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Why Kudankulam nuke plant is viable

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A number of people recently observed a fast near the Kudankulam nuclear power plant in Tamil Nadu to protest against the construction of a nuclear reactor. This power plant consists of two reactor units, each with a generating capacity of 1,000 Mw. The first unit is ready for fuel loading and can be started up in the next three months. However, the agitation has interrupted the start-up process. After a severe earthquake and tsunami hit Japan in March this year, three reactors suffered serious damage and radiation spread to the neighbourhood. As a result, people living within the 20-km radius had to evacuate the area. There has also been concern about contamination of fish, meat, vegetables produced in the region.

The Fukushima incident has raised concerns about the future of nuclear power. Indian Prime Minister Manmohan Singh promptly ordered a review of the safety status of all nuclear power units in India, both in operation and under construction. The Nuclear Power Corporation of India Ltd (NPCIL) and the Atomic Energy Regulatory Board (AERB) set up task forces to review the safety features of the reactors, particularly their ability to withstand risks posed by earthquakes and tsunamis, disconnection of the nuclear unit from the electrical grid system, and so on. These reviews have shown that the kind of situation that developed in Japan is not likely to occur in our installations owing to adoption of conservative design features and, above all, the low probability of an earthquake of the magnitude that shook Japan. The earthquake in Japan was a thousand times stronger than the Sikkim earthquake of September 2011.

As a result of the review carried out by NPCIL and AERB, certain additional design features are being implemented in our nuclear installations. One of them is providing adequate-capacity, portable air-cooled diesel generators to supply uninterrupted power to essential services. Another is ensuring that adequate amount of fresh water is available at the nuclear plant site for cooling of the nuclear fuel.

The nuclear power units in Kudankulam belong to the third generation of design evolution; the Fukushima reactors belong to the first generation design. A special feature of the Kudankulam design is the passive cooling system for the nuclear reactor core. The water cooling the reactor transfers its heat to the water in the steam generators. After driving the turbine, steam condenses into water in the condenser and is pumped back to the steam generator. In an abnormal situation, when no power is available to drive these pumps, the hot water in the steam generator flows to an air-cooled heat exchanger located at a height outside the reactor building. Owing to the difference in height, the hot water rises up on its own due to its lower density and cold water flows down to the steam generator. This is called the "thermo siphon effect" and it does not need any pump to move the water. This feature was incorporated in the Kudankulam design at India's insistence. The Kudankulam reactors are the first to have the passive cooling feature.

The Kudankulam design has another important feature" a "core catcher". In the event of an extreme accident and were the molten nuclear fuel to breach the reactor pressure vessel, it falls on to a matrix containing a large amount of neutron-absorbing substances (such as boron). Once mixed with this material, the nuclear fuel is rendered incapable of starting a nuclear chain reaction. Only the latest design of nuclear power units have this safety back-up system.

India has 20 nuclear reactors in operation and a core of highly trained personnel for operations and maintenance. While many of our units are 220 Mw in size, units 3 and 4 at Tarapur are 540 Mw. The two units at Tarapur have been operating well for the past two years. The Kudankulam units have a capacity of 1,000 Mw so a scale-up from the Tarapur units is not expected to pose problems.

GIVEN THE SAFETY RECORD OF THE NUCLEAR POWER CORPORATION OF INDIA AND THE DEPARTMENT OF ATOMIC ENERGY, **they can be trusted not to sacrifice the security of people living in and around Kudankulam**

Some weeks before the September agitation, a rumour was spread in the neighbouring villages that the Department of Atomic Energy (DEA) was likely to evacuate people living there and acquire their lands. DEA has no plans to acquire any land, since it already has a lot more than it needs.

Those who oppose nuclear energy often say, "Let us use solar and wind energy." At present, solar energy costs about ₹20/kWh, wind energy may cost ₹10/kWh and is available only for about 20 or 25 per cent of the time. Our nuclear power stations are selling energy for ₹1/kWh at Tarapur, and ₹3/kWh at Kaiga. Power from Kudankulam will be well below ₹3/kWh. We all know how Tamil Nadu and other southern states are struggling with power shortages. The two units of Kudankulam will supply about 1,000 Mw to Tamil Nadu, considerably easing local energy shortages. It is, therefore, in the interest of the people of Tamil Nadu to let the Kudankulam unit start operating at the earliest. Given the track record of NPCIL and DEA, they can be trusted not to sacrifice the security of people living in and around Kudankulam.

The author is former chairman and current member of the Atomic Energy Commission