(c) whether Ministry also proposes to run high speed trains from Delhi to Moradabad and Agra in future;

(d) if so, by when a decision would be taken in this regard; and

(e) if not, the reasons therefor?

THE MINISTER OF URBAN DEVELOPMENT (SHRI M. VENKAIAH NAIDU): (a) No, Sir.

(b) Question does not arise.

(c) and (d) Ministry of Railways (Railway Board) has informed that New Delhi-Agra is one of the nine routes announced in the Rail Budget 2014-15 for raising of train speed to 160/200 kmph. There is no proposal to run high speed trains from Delhi to Moradabad.

(e) Does not arise.

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## WRITTEN ANSWERS TO UNSTARRED QUESTIONS

### Utilization of thorium

3846. DR. K.V.P. RAMACHANDRA RAO: Will the PRIME MINISTER be pleased to state:

(a) whether it is a fact that the Atomic Minerals Directorate for Exploration and Research (AMD), a constituent unit of Department of Atomic Energy (DAE), has so far established 11.93 million tons of monazite (Thorium bearing mineral) in the country, which contains about 1.07 million tons of thorium, if so, the details thereof; and

(b) the steps that are being taken to address the utilization of thorium in different types of reactors?

THE MINISTER OF STATE IN THE DEPARTMENT OF ATOMIC ENERGY (DR. JITENDRA SINGH): (a) Yes, Sir. India has abundant quantity of thorium resources contained in the mineral monazite occurring in the beach sand placer deposits along the eastern and western coasts of the country as well as the inland placers in parts of Kerala, Tamil Nadu, Odisha, Andhra Pradesh, West Bengal, Jharkhand and Chhattisgarh. The Department of Atomic Energy (DAE) through its Atomic Minerals Directorate for Exploration and Research (AMD) has carried out exploration activities over the past six decades, which have resulted in establishing *in situ* resources of 11.93 million tonnes of

monazite as on May, 2014 in the country. Indian Monazite contains about 9-10% of Th02 which in turn results in about 1.07 million tonnes of thorium oxide (Th02).

(b) Substantial work has been carried out in the areas of research on technologies for utilisation of thorium in nuclear fuel cycle and on the development of an Advanced Heavy Water Reactor (AHWR), to serve as a technology demonstrator for use of thorium based fuel on a large scale. Some of the major initiatives taken in this direction are:

(i) Thorium fuel fabrication through powder pellet route has been well established. Few tons of fuel have been made for CIRUS and Dhruva, PHWR and for blanket assemblies for Fast Breeder Test Reactor (FBTR). Few pins have been fabricated using mixed oxides of (Th-Pu) for irradiation in research reactors.

(ii) Thoria bundles are used in the initial cores of PHWR. The irradiation experience of thoria fuel in the research reactors CIRUS and Dhruva, PHWR and test irradiations are satisfactory.

(iii) The thoria pins of CIRUS have been reprocessed to obtain Uranium-233. The recovered Uranium-233 has been fabricated as fuel for KAMINI reactor at Kalpakkam. The Post Irradiation Examination of one of the thoria bundle irradiated in PHWR has also been carried out for validation of theoretical analyses.

(iv) Studies have been carried out regarding use of thorium in different types of reactors with respect to fuel management, reactor control and fuel utilisation.

(v) A Critical Facility for Advanced Heavy Water Reactor (AHWR) has been commissioned in 2008 and is being used for carrying out experiments to further validate the physics design features of Advanced Heavy Water Reactor.

(vi) A small research reactor KAMINI with 30 kWth capacity utilises nuclear fuel based on Uranium-233 derived from irradiation of thorium. It is in operation at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam.

A 300 MWe Advanced Heavy Water Reactor (AHWR), which will produce most of its power from thorium based fuel, has been designed and developed in Bhabha Atomic Research Centre (BARC). This reactor has been included in the XII Five Year Plan for initiation of activities towards its construction. The reactor, being the first of its kind is likely to take about ten years for completion of its construction, following the first pour of concrete.