NUCLEAR ENERGY MISSION: ECONOMY

NEWS: Nuclear Power in Union Budget 2025-26

WHAT'S IN THE NEWS?

The Union Budget 2024-25 has introduced a ₹20,000 crore 'Nuclear Energy Mission' to develop Small Modular Reactors (SMRs) in India, aiming for five operational SMRs by 2033. The mission also proposes amendments to key nuclear laws to attract foreign and private investments in the sector.

1. Financial Allocation for Nuclear Energy

Budgetary Allocations for the Department of Atomic Energy (DAE)

- **Estimated expenditure for 2025-26:** ₹24,049 crore.
- **Expected expenditure by March 2025:** ₹24,450 crore.
- **Actual expenditure in 2023-24:** ₹25,882 crore.

Budget Concerns

- The **allocation for 2025-26 is lower** than the previous year's actual expenditure, raising concerns about **funding availability for nuclear expansion**.
- No explicit allocation is mentioned in the Budget for the development of **five Small Modular Reactors (SMRs)**, which are planned for **operation by 2033**.

2. Nuclear Energy Mission – ₹20,000 Crore Initiative

Objectives

- Develop **indigenous Small Modular Reactors (SMRs)** in India.
- Operationalize at least **five SMRs by 2033**.
- Expand **India's nuclear infrastructure** for long-term energy security.

Proposed Policy Changes

- Amendment of the **Atomic Energy Act, 1962**, to enable private sector participation.
- Amendment of the **Civil Liability for Nuclear Damage Act, 2010**, to attract **foreign investments** in nuclear power projects.
- Facilitate international collaborations for **technology transfer and funding support**.

Alignment with India's Energy & Climate Goals

- Contributes to achieving **100 GW of nuclear energy capacity by 2047**.

- Supports India's **net-zero carbon emissions commitment by 2070**.

3. Bharat Small Reactors (BSR) & Bharat Small Modular Reactors (BSMR)

Bharat Small Reactors (BSR)

- **Description:**
    - Incrementally modified versions of **India's existing Pressurized Heavy Water Reactors (PHWRs)**.
    - Designed to **enhance efficiency and scalability** within India's nuclear energy framework.
- **Key Features:**
    - Uses **natural uranium** as fuel and **heavy water** as a moderator.
    - Adapted for **quick deployment** and **higher operational efficiency**.

Bharat Small Modular Reactors (BSMR)

- **Description:**
    - A **next-generation technology** in modular nuclear power.
    - Under research for **enhanced safety, efficiency, and adaptability**.
- **Key Features:**
    - Designed for **factory production and modular deployment**.
    - Focus on **higher safety standards** with passive cooling systems.

4. Small Modular Reactors (SMRs) – Features & Advantages

Definition

- Advanced nuclear reactors with a **power capacity of up to 300 MW(e) per unit**, which is approximately **one-third of traditional nuclear reactors**.

Key Features of SMRs

- **Modular Manufacturing:** Built in **factories** and transported to installation sites.
- **Scalability:** Multiple reactors can be deployed based on **regional power demands**.
- **Lower Capital Costs:** Require **less initial investment** than conventional large nuclear plants.
- **Enhanced Safety:** Incorporate **passive cooling and self-regulating mechanisms** to prevent overheating.
- **Deployment Flexibility:** Suitable for **remote locations, industrial areas, and power-hungry urban centers**.

5. Legal & Regulatory Framework Changes

Atomic Energy Act, 1962

- **Objective:** Regulates the **development, control, and use** of atomic energy in India.
- **Key Provisions:**
    - Central Government has **exclusive control over atomic energy** production and research.
    - Regulates **discovery, mining, and disposal** of **uranium and thorium**.
    - Empowers the government to **declare restricted areas** for nuclear research.

Proposed Amendment to the Atomic Energy Act, 1962

- **Purpose:** To **allow private sector and foreign investments** in nuclear energy projects.
- **Impact:**
    - Encourages **technology transfer** from global nuclear firms.
    - Enables **public-private partnerships (PPP)** in nuclear power projects.

Civil Liability for Nuclear Damage Act, 2010

- **Objective:** Provides a **compensation mechanism for nuclear accidents**.
- **Key Provisions:**
    - **Strict & No-Fault Liability:** Operators are liable for nuclear incidents **without proof of negligence**.
    - **Liability Cap:**
        - Operator's liability: **₹500 crore**.
        - Central Government's liability: Up to **300 million Special Drawing Rights (SDRs) (~₹2,100 crore)**.
    - **Supplier Liability Clause:** Operators can **seek compensation from suppliers** for faulty nuclear components.
    - **Mandatory Insurance:** Nuclear operators must secure **financial security or insurance** before plant operation.

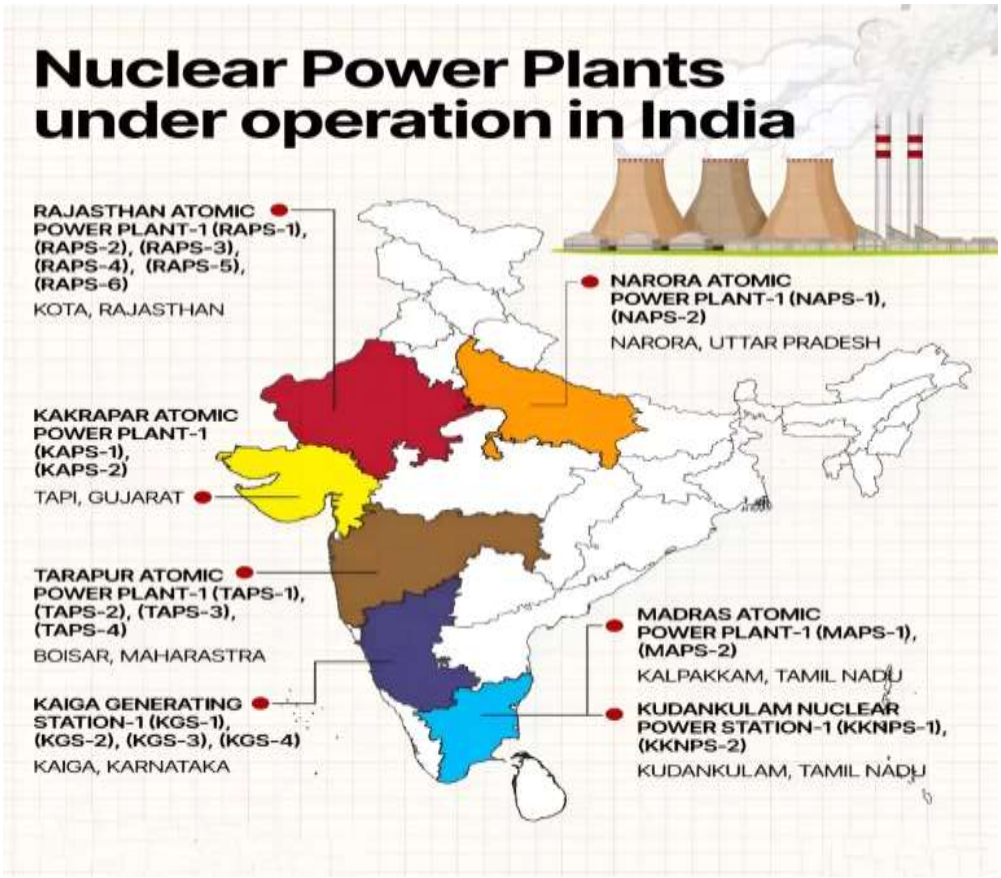
Proposed Amendment to the Civil Liability for Nuclear Damage Act, 2010

- **Purpose:** To **ease restrictions on foreign suppliers** and increase international nuclear collaborations.
- **Impact:**
    - Attracts **global nuclear technology companies** to invest in India.
    - Reduces concerns over **liability risks**, making India an attractive market.

6. Strategic & Geopolitical Significance

- **Reduces dependence on fossil fuels** by promoting nuclear energy.
- Strengthens **energy security** by developing an **indigenous nuclear technology base**.
- Enhances **India's credibility in international nuclear collaborations**.
- Facilitates **foreign direct investment (FDI) and technology transfer** in the nuclear sector.

Nuclear power plants in India :



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https://pib.gov.in/PressReleasePage.aspx?PRID=2099244#:~:text=A%20key%20highlight%20of%20the,and%20operational%20SMRs%20by%202033.