Dr.M.R.Srinivasan's visit report on Kudankulam Project

STATUS ON KUDANKULAM PROJECT

•Shri Jairam Ramesh, Minister of Environment and Forest set up a committee headed by Dr. A. Muthunayagam, Former Secretary, Department of Ocean Development, to review safety of coastal installation against tsunamis.

•Dr. Muthunayagam and myself visited Kudankulam on 20th May 2011, to review the safety of this installation against tsunamis.

STATUS ON KUDANKULAM PROJECT

Following were the fidings after visiting the installation at Kudankulam

Design Basis Flood Level

•Kudankulam design was finalized using two criteria to arrive at the Design Basis Flood Level -
The effects of storm surge and Tsunami separately.

•Based on historical data, wave run up at the site was 2.0 meters and Storm surge was 2.46 meters. The maximum tide was 1.42 meters with respect to the chart datum or 0.94 meters with respect to mean sea level. Maximum tsunami *wave height* was estimated at 2,5 meters.

•Thus storm surge criterion *combined with tide A wave run up* gave a maximum water level of 5.4 meters.

STATUS ON KUDANKULAM PROJECT

•The design assumed a maximum water level of 5.44 meters and allowing a margin of safety of 2 meters, the general grade level was kept at 7.44 meters *with respect to mean sea level.*

•During the December 2004 tsunami, the water level rise actually observed was *2.0* meters.

• In October 2010, NPCIL has calculated tsunami height at Kudankulam based on recently developed forecasting method in Japan and arrived at a figure of 2 meters. Thus, the *considered design value* of 2.5 meters *wave height* is adequate.

STATUS ON KUDANKULAM PROJECT

Levels of important facilities at KKNPP

As compared to the Design Basis Flood Level of 5.44 meters, levels of important facilities at KKNPP *wiih respect 10 -mean sea level* are:

Reactor Building ground floor	8.7m
Safety diesel generator sets	9.3m
Switch gear for safety trains	9.3m
Group I battery bank	12.9m
Station blackout battery	16.5m
Control instruments for safety trains	16.5m
Supplementary control room	9.7m

STATUS ON KUDANKULAM PROJECT

With regard to earthquakes

Strongest one occurred at Coimbatore on February 8, 1900. The India Meteorological Department estimated its magnitude at 6.0 on the Richter scale. The epicenter was about 300 km from Kudankulam. The nearest recorded was on August *25,* 1856 near Trivandrum with an intensity estimated at 4.3 on the Richter scale. Based on these observations, the parameters chosen for design were:

	Peak Ground Acceleration in g	
	Horizontal	Vertical
Design Basis - safe shutdown	0.15	0.11
Design Basis - operating	0.05	0.036

Automatic trip of the reactor is initiated at the vertical and horizontal acceleration levels chosen for the operating basis earthquake (namely 0.036 g vertical and 0.05 g horizontal)

STATUS ON KUDANKULAM PROJECT

Protection against flooding

The supplementary control room and the four diesel generator - safety train rooms are provided with water tight doors to protect them against flooding. We should *normally* ensure that the doors remain shut when the reactors are operating by using interlocks or strict administrative procedures. *These doors are normally kept closed during operation, however on issue of tsunami warning, an additional measures may he token*)

STATUS ON KUDANKULAM PROJECT

Grid connectivity

Kudankulam is connected to the southern grid at Tirunelveli by double circuit 220 KV series and double circuit 400 KV lines. Tuticorin thermal power station is connected directly to Tirunelveli. There are a number of hydro power stations in Kerala and Tamil Nadu close to Kudankulam. We are having 10 MW of wind turbines in our site

The topography of the site is such that we can locate *additional* small capacity diesel storage tank at a high level away from the sea, and hence safe from any disruptive flooding. Near such storage of diesel, we could also locate a certain capacity of air cooled diesel power.

STATUS ON KUDANKULAM PROJECT

Decay Heat Removal

For cooling of the core in a shut down condition, to remove the decay heat, four independent cooling trains, each with its own diesel generator set, are provided. There is a back up to this through *hydro* accumulators (in two stages). Normally, the decay heat gets transferred to the secondary side water. If the latter is not available for any reason. There is a passive heat removal system where by the secondary side water is cooled in air cooled heat exchangers. The latter are located at a considerable height on the outer containment to ensure natural circulation (i.e. it is a passive system requiring no pumps or no power driven equipment). This feature has been built into KKNPP design specifically at India's insistence.

STATUS ON KUDANKULAM PROJECT

Safety for extreme situation

There is a safety provision for an extreme situation of the fuel in the core melting and breaching the pressure vessel. In such a situation, the core catcher below the pressure vessel will ensure that the molten core mixes with a large quantity of neutron absorbing material and thus prevent the possibility of a nuclear explosion. Only the most modern designs have such a provision.

There are *154* passive hydrogen recombines to prevent any explosive mixture forming in any zone of the primary containment.

STATUS ON KUDANKULAM PROJECT

Inventory of Water

Regarding inventory of water in different systems of the power plant, NPCIL has carried out a detailed inventory and this shows that there is enough water to contend with various combination of circumstances. All fresh water at KKNPP is derived from two desalination plants - one based on the vapour compression
process and the other on reverse osmosis.

In view of *present thinking after Japan accident,* NPCIL is considering a reinforced concrete storage tank, at a higher elevation point in the site. Considering that we will have units 3 & 4 also, we may provide two such tanks, separated by a suitable distance and with interconnecting provisions.

STATUS ON KUDANKULAM PROJECT

Dr. Muthunayagam was satisfied about the safety provisions from the point of view of tsunami and shore protection.
At the meetings of May 7, 2011 and June 18, 2011, the Chairman Managing Director of NPCIL presented to the AEC the interim report of the task forces set up by him to evaluate the safety of KK.NPP, post Fukushirna. NPCIL and AERB will continue the safety review taking note of all lessons learnt from Fukushima and also carry out stress tests to evaluate design margins available to contend with extreme situations.
NPCIL may, in the meantime, publish a report on the background radiation collected by ESL, prior to commencement of fuel loading, in English, Hindi, Tamil and Malayalam.


THANKS