produce electricity, but not **nuclear power plants**. Instead, nuclear plants use the heat given off during fission as fuel. Fission takes place inside the reactor of a nuclear power plant. At the center of the reactor is the core, which contains the uranium fuel.

The uranium fuel is formed into ceramic pellets. The pellets are about the size of your fingertip, but each one produces the same amount of energy as 150 gallons of oil. These energy-rich pellets are stacked end-to-end in 12-foot metal fuel rods. A bundle of fuel rods is called a fuel assembly.

Fission generates heat in a reactor just as coal generates heat in a boiler. The heat is used to boil water into steam. The steam turns huge turbine blades. As they turn, they drive generators that make electricity. Afterward, the steam is changed back into water and cooled in a separate structure at the power plant called a cooling tower. The water can be used again and again.

Different types of nuclear power plants have been developed, including boiling-water reactors (BWRs), and pressurized-water reactors (PWRs).

Nuclear reactors are basically machines that contain and control chain reactions, while releasing heat at a controlled rate. In electric power plants, the reactors supply the heat to turn water into steam, which drives the turbine-generators. The electricity travels through high voltage transmission lines and low voltage distribution lines to end users.



Like all industrial processes, nuclear power generation has **by-product wastes**: spent (used) fuels, other radioactive waste, and heat. Because nuclear generated electricity does not emit carbon dioxide into the atmosphere, nuclear power plants prevent emissions of millions of metric tons of carbon dioxide.

Spent fuels and other radioactive wastes are the principal environmental concern for nuclear power. Most nuclear waste is low-level radioactive waste. It consists of ordinary tools, protective clothing, etc that have been contaminated with small amounts of radioactive dust or particles. These materials are subject to special regulation that govern their disposal so they will not come in contact with the outside environment. On the other hand, the spent fuel assemblies are highly radioactive and must initially be stored in specially designed pools resembling large swimming pools (water cools the fuel and acts as a radiation shield) or in specially designed dry storage containers.

***Disclaimer**: The information provided above is for information / illustrative purpose only. While it has been compiled from various authoritative sources, it is not definitive nor meant to be taken as India's official position on various issues mentioned.*

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