

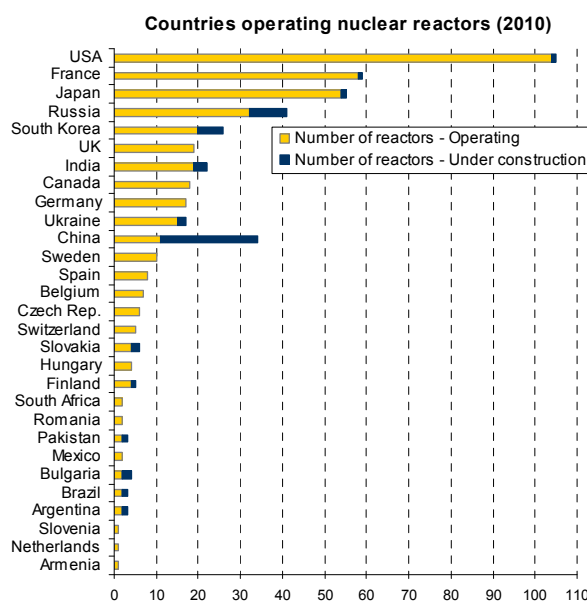
Vital Stats

Nuclear Power and Civil Liability

An increasing number of countries across the globe are looking at alternate sources of energy. Among the existing alternatives, nuclear fuel is being actively considered as an option by India.

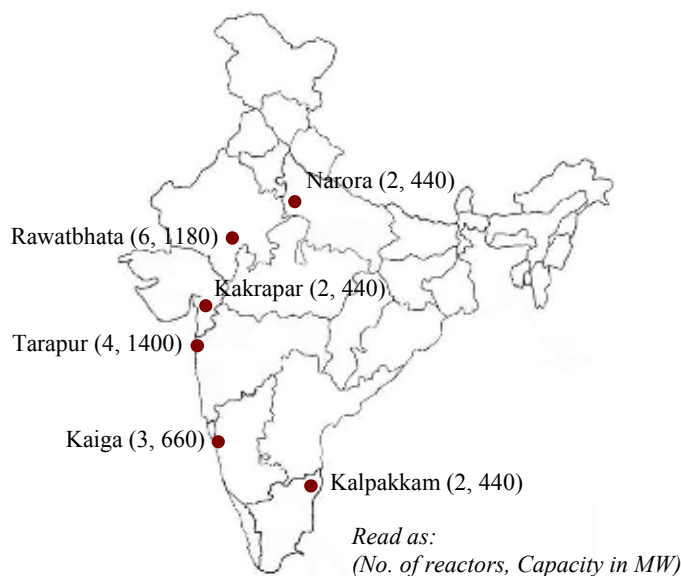
The tabling of the Civil Liability for Nuclear Damage Bill, 2010 has raised a number of concerns and questions about nuclear energy. In this context, we present here a snapshot of the use of nuclear energy by different countries and the liability regimes existing therein.

Of the 438 nuclear reactors operating worldwide, 104 are located in the US



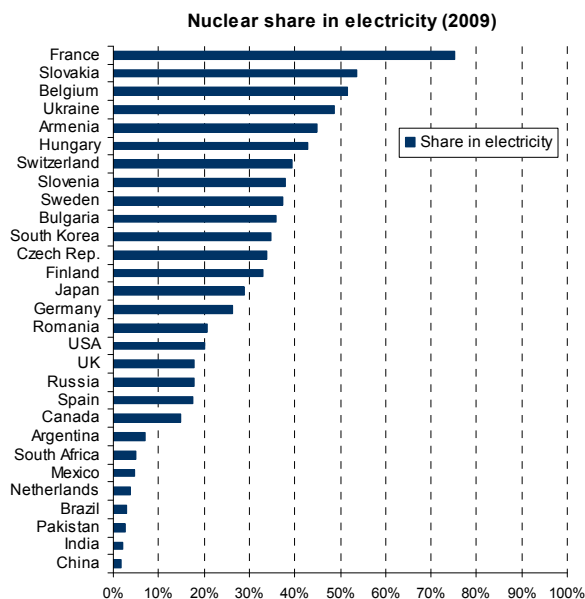
- In addition to the 438 reactors currently in operation², an additional 57 are under construction³.
- Three countries – US, France and Japan – account for the bulk of the nuclear energy produced worldwide. Between them, these countries operate 216 nuclear reactors and generate 57% of worldwide capacity.
- Though India ranks 7th in terms of the number of operating reactors (19), its total generating capacity is only 4,560 MW. Thus, average capacity of a nuclear reactor in India is 240 MW. In comparison, US generates 100,683 MW from 104 reactors, an average of 968 MW per reactor.
- China currently operates only 11 reactors. However, it leads the world in terms of addition to capacity - 23 reactors with a total generation capacity of 23,620 MW are under construction in China. This alone accounts for 42% of the worldwide planned expansions.⁴

In India, 30% of the nuclear power capacity is located at Tarapur



- Tarapur Atomic Power Station (TAPS) is located in district Thane in Maharashtra. With a total capacity of 1,400 MW, Tarapur is the largest nuclear power station in India. It began commercial operations in October, 1969.
- The Rajasthan Atomic Power Station (RAPS) follows with an installed capacity of 1,180 MW, spread over 6 reactors.
- Additional capacity is under construction at Kudankulam (2 x 1,000 MW) and Kaiga (1 x 220 MW).
- Currently all reactors in India are operated by the government controlled NPCIL (Nuclear Power Corporation of India Limited). Components, however, are sourced from various entities, including private enterprises and other countries.

France leads the world in percentage of electricity generated from nuclear fuel



- The 58 operating reactors in France contribute a total of 63,130 MW. This constitutes 75% of the total electricity generated in the country.
- France is followed by Slovakia, a distant second, at 54%.
- In fact, most nuclear energy producing countries in Europe meet relatively high degrees of their electricity requirements through nuclear power.
- In the US, despite its worldwide lead in nuclear power generation, nuclear sources contribute only 20% to total electricity generation. This is primarily due to high overall consumption.
- In India, in 2009, 2.2% of the total electricity generated came from nuclear fuel.

As per IAEA, Chernobyl is the only nuclear event that led to widespread damage

Table: Nuclear accidents

Year	Country	Reactor	Immediate deaths	Environmental effect (Radiation release)
1957	UK	Windscale-1	-	Widespread
1957	Russia	Mayak	NA	Widespread
1961	USA	SL-1	3 operators	Very minor
1969	Switzerland	Lucens	-	Very minor
1979	USA	Three-Mile Island-2	-	Minor
1980	France	Saint Laurent-A2	-	Minor
1986	Ukraine	Chernobyl-4	31 staff and firemen	Widespread
1999	Japan	Tokai-mura	2 operators	Minor

Source: Compiled from IAEA and World Nuclear Association; PRS
Immediate deaths do not include deaths due to prolonged effects of radiation

- The International Atomic Energy Agency (IAEA) introduced the International Nuclear and Radiological Event Scale (INES) in 1990.
- Events are classified at seven levels: Levels 1–3 are called ‘incidents’ and Levels 4–7 ‘accidents’. The scale is so designed that each increase in level indicates a ten-fold increase in severity.
- Level 7 is described as ‘Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures’.
- So far, only one event qualifies as Level 7 – Chernobyl, 1986. In total, more than 330,000 people had to be relocated as a result of this accident.

Many countries that are major producers of nuclear energy do not cap overall liability

Table: Liability regime (USD mn), Top 10 producers (by MW)

Country	Operator's Liability	State Compensation	Total Liability
USA	11,900	Unlimited	Unlimited
France	861	300	1,161
Japan	Unlimited	Unlimited	Unlimited
Russia	N/A	Unlimited	Unlimited
Germany	Unlimited	2,500	Unlimited
South Korea	474	Unlimited	Unlimited
Ukraine	237	Unlimited	Unlimited
Canada	71	Unlimited	Unlimited
UK	228	50	278
Sweden	474	198	672
India (proposed)	109	345	454

Source: Various sources⁵; PRS

- Overall liability, which includes state compensation, is unlimited in most cases. Exceptions include countries like France, UK and Sweden.
- Most countries cap operator’s liability. This is usually done either to attract private investment or to ensure compliance with requirements of international partners. Notable exceptions to this include Japan and Germany.
- In case of Japan, the liability law provides for the possibility of government aid to the operator, where the cost of nuclear damage exceeds the operator’s financial capacity. However, there is no such provision in Germany.
- Despite this, nuclear industry in both Japan and Germany sees active participation from private operators. TEPCO and JAPC are examples of private operators in Japan. E.ON and RWE are examples from Germany.

Operators are usually required to provide financial security

Table: Insurance/ Financial security – Top 10 producers

Country	Insurance (USD mn)	Financial security (USD mn)
USA	412*	
France	861	
Japan		1,300
Russia	N/A	
Germany		3,600
South Korea	43	
Ukraine	237	
Canada	71	
UK	228	
Sweden	474	
India (proposed)	109	

* Includes \$300 mn insurance and \$111.9 mn contribution to special fund
Source: Various sources⁵; PRS

- Many countries require operators to provide financial security (in specific cases, as insurance). This usually helps cover the operator's liability in the event of an accident.
- In this respect, the US system is somewhat unique. In addition to insurance, the law in US requires compulsory contribution by each operator to a special fund. This fund, established under the Price-Anderson Act, can be used for additional compensation. Current estimates put the fund at over \$11.9 billion².
- Currently in India there is no law governing nuclear event liability. With the introduction of the Civil Liability for Nuclear Damage Bill, this looks set to change.

Notes:

1. Primary sources of data: International Atomic Energy Association (IAEA), Department of Atomic Energy (DAE), Nuclear Power Corporation of India Limited (NPCIL).
2. Includes reactors in Taiwan. Currently, Taiwan operates 6 reactors.
3. Includes reactors in Taiwan and Iran. Currently, 2 reactors are under construction in Taiwan and 1 reactor is under construction in Iran.
4. Figures represent reactors on mainland China, excluding those in Taiwan.
5. Nuclear Operator Liability Amounts & Financial Security Limits, AEN-Nuclear Energy Agency, December 2009; International Atomic Energy Agency Power reactor Information System; French Act on Transparency and Security in the Nuclear Field, 2006.

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