

Rapporteur's Report of the Question and Answer Session

Nuclear Power in India: Failed Past, Dubious Future

A Presentation

By M. V. Ramana

Program on Science and Global Security, Princeton University

Before a Dinner Hosted by

The Nonproliferation Policy Education Center (NPEC) on

May 10, 2006

*The Nonproliferation Policy Education Center (NPEC) offers below a summary of the "Question and Answer" session that followed M.V. Ramana's presentation, Nuclear Power in India: Failed Past, Dubious Future.*¹

Question and Answer Session

After M.V. Ramana completed his presentation, the moderator began the "question and answer" session by asking Ramana to discuss India's electrical grid, as well as its base load and peak load electrical generation requirements, and the extent to which India's grid is stable.

Ramana answered that there is a clear shortage of peak load power in India. In Indian cities, there is regular "load shedding"—that is, planned outages of power, which Americans would call "rolling blackouts." There is a real need for "peaking" plants; that is where the shortage is. The most economic and popular of these peaking plants run on natural gas. India is trying to improve its grid, but it is still difficult to extend the grid to rural areas.

An attendee asked whether the US-India nuclear cooperation deal has anything to do with oil—that is, to what extent can nuclear-generated electricity actually substitute and actually displace oil usage in India.

Ramana answered that the deal has little do with oil. It will be hard to substitute India's current level of oil consumption, which is driven by the transport and certain industrial sectors, with nuclear electricity.

¹ The slides of M.V. Ramana's presentation, *Nuclear Power in India: Failed Past, Dubious Future*, is available on the Nonproliferation Policy Education Center's website. <http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=Ramana_NPEC_May10&PDFFolder=Presentations>

An attendee noted that s/he had spoken with U.S. physicists about India's fast breeder reactor (FBR) program. The physicists said that India's FBR won't work, and will force a sort economic rationality in India that will effectively kill the FBR. The attendee asked whether the assessments of the physicist are reasonable to Ramana.

Ramana did not think that the assessments of the U.S. physicists were correct. India's nuclear establishment would go ahead with the breeder no matter what the technical or economic obstacles are. India's nuclear program was always envisioned as one that would be divided into three phases. Phase I focuses on India's pressurized heavy water reactors (PHWRs), which would be fueled by natural uranium. Phase II focuses on plutonium breeder reactors that would run on plutonium produced by the phase I PHWRs. Phase III focuses on thorium reactors, which would run on thorium produced in the phase II breeders. Ramana projected that phase III thorium reactors would come into play—at the earliest—by 2050. This three-phase program was designed to exploit India's large supply of thorium and promised nuclear self-sufficiency—albeit at a very high economic and technical cost.

An attendee asked whether the United States could interest the Indians in purchasing light water reactors (LWRs).

Ramana said that he did not think that the Indians would ever be interested in LWRs. There is a distrust of the West, and doubts about the extent to which India should rely on Western nuclear technology. Moreover, Indians are more likely to buy Russian equipment, which they are familiar with and does not require liability insurance.

An attendee asked Ramana whether he thought the Indians, in a hypothetical future, could ever be convinced to purchase AP-1000 reactors from Westinghouse instead of pursuing their three-phase program.

Ramana said that if an American company were to give Indians a good price (that is, heavily subsidized financing), they might buy such American reactors. However, he emphasized that Indians would remain committed to their three phase program..

An attendee asked Ramana whether the Indians would put US nuclear fuel into the three phase sequence of India's reactor program and take advantage of offers to take the spent fuel back

Ramana said no, that the Indian government instead believed that the US and others would, in time, see the advantages of recycling and reprocessing the way India plans to.

The moderator noted that, in the past, the United States fueled Tarapur, and that the contractual limits surrounding the use of US-origin Tarapur fuel has expired. This fuel, now spent, is in "limbo"—it is not clear if the Indians will reprocess it or not. The Indians in the past said that they were free to reprocess it but so far had chosen not to do so.

Ramana added that the United States is not trying to take back the spent fuel it supplied for Tarapur.

An attendee asked Ramana where India's spent fuel goes—that is, where it is stored and what its disposition is.

Ramana answered that it is not clear. The reports are contradictory.

An attendee asked Ramana about the extent to which increase use of nuclear energy in India could positively impact the environment. S/he suggested that even if India increases the use of nuclear energy, India's reduction of greenhouse gases would be negligible.

Ramana answered that, for Indian nuclear energy to make a dent in global warming, it would require the use of nuclear energy to increase by several orders of magnitude. When someone talks up the ways in which nuclear energy can decrease greenhouse gases, you must ask: What are they assuming? In addition, Ramana noted how Japan, after it substantially increased its use of nuclear energy, actually experienced a concomitant increase in carbon emissions.

An attendee noted how the Ukraine—despite Chernobyl—is contemplating increased nuclear power largely because it fears being overly dependent on Russia, as well as competing with Russia, for oil and gas.

An attendee asked Ramana to summarize what he would recommend Congress to think about as it contemplates whether and how to implement the U.S.-India nuclear deal.

Ramana said that Congress should not focus on nuclear generation of electricity. Instead it should focus on the problems of electrical distribution. In India, the distribution of electricity is inefficient, and in some cases, not even metered.

The moderator asked how much of India's electricity is stolen off the grid or given away.

Ramana estimated that between 20 percent to 30 percent of India's electricity is either stolen off the grid, given away, or lost due to technical problems in the grid.

An attendee asked about the role that Iran's pipeline to India is playing in India's energy consumption.

Ramana answered that it doesn't have a major role yet because the pipeline proposal is so new.

An attendee asked whether India will discover more proven reserves of oil, such as the Bay of Bengal.

Ramana said yes, but not in significant amounts.

An attendee asked what the main purpose of the U.S.-India nuclear cooperation deal is—that is, whether it is a political, or symbolic, or psychological gesture.

Ramana answered that he thought the deal was primarily a symbolic gesture and was seen by Indians as such.

The workshop adjourned at 10 p.m.

Rapporteur: R.B. Zarate