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MK Yadav Sir

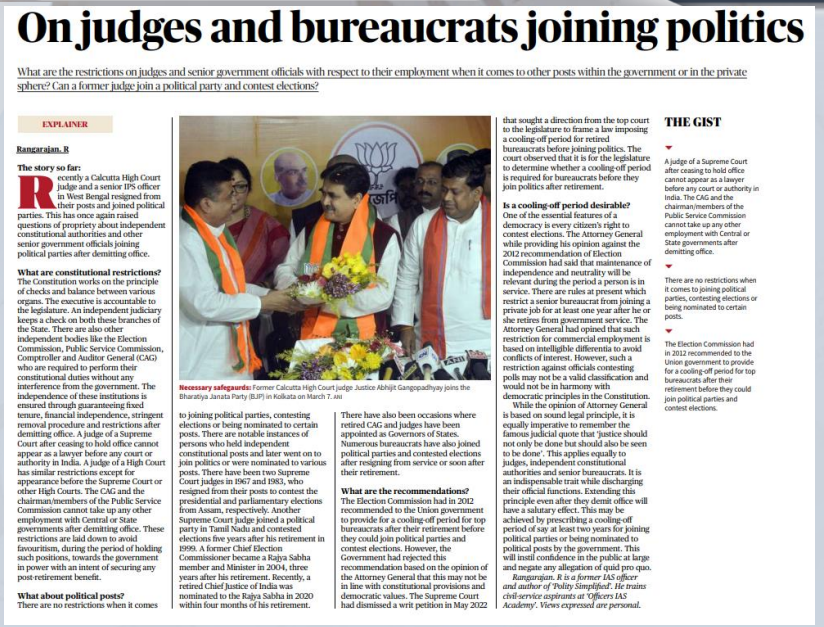
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POLITICAL NEUTRALITY

(Syllabus: GS Paper 2 – Polity)



On judges and bureaucrats joining politics

What are the restrictions on judges and senior government officials with respect to their employment when it comes to other posts within the government or in the private sphere? Can a former judge join a political party and contest elections?

EXPLAINER

Rangarajan. R

The story so far:

Recently a Calcutta High Court judge and a senior IPS officer in West Bengal resigned from their posts and joined political parties. This has once again raised questions of propriety about independent constitutional authorities and other senior government officials joining political parties after demitting office.

What are constitutional restrictions?

The Constitution works on the principle of checks and balance between various organs. The executive is accountable to the legislature. An independent judiciary keeps a check on both these branches of the State. There are also other independent bodies like the Election Commission, Public Service Commission, Comptroller and Auditor General (CAG) who are required to perform their constitutional duties without any interference from the government. The independence of these institutions is ensured through guaranteeing fixed tenure, financial independence, stringent removal procedure and restrictions after demitting office. A judge of a Supreme Court after ceasing to hold office cannot appear as a lawyer before any court or authority in India. A judge of a High Court has similar restrictions except for appearance before the Supreme Court or other High Courts. The CAG and the chairman/members of the Public Service Commission cannot take up any other employment with Central or State governments after demitting office. These restrictions are laid down to avoid favouritism, during the period of holding such positions, towards the government in power with an intent of securing any post-retirement benefit.

What about political posts?

There are no restrictions when it comes to joining political parties, contesting elections or being nominated to certain posts. There are notable instances of persons who held independent constitutional posts and later went on to join politics or were nominated to various posts. There have been two Supreme Court judges in 1967 and 1983, who resigned from their posts to contest the presidential and parliamentary elections from Assam, respectively. Another Supreme Court judge joined a political party in Tamil Nadu and contested elections five years after his retirement in 1999. A former Chief Election Commissioner became a Rajya Sabha member and Minister in 2004, three years after his retirement. Recently, a retired Chief Justice of India was nominated to the Rajya Sabha in 2020 within four months of his retirement.

Necessary safeguards: Former Calcutta High Court judge Justice Abhijit Gangopadhyay joins the Bharatiya Janata Party (BJP) in Kolkata on March 7. PTI

There have also been occasions where retired CAG and judges have been appointed as Governors of States. Numerous bureaucrats have also joined political parties and contested elections after resigning from service or soon after their retirement.

What are the recommendations?

The Election Commission had in 2012 recommended to the Union government to provide for a cooling-off period for top bureaucrats after their retirement before they could join political parties and contest elections. However, the Government had rejected this recommendation based on the opinion of the Attorney General that this may not be in line with constitutional provisions and democratic values. The Supreme Court had dismissed a writ petition in May 2022 that sought a direction from the top court to the legislature to frame a law imposing a cooling-off period for retired bureaucrats before joining politics. The court observed that it is for the legislature to determine whether a cooling-off period is required for bureaucrats before they join politics after retirement.

Is a cooling-off period desirable?

One of the essential features of a democracy is every citizen's right to contest elections. The Attorney General while providing his opinion against the 2012 recommendation of Election Commission had said that maintenance of independence and neutrality will be relevant during the period a person is in service. There are rules at present which restrict a senior bureaucrat from joining a private job for at least one year after he or she retires from government service. The Attorney General had opined that such restriction for commercial employment is based on intelligible differentia to avoid conflicts of interest. However, such a restriction against officials contesting polls may not be a valid classification and would not be in harmony with democratic principles in the Constitution.

While the opinion of Attorney General is based on sound legal principle, it is equally imperative to remember the famous judicial quote that 'justice should not only be done but should also be seen to be done'. This applies equally to judges, independent constitutional authorities and senior bureaucrats. It is an indispensable trait while discharging their official functions. Extending this principle even after they demit office will have a salutary effect. This may be achieved by prescribing a cooling-off period of say at least two years for joining political parties or being nominated to political posts by the government. This will instil confidence in the public at large and negate any allegation of quid pro quo.

Rangarajan. R is a former IAS officer and author of 'Polity Simplified'. He trains civil-service aspirants at 'Officers IAS Academy'. Views expressed are personal.

THE GIST

- A judge of a Supreme Court after ceasing to hold office cannot appear as a lawyer before any court or authority in India. The CAG and the chairman/members of the Public Service Commission cannot take up any other employment with Central or State governments after demitting office.
- There are no restrictions when it comes to joining political parties, contesting elections or being nominated to certain posts.
- The Election Commission had in 2012 recommended to the Union government to provide for a cooling-off period for top bureaucrats after their retirement before they could join political parties and contest elections.

Context: Recently a Calcutta High Court judge and a senior IPS officer in West Bengal resigned from their posts and joined political parties. This raised a question of political neutrality of the various posts in India.

Constitutional Restrictions

- **About:** The Constitution operates on the principle of checks and balances, ensuring accountability between various branches of the government.
- **Executive Accountability to Legislature**: The executive branch is accountable to the legislature, ensuring transparency and oversight in governance.
- **Role of Independent Judiciary:** An independent judiciary acts as a check on both the executive and legislative branches, ensuring adherence to constitutional principles and protecting citizens' rights.
- **Independent Bodies**: Independent bodies like the Election Commission, Public Service Commission, and Comptroller and Auditor General (CAG) are tasked with specific constitutional duties without interference from the government.
- Independence of these institutions is guaranteed through measures such as fixed tenure, financial autonomy, stringent removal procedures, and post-office restrictions.
- **Post-Office Restrictions**: After demitting office, judges of Supreme Court and High Court, as well as members of the CAG and Public Service Commission, are subject to restrictions such as limitations on appearing as lawyers or taking up employment with the government.

Political Posts: No Restrictions

- **Joining Political Parties**: There are no restrictions on joining political parties.
- **Contesting Elections**: Individuals can contest elections without limitations.
- **Nomination to Posts**: Certain individuals have held independent constitutional posts before joining politics or being nominated to various political posts.

Recommendations Regarding Political Posts

- **Election Commission's Recommendation (2012)**: The Election Commission suggested a cooling-off period for top bureaucrats after retirement before joining political parties or contesting elections.
- **Government Response:** The government rejected this recommendation, citing concerns about its alignment with constitutional provisions and democratic values.
- **Supreme Court's Dismissal (May 2022)**: A writ petition seeking a legislative direction for a cooling-off period was dismissed by the Supreme Court. The court emphasized that it's up to the legislature to decide on such matters.

INDIAN EXPRESS

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FIRST AUTONOMOUS AI

(Syllabus GS Paper 3 – Sci and Tech)

THE 'FIRST AUTONOMOUS' AI SOFTWARE ENGINEER: MEET DEVIN

BIJIN JOSE
NEW DELHI, MARCH 13

US-BASED applied AI lab, Cognition, has introduced what it claims is the world's first AI software engineer. The makers say that the AI agent, named Devin, has successfully passed practical engineering interviews held by leading AI companies. It has also completed real jobs posted on Upwork, an US-based freelancing platform, according to Cognition.

"Devin is a tireless, skilled teammate, equally ready to build alongside you or independently complete tasks for you to review. With Devin, engineers can focus on more interesting problems, and engineering teams can strive for more ambitious goals," read the company's official blog post on Devin.

What can Devin do?

The AI agent comes with advanced capabilities in software development, including coding, debugging, problem-solving, etc. Devin uses machine learning algorithms to constantly learn and improve its performance and adapt according to new challenges. It can build and deploy apps end-to-end and can also train and fine-tune its own AI models.

Devin can plan and execute complex engineering tasks that would require thousands of decisions. This is possible owing to Cognition's advances in long-term reasoning and planning. According to the company, Devin can recall relevant context at each step, self-learn over time, and even fix mistakes.

Besides, the makers have also endowed the AI software engineer with the ability to proactively collaborate with the user. It reports progress in real-time, is capable of accepting feedback, and works along with the user through design choices as needed.

What about its performance?

On the SWE-Bench benchmark (a benchmark for evaluating large language models on real-world software issues found on GitHub), Devin correctly resolved 13.86 per cent of the issues without any assistance compared with the 1.96 per cent unassisted and 4.80 per cent assisted of the previous state-of-the-art model.

In terms of performance, Devin AI is capable of augmenting efficiency and speed within software development processes by automating repetitive tasks, instantly generating code, expediting project timelines, and cutting down development expenses substantially.

One of the most notable facets of Devin AI is that it is immune to human errors or inconsistencies. The AI agent is capable of guaranteeing precision and uniformity in coding practices which can lead to the development of superior-quality software products.

It needs to be noted that the company has not disclosed anything about the AI model that is powering Devin AI, nor has it revealed detailed technical specifications. Some of the other popular AI-powered tools that help with coding are OpenAI Codex, GitHub Copilot, Polycoder, CodeT5, Tabnine, etc.

What challenges, opportunities does it bring?

While the company has elaborated on the capabilities of Devin, some experts feel that the AI software engineer may struggle with complex requirements or instances that rely on human intuition and creativity. Besides, AI tools such as Devin seem to fan concerns about job losses.

However, others believe that Devin can be an ally for thousands of software engineers, offering new avenues of collaboration between human ingenuity and AI.

What is Cognition?

Cognition, the firm behind Devin, is headed by Scott Wu. Cognition calls itself an applied AI lab that is focussed on reasoning. The company claims that it is building AI teammates with capabilities that surpass existing AI tools. "Building Devin is just the first step—our hardest challenges still lie ahead," reads the website.

The agent will soon be available to be hired for engineering works, but for now, companies need to join a waitlist.

LONGER VERSION ON
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Context: US based applied AI lab, Cognition, has introduced what it claims is the world's first AI software engineer.

Devin

- **About:** It is the world's first AI software engineer, can write codes, create websites, and software with just a single prompt.
    - Devin has successfully passed engineering interviews from leading AI companies
- **Created by:** The tech company Cognition.
- **Devin's Forward-Thinking Abilities**: Devin excels in forward-thinking and planning intricate tasks, showcasing remarkable foresight and strategy.
- **Sophisticated Decision-Making**: With the capacity to make thousands of decisions and learn from errors, Devin continuously improves its performance over time.
- **Comprehensive Engineering Toolkit:** Equipped with essential tools like a code editor and browser, Devin offers engineers a comprehensive set of resources at their disposal.
- **Benchmark Excellence**: Devin is hailed as the pinnacle solution for software engineering evaluations, outshining competitors in the SWE-bench coding benchmark.

Cognition

- **About:** It is the firm behind Devin, is led by Scott Wu.
- **Focus:** It describes itself as an applied AI lab with a focus on reasoning.
- **Ambition:** The company asserts it's developing AI teammates with capabilities exceeding current AI tools.
- **Availability**: While engineering companies will soon be able to hire Devin, currently, interested parties must join a waitlist.

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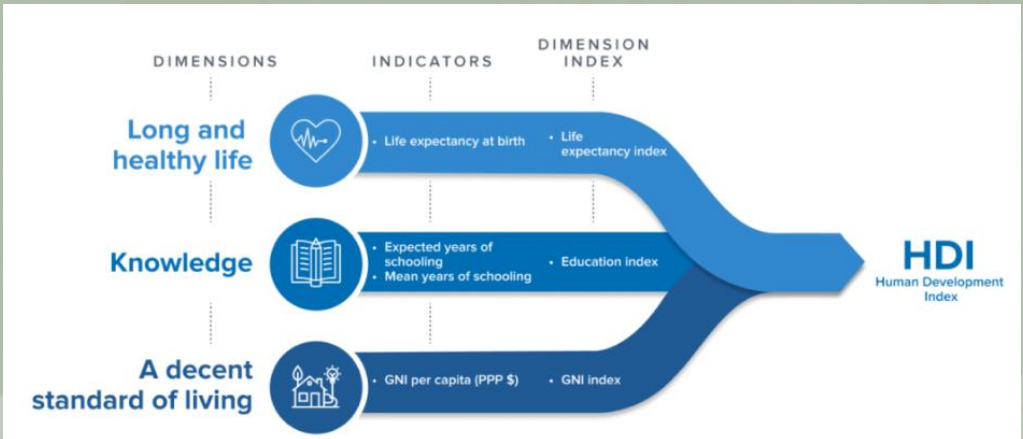
HUMAN DEVELOPMENT INDEX

(Syllabus: GS Paper 2 – Social Issues)

Humanity divided: Poverty reduction in reverse, far-right populism to blame, says UN 2023 Human Development Index

Key Point of HDI

- The 2023 Human Development Index (HDI) has soared to a new peak after a significant downturn during the COVID-19 pandemic in 2020 and 2021.
- **Disparity Between Rich and Poor Nations**: Wealthier nations have seen unparalleled development, while half of the world's poorest countries continue to struggle below pre-COVID levels.
- **Emergence of the "Democracy Paradox"**: Despite widespread support for democracy, there's a concerning trend where citizens endorse leaders who may undermine democratic values.
- **Fueling Political Polarization:** Feelings of powerlessness and lack of control over government decisions contribute to increased political polarization and inward-focused policy approaches.



Context: Humanity appeared to be making progress in addressing economic inequality for two decades, but recent findings from the **United Nations 2023 Human Development Index** indicate a concerning reversal, suggesting a return to square one.

Human Development Index (HDI)

- **About:** It is a measurement system used by the United Nations to evaluate the **level of individual human development** in each country.
- **Released by:** United Nations Development Program (UNDP).
- **key dimensions of human development:**
  - A long and healthy life,
  - Being knowledgeable, and
  - Have a decent standard of living.
- Each of the four components is normalized **to scale between 0 and 1,** and then the geometric mean of the three components is calculated.
- **India's Rank 2023:** 132nd among 191 countries

UCPMP
(Syllabus: GS Paper 2 – Health)

'No freebies, cash': Centre rolls out pharma marketing code to curb unethical practices

Context: The Central Government recently rolled out a Uniform Code for Pharmaceutical Marketing Practices (UCPMP) for pharmaceutical companies.

Uniform Code for Pharmaceutical Marketing Practices (UCPMP)

- **Implementation:** UCPMP 2024 aims to regulate unethical practices within the pharmaceutical industry.
- **Updated Guidelines**: The guidelines cover areas such as drug endorsement, promotion, ethical conduct for medical representatives, and interactions with healthcare professionals.
- **Important Provisions**:
- **Prohibition of Gifts and Travel Facilities:** Pharma companies are barred from offering gifts or travel facilities to healthcare professionals or their families.
- **Ethical Conduct for Medical Representatives**: Medical representatives are prohibited from using inducements or subterfuge to gain access to healthcare professionals.
- **Company Accountability:** Pharma companies are held responsible for the actions of their medical representatives.
- **Ban on Free Samples Distribution**: Free samples cannot be provided to individuals unqualified to prescribe the product.
- **Establishment of Ethics Committee**: Pharmaceutical associations must form an Ethics Committee and a dedicated UCPMP portal on their websites.
- **Guidelines for Drug Promotion**: Specific rules outline how drugs can be promoted, emphasizing balance, accuracy, and non-misleading information.
- **Penalties and Complaint Handling:** Detailed penalties for violations are specified, and complaints are addressed by the Ethics Committee for Pharmaceutical Marketing Practices (ECPMP).

PIB Mar 13

VOCAL FOR LOCAL INITIATIVE
(Syllabus: GS Paper 2 – Govt Scheme)

NITI Aayog Launches 'Vocal for Local' Initiative Fostering Grassroots Entrepreneurship and Self- reliance

Context: NITI Aayog recently launched the 'Vocal for Local' initiative as part of its Aspirational Blocks Programme.

Vocal for Local Initiative

- **About:** The initiative consolidates indigenous local products from 500 Aspirational Blocks under the brand 'Aakanksha', promoting self-reliance and sustainability.
- **Empowering through E-commerce**: A dedicated window on the GeM portal facilitates the promotion and sale of products from Aspirational Blocks, supported by technical and operational assistance for e-commerce onboarding.
- **Capacity Building:** Partnerships provide support in various areas such as financial literacy, documentation, and skill enhancement, strengthening the local economy and ensuring the sustainability of the Vocal for Local initiative.
- **Economic Empowerment**: By fostering a conducive environment for local businesses, the initiative aims to empower communities and drive inclusive growth, ultimately leading towards self-sufficiency.

NITI Ayog

- **About**: It is the premier policy 'Think Tank' of the Union Government, providing both directional and policy inputs.
- **Establishment**: In 2015 via an executive resolution by replacing the Planning Commission of India
- **Objective**: To develop a common vision for both the Central and State governments, recognizing that robust states are the foundation of a robust nation.
    - To encourage an ongoing environment of competitive and cooperative federalism among the states.

LIVEMINT

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PRESIDENT'S ASSENTS TO STATE BILLS

(Syllabus: GS Paper 2 – Polity)

UCC in Uttarakhand gets President's assent, becomes law

The Uniform Civil Code (UCC) Bill, passed by the Uttarakhand Assembly on 7 February, has become a law with President Droupadi Murmu giving her assent to it. Uttarakhand is the first state in the country after independence to adopt the UCC.

"It is a moment of great joy and pride for people of the state that the Uniform Civil Code Bill passed by our government in the Uttarakhand Assembly has been approved by the Honorable President Smt Droupadi Murmu," chief minister Pushkar Singh Dhami said in a post on X.

The President gave her assent to the UCC, Uttarakhand, 2024 under Article 201 of the Constitution of India on 11 March, a gazette notification by the government of Uttarakhand said. "With the implementation of the Uniform Civil Code law in the state alongside providing equal rights to all citizens, the oppression of women will also be curbed," Dhami said. The state government is determined to protect the interests of citizens and maintain the essential character of Uttarakhand, he added. PTI



Uttrakhand chief minister Pushkar Singh Dhami. PTI

Context: Recently, the Uniform Civil Code Bill, passed by the Uttarakhand Assembly, has been enacted into law after receiving assent from President of India.

President's Assents to State Bills

- **Powers of the Governor:** Article 200 of the Indian Constitution delineates the authority vested in the Governor regarding bills passed by the state legislature.
- **Actions Available to the Governor**: Upon receiving a bill, the Governor can choose to assent to it, withhold assent, or reserve it for the President's consideration.
- **Governor's Response to Non-Money Bills**: For non-money bills, the Governor may assent, withhold assent, or return the bill for reconsideration by the state legislature.
- **Procedure for Reconsideration:** If the bill is sent back for reconsideration and is passed again, with or without amendments, the Governor must either give assent or reserve it for the President's consideration.
- **Limitations on Money Bills**: Money bills typically do not undergo reconsideration as they are usually introduced with prior assent from the Governor.
- **Role of the President:** If a money bill is reserved, the President decides whether to assent or withhold assent.
- **Governor's Discretion:** The Constitution doesn't specify criteria for the Governor's decision to assent or withhold assent.
- **Options for the President**: When a bill is reserved for the President's consideration, they can assent, withhold assent, or direct the Governor to return the bill to the state legislature.
- **President's Discretion**: The President isn't obligated to assent, even if the bill is re-passed by the state legislature.

FINANCIAL EXPRESS

Page 3

TRADE SECRET LAW

(Syllabus: GS Paper 3 – Economy)

Law panel moots robust trade secret law

MUKESH JAGOTA
New Delhi, March 13

THE LAW COMMISSION has suggested introduction of a new "trade secrets" law to buttress the protection for firms and business from third party misuse of proprietary information, by including more categories to the current list of protected domains like copyright, patents and other intellectual property.

Under the proposed Protection of Trade Secrets law the holder of trade secret shall be entitled to institute proceedings under this Act in respect of misappropriation of trade secret, to prevent further misappropriation or disclosure of trade secret in the public domain.

Trade secret is any proprietary information held by a business entity that gives it a competitive advantage in the market and differentiates its product or services.

For determining what constitutes a trade secret the commission has suggested an approach followed under the World Trade Organisation (WTO) Trade Related Intellectual Property Rights (TRIPS) Agreement where the triple criteria of secrecy, commercial value and reasonable steps is specified as the qualifying criteria.

The TRIPS agreement is the most comprehensive multilateral agreement on intellectual property and plays a critical role in facilitating trade in knowledge and creativity, in resolving trade disputes over intellectual property. TRIPS deals with copyright and related rights, trademarks, geographical indications, industrial designs, patents, layout-designs of integrated circuits and undisclosed information.

The recommendation of the Law Commission came in a report that was prepared after a reference by the government which wanted to introduce legislation on Economic Espionage and Trade Secrets Protection. The government wanted the issue to be examined in depth before moving ahead.

"The Commission held extensive deliberations on the subject-matter with domain experts across the spectrum, ranging from judiciary and academia to the government and industry. Thereafter, the commission undertook a comprehensive study of the law relating to trade secrets and economic espionage examining at length both the concepts," the report said.

"Consequently, the Commission is of the considered view that a sui generis legislation should be introduced to protect trade secrets... With regard to the issue of economic espionage, it is pertinent to note that it typically involves a foreign State as a party, it added.

KEY TAKEAWAYS



- Under the proposed Protection of Trade Secrets law the holder of trade secret shall be entitled to institute proceedings
- The recommendation of the Law Commission came in a report that was prepared after a reference by the government

Context: The Law Commission has suggested introduction of a new "trade secrets" law to buttress the protection for firms and businssses.

Trade Secret Law

- **About:** Under the proposed law, holders of trade secrets gain legal recourse against misappropriation and disclosure.
- **Aim:** To strengthen safeguards for companies against third-party misappropriation of confidential information by expanding the scope of protected domains beyond existing categories such as copyright, patents, and other forms of intellectual property.
- **Criteria for Determining Trade Secrets**: The commission recommends adopting the TRIPS Agreement's criteria of secrecy, commercial value, and reasonable steps for defining trade secrets.
- **Role of TRIPS Agreement**: It serves as a comprehensive framework for intellectual property rights, fostering global trade and resolving disputes.
- **Scope of TRIPS Agreement:** TRIPS covers various aspects of intellectual property, including copyrights, patents, trademarks, and undisclosed information.

Law Commission's recommendation

- The Law Commission advocates for a separate legislation to address economic espionage distinct from commercial espionage.
- **Legal Remedies for Misappropriation**: The proposed law grants remedies such as damages, surrender, destruction of materials containing trade secrets, and recall of products based on misappropriated information.
- **Exemptions from Misappropriation**: Certain actions, like disclosure for exposing unlawful acts or protecting public interest, are not considered misappropriation, along with provisions for compulsory licensing.

Law Commission Of India

- **About**: It is an executive body established by an order of govt of India.
- It ensure that the laws formed are just and fair which work towards its proper implementation.
- **It works as**: An advisory body to the Ministry of Law and Justice.
- It is not defined under the Indian Constitution but It is constituted as part of Article 39A.
- **Tenure**: Generally law Commission is Constituted for a term of 3 year but Govt can extend the same.

PIB Mar 13

EMPS 2024
(Syllabus: GS Paper 2 – Govt Schemes)

Ministry of Heavy Industries announces Electric Mobility Promotion Scheme 2024

Context: The Ministry of Heavy Industries recently announced the Electric Mobility Promotion Scheme 2024, with a total outlay of Rs. 500 crore, set to be implemented from 1st April to 31st July, 2024.

Electric Mobility Promotion Scheme 2024

- **About:** The Ministry of Heavy Industries, Government of India, in collaboration with the Department of Expenditure, Ministry of Finance, is launching the Electric Mobility Promotion Scheme 2024 (EMPS 2024).
- **Objective**: EMPS 2024 aims to expedite the uptake of Electric Vehicles (EVs) across India.
- **Financial Allocation**: EMPS 2024 is a fund-limited scheme with a total budget of Rs. 500 crore.
- **Duration of the Scheme**: The scheme is set to operate for a duration of four months, commencing from April 1, 2024, to July 31, 2024.
- **Focus**: EMPS 2024 prioritizes the adoption of electric two-wheelers (e-2W) and three-wheelers (e-3W) to bolster green mobility initiatives and foster the growth of the EV manufacturing ecosystem.
- **Eligible EV categories**
  - Two Wheelers (electric) (e-2W)
  - Three-wheeler (electric) including registered e-rickshaws & e-carts and L5 (e-3W).
- **Components of EMPS 2024:**
  - **Subsidies/Demand Incentive**: incentive for electric 2W (e-2W) and electric 3 W including registered e-rickshaws & e-carts and L5 (e-3W)
- **Administration of scheme:** Including IEC (Information, Education & Communication) activities and fee for Project Management Agency.

HINDUSTAN TIMES

Mar 13

PM-SURAJ PORTAL

(Syllabus: GS Paper 2 – Govt Scheme)

Modi launches PM-SURAJ portal; to benefit marginalised sector

Context: The Prime Minister of India recently launched the 'Pradhan Mantri Samajik Utthan and Rozgar Adharit Jankalyan' (PM-SURAJ) national portal and approved credit assistance for one lakh entrepreneurs from marginalized backgrounds.

Pradhan Mantri Samajik Utthan and Rozgar Adharit Jankalyan' (PM-SURAJ)

- **About:** The PM-SURAJ portal reflects the ministry's commitment to prioritizing the development of underprivileged communities.
- **Centralized Platform for Disadvantaged Sections**: It serves as a unified platform where individuals from disadvantaged backgrounds can apply for and track the progress of various loan and credit schemes tailored to their needs.
- **Direct Financial Assistance**: This initiative facilitates the direct disbursement of financial aid to beneficiaries, bypassing intermediaries and reducing the prevalence of commissions.
- **Focus on Marginalized Segments**: The primary objective is to uplift the most marginalized sections of society, ensuring they have equitable access to opportunities for growth and development.
- **Implementing Agency:** The Ministry of Social Justice and Empowerment.
- **Previous Efforts for Social Empowerment**: To achieve the vision of a developed India by 2047, it's imperative to extend essential facilities like gas connections, bank accounts, and **sanitation amenities to Dalits, backward classes, the deprived, and tribal communities.**
- **Empowerment of SC, ST, and OBC Communities**: The government has doubled its efforts to empower Scheduled Castes, Scheduled Tribes, and Other Backward Classes, evident in the substantial increase in financial assistance and targeted support programs over the past decade.

INDIAN EXPRESS Page 26

India's FBR Programme

(Syllabus: GS Paper 3 – Sci and Tech)

FBR and energy security

The beginning of 'core loading' at the Kalpakkam Fast Breeder Reactor marks a critical milestone in India's three-stage nuclear power programme. How does FBR work to convert 'fertile' material to fissile material?

ANIL SASI
NEW DELHI, MARCH 13

THE VITAL second stage of India's three-stage nuclear programme got a boost with the commencement of 'core loading' at the country's first indigenous Fast Breeder Reactor (FBR) at Kalpakkam, Tamil Nadu, earlier this month.

Core loading refers to the process of placing nuclear fuel assemblies inside the core of a nuclear reactor. The initiation of the process was witnessed by Prime Minister Narendra Modi on March 4.

The completion of core loading will effectively mark the first approach to 'criticality' — the initiation of a self-sustaining nuclear fission reaction that will eventually lead to the generation of power by the 500 megawatt electric (MWe) FBR.

India's FBR programme

Efforts to build an FBR were initiated two decades ago, and successive governments have nurtured the project as a step towards India developing comprehensive capabilities that span the entire nuclear fuel cycle, by which electricity is produced from uranium in nuclear power reactors.

In 2003, when Atal Bihari Vajpayee was Prime Minister, the Bharatiya Nabhikiya Vidyut Nigam Ltd or BHAVINI was incorporated to build and operate India's most advanced nuclear reactor, the Prototype Fast Breeder Reactor (PFBR).

The project was expected to be completed by September 2010, but was delayed due to technological challenges. The last set of approvals had revised the completion target to October 2022.

Once commissioned, India will be the second country after Russia to have a commercial operating FBR. China has a small programme on fast breeders; programmes in countries such as Japan, France, and the United States were shut down amid safety concerns.

From 'fertile' to 'fissile'

The Department of Atomic Energy's (DAE's) three-stage power programme envisages a pathway to utilising India's abundant thorium reserves — found in coastal and inland placer sands on the beaches of Kerala, Tamil Nadu, Odisha, Andhra Pradesh, Maharashtra, and Gujarat, and in the inland riverine sands of Jharkhand and West Bengal — to generate electricity.

A placer deposit is a natural concentration of heavier minerals created by the action of gravity on moving particles. These concentrations are typically found along streams, rivers, beaches, and stretches of residual gravel where they wash up. Besides thorium (from monazite ore), gold, platinum, titanium, uranium, and rare earth elements are commercially mined from placer deposits.

India owes the vision of the three-phase programme of nuclear power to ensure energy security to Dr Homi J Bhabha, the father of India's nuclear programme, and Dr Vikram Sarabhai, who recognised the need for developing FBRs, as these reactors generate more nuclear fuel than they consume due to the gainful conversion of fertile isotopes into fissile material.

The three stages involve the conversion of 'fertile' material (which is not fissionable by thermal neutrons but can be converted into fissile material) into fissile material.

For example, U238, the dominant isotope of uranium, is a fertile material that cannot by itself make the reactor achieve criticality, and has to be converted to fissile plutonium (Pu239) in a nuclear reactor. The spent fuel from thermal reactors contains Pu239, which is most efficiently burnt in a fast reactor.

Thorium-bearing monazite too, is a fertile material that has to be converted to fissile material U233.

India has adopted a "closed fuel cycle" approach, which involves the reprocessing of spent fuel to separate the useful Pu239 and U233 isotopes from U238 and Th232. To multiply the fissile inventory and to gradually work towards establishing a higher power base, it is key to ultimately use thorium in the third stage of the programme.

The FBR is an important milestone for getting to the third stage, paving the way for the eventual full utilisation of the country's thorium.

Three stages and FBR

The first stage — the setting up of Pressurised Heavy Water Reactors (PHWRs) and associated fuel cycle facilities — is in progress. PHWRs are reactors that use natural uranium as fuel and heavy water (deuterium oxide) as coolant and moderator.

Nuclear Power Corporation of India Ltd operates 22 commercial reactors with an installed capacity of 6,780 MWe. The programme has been supplemented by construction of imported Light Water Reactors (LWRs) — the first of two units built with Russian collaboration is already generating power.

The second stage involves the setting up of FBRs backed by reprocessing plants and plutonium fabrication plants, primarily to multiply the inventory of fissile material. Multiplication of fissile inventory is also needed to establish a higher power base for using thorium in the third stage of the programme.

The third stage will be based on the Th-U233 cycle. For producing U233, obtained by irradiation of thorium in PHWRs and FBRs, an Advanced Heavy Water Reactor (AHWR) is proposed.

The combination of power reactors from all the three stages is expected to ensure long-term energy security for the country. But the commercial utilisation of thorium on a significant scale can begin only when abundant supplies of either U233 or Pu239 are available. The progress on the FBR has made the passage to the third phase visible.

Way forward hereafter

As core loading commences, the FBR will initially use Uranium-Plutonium Mixed Oxide (MOX) fuel, officials said. The U238 'blanket' around the fuel core will undergo nuclear transmutation to produce more fuel — thus the name 'Breeder'. Nuclear transmutation involves the conversion of a chemical element or isotope into another chemical element, with the numbers of protons or neutrons in the nucleus of the atom undergoing a change.

The use of Th232, which is not a fissile material, as a blanket is also envisaged in this stage. Through transmutation, thorium will create fissile U233, which will be used as fuel in the third stage.

The DAE maintains that despite the use of this advanced technology, both the capital cost and per-unit electricity cost are "comparable" to other nuclear and conventional power plants.

While the first of the three stages is already underway with the PHWR programme, the India-US civil nuclear deal has opened the doors for India to buy uranium for its domestic reactors, thus increasing the pace of its nuclear programme.

The DAE aims to increase the share of nuclear power in the energy mix by 2032 by producing 22,400 MWe from its nuclear power plants. It has approved the construction of 10 new PHWRs in 'fleet mode', in which a plant is expected to be built in five years from the first pouring of concrete.

NUCLEAR FUELS & REACTORS

NUCLEAR FUELS are classified as 'fissile' (U233, U235, Pu239) or 'fertile' (U238, Th232). Fissile isotopes can be directly used as nuclear fuel; fertile isotopes need to be converted into fissile before they can be used. U235 is the only fissile isotope that occurs in nature.

IN INDIA, resources of exploitable uranium (natural uranium is mostly U238, with only 0.7% U235) are limited, while thorium (Th232) is abundantly available.

BOTH fissile and fertile isotopes are precious commodities that must be used judiciously for optimum utilisation. Pressurised Heavy Water Reactors, which burn U235, also convert fertile U238 to Pu239. This plutonium is used in Fast Breeder Reactors as fuel to generate electricity.

FAST REACTORS produce more fuel than they consume. They also aid in the conversion of fertile Th232 into fissile U233, which can be used to fuel subsequent reactors.



Prime Minister Narendra Modi in Kalpakkam on March 4. PTI

INDIA'S THREE-STAGE PROGRAMME

STAGE 1: PHWRs use natural uranium-based fuels to generate electricity, while producing fissile Pu239, which can be extracted by reprocessing the spent fuel.

STAGE 2: FBRs of the kind at Kalpakkam, using Pu-based fuels, can enhance nuclear power capacity, and convert fertile thorium into fissile uranium (U233). Reprocessing of the spent fuel is vital for efficient utilisation of plutonium inventory.

STAGE 3: U233 produced in the second stage can be used for the third stage of the power programme, which consists of advanced thermal and fast breeder reactors, for long-term energy security. In addition, fissile isotopes can be produced by Accelerator-driven Subcritical Reactor (ADS) systems.

Source: BARC, DAE

Context: The vital second stage of India's three-stage nuclear programme got a boost with the commencement of 'core loading' at the country's first indigenous Fast Breeder Reactor (FBR) at Kalpakkam, Tamil Nadu, earlier this month.

India's FBR Programme

- **About**: Efforts to establish an FBR began two decades ago, representing a strategic move towards comprehensive nuclear capabilities encompassing the entire fuel cycle.
- **BHAVINI and the PFBR**: In 2003, during Atal Bihari Vajpayee's tenure as Prime Minister, BHAVINI was formed to spearhead India's most advanced nuclear reactor project, the Prototype Fast Breeder Reactor (PFBR).
- **Technological Hurdles and Delay**: Initially slated for completion by September 2010, the PFBR project encountered significant delays owing to technological obstacles.
- **Revised Completion Timeline**: Despite setbacks, the project received last-minute approvals with a revised completion target set for October 2022.
- **India's Position in FBR Technology**: Upon commissioning, India will become the world's second nation, following Russia, to operate a commercially viable Fast Breeder Reactor, showcasing its advancements in nuclear technology.
- **Global Landscape**: While India and Russia lead in FBR development, other nations like China have smaller programs, while countries such as Japan, France, and the United States have halted their FBR initiatives due to safety concerns.

Three stages and FBR

- **Stage One**: Progress is underway in setting up Pressurised Heavy Water Reactors (PHWRs) and associated fuel cycle facilities.
  - PHWRs utilize natural uranium and heavy water as coolant and moderator.
- **Stage Two:** The second stage involves establishing Fast Breeder Reactors (FBRs) alongside reprocessing and plutonium fabrication plants.
  - Fissile material multiplication aims to enhance inventory for future stages and facilitate thorium utilization.
- **Stage Three**: The third stage will center on the ThU233 cycle, leveraging U233 produced through thorium irradiation in PHWRs and FBRs.
  - Proposal for an Advanced Heavy Water Reactor (AHWR) to facilitate U233 production and further program advancement.

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