

## RESEARCH ARTICLE

# An exploration of the regulatory regime of the Indian nuclear industry

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### ABSTRACT

India has always attached great importance to the development of its nuclear industry. India's nuclear industry started early with the establishment of the Atomic Energy Commission (AEC) in 1948 and the Department of Atomic Energy (DAE) in 1954. The current management system in India is that the Prime Minister exercises the highest decision-making power, the Atomic Energy Commission assists the Prime Minister in decision-making; the Department of Atomic Energy is in charge of the nuclear industry; research and development institutions and state-owned enterprises under the Department of Atomic Energy implement specific decisions. The characteristics of India's nuclear industry system are: direct supervision by the Prime Minister and full safeguards; high degree of centralisation and unified management; integration of the military and civilian sectors and the use of the civilian sector as a cover for the military; and adherence to the "three-step" nuclear energy development route. India's remarkable achievements in the face of a prolonged international embargo are attributable to the nuclear industry management system that has been in place in India for more than 60 years, which is worthy of our reference.

**Keywords:** nuclear industry; management system; India

India has always attached great importance to the development of its nuclear industry. India's nuclear industry started earlier with the establishment of the Atomic Energy Commission in 1948 and the Department of Atomic Energy in 1954. After more than 70 years of endeavour, India claims to have built a "trinity" of nuclear deterrent forces on land, at sea and in the air; the nuclear industry system is more complete, although there is a gap with the advanced countries in the West, but in the fast reactors, spent fuel reprocessing and thorium fuel technology development is in the international advanced ranks. This is due to the highly centralised nuclear industry management system, regardless of political changes, India's nuclear industry has always been under the leadership of successive Prime Ministers to continue to develop.

## 1. Existing regulatory regime of the Indian nuclear industry

The Indian nuclear industry is under the supreme decision-making authority of the Prime Minister, who is assisted by an interdepartmental Atomic Energy Commission; a dedicated Department of Atomic Energy in the Cabinet, which is responsible for the nuclear industry; and various research and development institutes and State-owned enterprises under the Department of Atomic Energy at the executive level.

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The Prime Minister has the legal authority to make decisions on the use of nuclear weapons and on the strategy for the development of nuclear forces and, as Head of Government, directly leads the development of the nuclear industry and personally manages the Department of Atomic Energy. Nuclear scientists can report directly to the Prime Minister.

The Atomic Energy Commission (AEC) is the Prime Minister's decision-making support body, whose main responsibilities are to formulate national policies for the development of the nuclear industry and to review the budget of the Department of Atomic Energy. The Chairman and members of the Atomic Energy Commission are ministers or senior officials of government agencies and are appointed by the Prime Minister himself.

The Department of Atomic Energy (DAE) is part of the Government Cabinet, headed by the Chairman of the Atomic Energy Commission (AEC), is directly responsible to the Prime Minister, and is fully funded by the Government <sup>[1]</sup>. The main responsibilities of the Department of Atomic Energy are to organise and manage the design and manufacture of nuclear weapons, the production of nuclear materials, the development of nuclear power for submarines, the design, construction and operation of nuclear power stations and fuel cycle facilities, and research in nuclear science and technology <sup>[2]</sup>.

The Department of Atomic Energy consists of six Nuclear Energy Research and Development Centres (NERDCs), six State-owned Nuclear Industry Enterprises (SINIEs) and related services, the most important of which are the Baba Centre for Atomic Research (hereinafter referred to as the Baba Centre) and the Indira Gandhi Centre for Atomic Research (hereinafter referred to as the Gandhi Centre), which have been set up to provide nuclear energy research and development services. It is mainly responsible for the design and manufacture of nuclear weapons, the development of nuclear power for submarines and the production of nuclear materials, as well as the development of nuclear power and other civil nuclear technologies <sup>[3]</sup>.

The Atomic Energy Supervisory Commission, established under the Atomic Energy Commission, provides safety supervision of the nuclear facilities and activities of the Department of Atomic Energy and is responsible to the Chairman of the Atomic Energy Commission.

## **2. Characteristics of the Indian nuclear industry regulatory regime**

### **(1) Direct control by the Prime Minister, full protection**

The high status of the nuclear industry in India is reflected in the direct management of the industry by the Prime Minister. The Prime Minister's direct stewardship of the nuclear industry ranges from authorising the use of nuclear weapons and approving nuclear tests to appointing the Minister of Atomic Energy/Chairman of the Atomic Energy Commission and approving the budget of the Department of Atomic Energy. This system of governance has kept the Indian nuclear industry at the top of the defence industry's priority list, with adequate funding and safeguards, and has contributed to the development of India's nuclear forces and industry.

### **(2) Highly centralised and unified management**

Since the establishment of the Department of Atomic Energy (DAE) by order of the Prime Minister in 1954, India has been implementing a highly centralised nuclear industry system for more than 70 years, placing the nuclear industry under the centralised management of the Department of Atomic Energy (DAE), which is solely responsible for the design and manufacture of nuclear weapons, the development of nuclear power for submarines and the production of nuclear materials. This system allows for efficient management, concentration of resources, technological focus and concentration of efforts on major issues<sup>[4]</sup>.

### **(3) Integration of the military and the people, using the people to cover the army**

Civil-military integration of nuclear programmes: In 1954, India formulated a three-phase nuclear energy development programme, “Pressurised Heavy Water Reactor (PHWR) - Fast Reactor (FRR)-Advanced Heavy Water Reactor (AHWR)”, with the military purpose hidden in the civilian programme. In the first phase, India's pressurised heavy water reactors (PHWRs) produced large quantities of weapons-grade plutonium while generating electricity. In the second phase, fast reactors were developed and built to produce both electricity and weapons-grade plutonium. The third stage, advanced heavy water reactors, can operate on a thorium fuel cycle to enrich uranium-233<sup>[5]</sup>. Uranium-233 is a good fissile fuel and one of the raw materials for nuclear weapons<sup>[6]</sup>.

Civil-military integration of nuclear institutions: A number of institutions and research and development centres of the Department of Atomic Energy are engaged in the production of military products as well as in the development of nuclear energy technologies for civilian use. In addition to the Baba and Gandhi Centres mentioned earlier, institutions such as the Council for the Exploration and Research of Nuclear Minerals (CERNM), the Nuclear Fuel Complex Corporation (NFC), and the Raja Ramanullah Centre for Advanced Technology (RACAT), among others, are developing and producing both military and civilian products or technologies<sup>[7]</sup>.

Civil-military integration of nuclear facilities: Nuclear material and components for India's nuclear weapons are supplied by the nuclear facilities of the Department of Atomic Energy. India has 101 nuclear facilities in 11 categories, covering uranium mining, uranium conversion, uranium enrichment, nuclear materials, reactors, reprocessing, etc., forming a complete nuclear industrial system. Of these 101 nuclear facilities, only 26 are under International Atomic Energy Agency (IAEA) safeguards, while the rest of the non-safeguarded nuclear facilities are of dual military and civilian nature.

### **3. Conclusion**

India has always regarded the development of its nuclear forces as an important means of upgrading its national defence strength and international status, with a view to joining the “Club of Military Powers” and dominating South Asia and the Indian Ocean. Under the guidance of this strategic idea, India has made great efforts to develop its nuclear force and nuclear industry, placing the nuclear industry in an important position in the development of the defence industry and steadily pushing forward the “three-step” nuclear energy development plan for a long time, and implementing the nuclear industry management system under the direct leadership of the Prime Minister and with a high degree of concentration in the Department of Atomic Energy, which has facilitated the enhancement of the nuclear industry's capability and breakthroughs in nuclear science and technology. This has facilitated the upgrading of the capabilities of the nuclear industry and breakthroughs in nuclear science and technology. India has achieved a breakthrough in its nuclear industry despite the long-standing international embargo, and has initially established a “triad” of nuclear forces and made remarkable achievements in the development of fast reactors, spent fuel reprocessing and thorium fuel.

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