It cooperation among scientists and scientific establishments.

Science

It was ready for commissioning by the middle of 1985 but a technical hitch and its creators' insistence of " ensuring 100 per cent safety" delayed the announcement of their hour of triumph by over a year. This landmark in our atomic research is particularly exciting because it would give a fresh fillip to the production of isotopes like iodine 131, chromium 51 and molybdenum 99 providing better facilities for medical diagnosis and productive investigations in the fields of agriculture and industry. Dhruva is the product of exemplary cooperation among scientists and scientific establishments. The fuel for it was prepared at the Nuclear Fuel Complex, Hyderabad. As much as 100 tonnes of heavy water came from the heavy water plants at Nangal, Vadodara and Tuticorin. The scientists working on its various phases came from Delhi, Mumbai, Chennai and other Indian cities.

Its five precursors – Apsara (the one megawatt " swimming pool" reactor), Zerlina, Purnima, Purnima ID and the biggest of them all named Cirus (which celebrated its 25th birthday on July 10, 1985) – are all fulfilling their assignments. DHRUVA reactor, because of its indigenous fabrication, gives India freedom from the constraining safeguard regulations of International Atomic Energy. 2. Kamini: ' Kamini' nuclear research reactor using man-made Uranium-233 fuel, derived from the beach sands of Kerala, went critical in Oct. 1996. The commissioning of the Kamini research reactor at Kalpakkam marked an important landmark in India's long cherished endeavour at mastering the thorium-U 233 fuel cycles.

While the country has somewhat limited resources of natural uranium, estimated at 70, 000 tonnes, it has five times as much thorium. In the long

run, therefore, India’s nuclear programme will eventually have to depend on thorium. The crux of the matter is that thorium lacks a fissile component.

It has to be converted into fissile uranium-233. With Kamini going critical, Indian scientists have shown that they have mastered the key technology to create a reactor which embodies the “ small is beautiful” principle enunciated by the late Ernst Schumacher. Kamini, which is an acronym for Kalpakkam Mini Reactor, also literally means “ desirable damsel” in Sanskrit. Indeed, the eponymous reactor is desirable in more ways than one: it is the only one of its kind in the world, and also has a very low critical mass. This has been made possible by the ingenious use of beryllium oxide as a neutron reflector surrounding the highly compact core. To be sure, there have been smaller zero power experimental reactors using lower critical masses. Purnima-2, for instance which was built at BARC as a forerunner to Kamini, had a critical mass of only 397 gms as compared to 600 gms used in Kamini.

However, what distinguishes Kamini from the zero power experiments is its projected lifespan. Like Apsara at Bhabha Atomic Research Centre, Kamini is expected to serve generations of scientists in the Atomic Energy laboratories as well as researchers from universities and IITs. in the southern region over the next few decades.

However, the reactor will be mainly used to study the highly radioactive fuel elements which are discharged from the fast breeder test reactor at Kalpakkam. The insights thus gained are expected to spur the development of high performance plutonium fuel elements for the prototype fast breeder reactor, the first of a series, to be built in the next century. Kamini will also

serve as a neutron source for a variety of research applications. It will also assist scientists studying molecules with low atomic number, such as hydrogen and carbon, which cannot be probed with conventional X-ray radiography. Moreover, it can also be used as a Sherlock Holmesian tool, as a powerful “ fingerprinting” analyser, in forensic science. All in all, the commissioning of Kamini on the threshold of the new millennium, will serve as a much-needed morale booster to India’s nuclear power programme.