

**GOVERNMENT OF INDIA
ATOMIC ENERGY
LOK SABHA**

UNSTARRED QUESTION NO:2949
ANSWERED ON:10.12.2014
NUCLEAR POWER REACTORS
Kamaraaj Dr. K.

Will the Minister of ATOMIC ENERGY be pleased to state:

- (a) the quantum of uranium required for 1 MW power generation, reactor-wise;
- (b) the cost of nuclear power generation for 1 MW in comparison to 1 mw of renewable, hydro and thermal power generation;
- (c) whether all the nuclear reactors are functional; and
- (d) if not, the reasons therefor and the action taken to make the reactors functional?

Answer

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE
(DR.JITENDRA SINGH):

(a) There are two types of nuclear power reactors presently in operation in the country. The first is of the indigenous Pressurised Heavy Water Reactors (PHWRs) that use natural uranium (uranium as is extracted from the earth crust in which the fissile content i.e. U-235 is 0.71%) in the oxide form (UO₂). The other type of nuclear power reactors comprise the Light Water Reactors (LWRs) that use uranium in enriched form (enriched uranium has higher than 0.71% up to 4-5% U-235). The quantity of fuel required for the Light water Reactors depends on the level of enrichment of the fuel. Further the quantity of nuclear fuel (uranium) required to generate a given quantity of electricity also changes depending upon the generation capacity of a given nuclear power plant. The power plants with larger generating capacity consume marginally lesser amount of fuel for generation of the same quantity of electricity as compared to nuclear power plants of smaller generating capacity.

Fuel requirement for generation of electricity through nuclear power plant is calculated in terms of quantity of fuel required to generate a given quantity of electricity, i.e kilowatt/hour, or units, usually quantified in "Million Units" (MUs). The quantity of fuel required for generation of 1 MUs of electricity through operation of indigenous PHWRs and LWRs is tabulated below:

For indigenous Pressurised Heavy Water Reactors (PHWRs)

Unit Capacity	Fuel Required as UO ₂ to generate 1 Million Unit of electricity
220 MW	27 Kg (natural uranium)
500 MW	25 Kg (natural uranium)
700 MW	24 Kg (natural uranium)

Note: Fuel quantity figures are rounded off and are based on 85% Capacity Factor. For Light Water Reactors (LWRs)

Capacity	Fuel Required as UO ₂ to generate 1	Enrichment % of
MW	Million Unit of electricity	U-235 (Average)
TAPS 160	6.5 Kg (enriched uranium)	2.41
KKNPP 1000	3.4 Kg (enriched uranium)	3.92

Note: Fuel quantity figures are rounded off and are based on 85% for TAPS and 90% for KKNPP Capacity Factor respectively.

The 700 MW indigenous PHWRs require about 78.5 tonnes of mined uranium ore per million units of electricity. For Light Water Reactors (based on enriched uranium fuel) the need for mined uranium per million units of electricity generated is approximately 50 percent higher.

(b) Rates of tariff of electricity supplied by various sources of generation of electric power (including nuclear power energy) as on 31.03.2014 is as follows:

S.No.	Type of generating stations	Maximum Total	Minimum Total
	Tariff (both	Tariff (both	

fixed charge fixed charge
and energy and energy
charge) charge)

1. Pit-head coal based station Rs. 3.19 per unit Rs. 0.87 per unit
2. Non-pit-head based station Rs. 5.29 per unit Rs. 3.32 per unit
3. Lignite based station Rs. 4.01 per unit Rs. 2.79 per unit
4. Natural gas based station (APM gas) Rs. 3.99 per unit Rs. 2.66 per unit
5. Natural gas based station (NAPM gas) Rs. 4.52 per unit Rs. 4.23 per unit
6. LNG gas based station Rs. 10.67 per unit Rs. 8.41 per unit
- 7 Liquid based stations (Naphtha/HSD) Rs. 13.01 per unit Rs. 7.67 per unit
8. Hydro based station Rs. 5.77 per unit Rs. 0.86 per unit
9. Wind energy Rs. 6.00 per unit Rs. 3.74 per unit
10. Solar PV(Photovoltaic) Rs. 7.72 per unit
11. Solar CSP(Concentrated Solar Power) Rs. 11.88 per unit
12. Nuclear energy Rs.3.41 per unit Rs.0.95 per unit

Source: Reply by DAE to Unstarred Question No. 5072 answered on 13.08.2014

(c)&(d) Out of the twenty nuclear power reactors in the country, one reactor Rajasthan Atomic Power Station Unit – 1 (100MW) is under extended shutdown since 2004 for techno-economic assessment for its continuation of operation. Further, the Unit - 1 of Kudankulam Nuclear Power Plant in Tamil Nadu has been connected to the grid in October, 2013 and is expected to be declared commercial in this month.