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Cabinet Approves Green Energy Corridor Phase-III to Strengthen Renewable Energy Transmission and Grid Storage

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Recent Developments:

- The **Union Cabinet approved the Green Energy Corridor Phase-III (GEC-III)** on 30 September 2026 to strengthen India's **Intra-State Transmission System (InSTS)** and enable evacuation of up to **135 GW of renewable energy** across States and Union Territories.
- The scheme has a total project outlay of **₹1,86,405 crore** and is targeted for implementation by **FY 2032-33**. It combines transmission infrastructure with **50 GWh of Battery Energy Storage Systems (BESS)** to address renewable-energy intermittency and improve grid flexibility.
- The scheme is linked to India's target of achieving **900 GW of installed non-fossil-fuel capacity by 2035**, making transmission and storage critical complements to renewable-generation capacity.

Green Energy Corridor Phase-III: Key Components:

Financial and Physical Components:

- The total outlay of **₹1,86,405 crore** comprises:
- **₹1,36,378 crore** for development of Intra-State Transmission Systems under GEC-III.
- **₹50,000 crore** for deployment of **50 GWh BESS**.
- The scheme provides **₹54,082 crore as Central Financial Support (CFS)** to offset Intra-State transmission charges and help contain the transmission-related cost ultimately borne by consumers.
- The transmission component is designed to create the grid infrastructure required to evacuate renewable electricity generated at locations that may be geographically distant from major consumption centres.

Battery Energy Storage Systems:

- The **50 GWh BESS** can be deployed at renewable-energy developer/generator locations or at other strategically important locations that improve grid flexibility.
- Storage can absorb surplus electricity when renewable generation is high and discharge it during periods of high demand or low renewable generation.
- BESS is particularly relevant for managing **intermittency, transmission congestion, peak-hour curtailment and non-solar-hour demand**.
- According to the Ministry of New and Renewable Energy, India's energy-storage requirement is projected to rise substantially as the share of variable renewable energy increases; the National Electricity Plan projects **411.4 GWh of storage requirement by 2031-32**, including 236.22 GWh of BESS.

How GEC-III Will Strengthen the Power Grid:

Intra-State Transmission and Renewable-Energy Evacuation:

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- Renewable-energy-rich States can generate large quantities of solar and wind power, but generation capacity alone does not ensure that electricity can reach consumers.
- **Intra-State transmission networks** connect renewable-generation clusters and pooling stations with State-level transmission and distribution networks, complementing the **Inter-State Transmission System (ISTS)**.
- GEC-III therefore addresses a critical infrastructure gap between renewable-energy generation and actual electricity consumption.
- The Government has planned transmission infrastructure for integration of **more than 500 GW of renewable-energy capacity by 2030**, while the National Electricity Plan envisages expansion of the transmission network to **6.48 lakh circuit kilometres** and transformation capacity to **2,345 GVA by 2031-32**.

Grid Flexibility and Reliability:

- High shares of solar and wind generation create variability because their output depends on **solar radiation, wind conditions, weather and time of day**.
- GEC-III combines transmission expansion with storage so that renewable electricity can be integrated without relying entirely on conventional generation for balancing.
- Energy storage can provide **peak shifting, ancillary services, reduction in peak deficit, improved grid stability and greater renewable-energy absorption**.
- The Government is also developing **Renewable Energy Management Centres (REMCs)** for forecasting and real-time monitoring of renewable generation, thereby improving management of variability.

Implementation and Financing Framework:

Greenfield and Brownfield Projects:

- **Greenfield InSTS projects** under GEC-III will be implemented through **Tariff Based Competitive Bidding (TBCB)**.
- **Brownfield upgradation and network-strengthening works** will follow the **Cost Plus Basis (CPB)**.
- State Transmission Utilities will act as the overall implementing agencies.
- Transmission Service Providers will participate in competitively bid projects through the **Build-Own-Operate-Maintain (BOOM)** model.

Central Financial Support:

- The **₹54,082 crore Central Financial Support** is intended to reduce the financial burden of State transmission systems and offset part of the Intra-State transmission charges.
- Such support is significant because transmission investment can otherwise increase the delivered cost of electricity, particularly in States where large renewable-energy projects require extensive network strengthening.
- The broader objective is to make renewable electricity more **grid-accessible and economically viable for end users**.

Progress of Green Energy Corridor:

GEC Phase-I:

- GEC-I is being implemented across **Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu**.
- Government data reported to Parliament indicate that **9,130 circuit kilometres** of transmission lines had been constructed against a target of **9,461 circuit kilometres** as of 30 June 2026.
- GEC-I formed the initial large-scale effort to develop dedicated Intra-State transmission infrastructure for renewable-energy evacuation.

GEC Phase-II:

- GEC-II covers **Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh.**
- It targets **7,863 circuit kilometres of transmission lines** and **24,388 MVA of substation capacity.**
- As of 30 June 2026, **1,124 circuit kilometres** had been charged and **6,860 MVA** of substation capacity had been commissioned, according to government data reported to Parliament.
- Earlier parliamentary scrutiny identified implementation delays, with **Right of Way (RoW) compensation** among the important issues affecting transmission-line construction.

GEC-III and India's Energy Transition:

Energy Security:

- GEC-III strengthens the infrastructure required to integrate rising renewable capacity into the national electricity system, reducing the risk that generation capacity remains underutilised because of transmission constraints.
- Greater renewable integration can reduce dependence on imported fossil fuels and contribute to **long-term energy security.**
- The scheme is explicitly linked by the Government to the **900 GW installed non-fossil capacity target for 2035.**

Decarbonisation and Net-Zero:

- Expansion of renewable electricity and supporting transmission can reduce the carbon intensity of power generation when renewable electricity displaces fossil-fuel-based generation.
- India's broader climate pathway includes achieving **Net Zero emissions by 2070**, making electricity-sector decarbonisation a central component of long-term climate policy.
- Transmission and storage are therefore not secondary infrastructure but **enabling infrastructure for decarbonisation.**

Employment and Domestic Industry:

- GEC-III is expected to generate direct and indirect employment in **power transmission, construction, manufacturing, energy storage, operation and maintenance.**
- BESS deployment can also support the development of India's domestic energy-storage ecosystem.
- The Government is simultaneously promoting domestic battery manufacturing through the **₹18,100 crore Production Linked Incentive scheme for Advanced Chemistry Cell manufacturing**, with 50 GWh of manufacturing capacity targeted, including capacity relevant to grid-scale storage.

Major Challenges:

Land and Right of Way:

- Transmission projects require long corridors for towers, substations and associated infrastructure, creating potential conflicts over **land acquisition, compensation, agricultural land and forest areas.**
- Delays in Right of Way compensation have already affected earlier GEC phases, making timely land-related coordination essential for GEC-III.

Financial and Institutional Capacity:

- State transmission and distribution utilities may face financial constraints, while complex Centre-State coordination can slow project execution.

- Timely tendering, land clearances, procurement and project commissioning will determine whether the large sanctioned outlay translates into operational transmission capacity.

Supply-Chain and Technology Risks:

- Large-scale deployment of batteries requires reliable access to cells, power-electronic components and critical minerals.
- Battery systems also require appropriate **safety standards, recycling mechanisms, thermal management and lifecycle management**.
- Transmission expansion will increasingly require advanced forecasting, automated grid management, smart-grid technologies and skilled technical personnel.

Renewable-Energy Integration:

- Solar and wind resources are variable and geographically concentrated, while electricity demand varies across regions and time periods.
- Simply increasing generation capacity without synchronised transmission and storage can result in **curtailment, congestion and underutilisation of renewable assets**.
- GEC-III must therefore be implemented alongside storage, forecasting, flexible generation, demand management and stronger distribution networks.

Significance for UPSC GS-III:

Infrastructure and Energy:

- GEC-III illustrates the shift from a **generation-centric approach to an integrated generation-transmission-storage model** of energy planning.
- It highlights the importance of transmission infrastructure as a prerequisite for large-scale renewable-energy deployment.

Environment and Climate Change:

- Renewable-energy integration supports reduction of power-sector emissions and contributes to India's long-term **decarbonisation pathway**.
- Energy storage improves the ability of the grid to absorb variable renewable electricity without compromising reliability.

Cooperative Federalism:

- Electricity is in the **Concurrent List**, while GEC-III requires coordinated implementation by the Centre, States, State Transmission Utilities, regulators and private Transmission Service Providers.
- Effective Centre-State coordination is therefore essential for land acquisition, project approvals, financing and network development.

Way Forward:

Integrated Planning:

- Transmission planning should remain synchronised with renewable-generation projects so that generation capacity and evacuation infrastructure become operational within compatible timelines.
- Storage deployment should be planned alongside transmission expansion to minimise congestion and improve utilisation of renewable electricity.

Faster Project Execution:

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- Standardised land and **Right of Way compensation frameworks**, time-bound approvals and stronger State-level project monitoring can reduce implementation delays.
- Digital project monitoring can improve accountability for tendering, construction, commissioning and expenditure.

Technology and Domestic Capability:

- India should strengthen domestic manufacturing of transmission equipment, batteries and power electronics while developing recycling and critical-mineral supply chains.
- Advanced forecasting, smart-grid technologies, flexible generation and skilled human resources should accompany physical infrastructure expansion.

Value Addition for UPSC:

- **GEC-III:** Green Energy Corridor Phase-III.
- **Approved:** 30 September 2026.
- **Total outlay:** ₹1,86,405 crore.
- **Intra-State transmission component:** ₹1,36,378 crore.
- **BESS component:** ₹50,000 crore for 50 GWh.
- **Central Financial Support:** ₹54,082 crore.
- **Renewable-energy evacuation:** Up to 135 GW.
- **Completion target:** FY 2032-33.
- **Linked national target:** 900 GW installed non-fossil capacity by 2035.
- **Greenfield:** TBCB.
- **Brownfield strengthening:** Cost Plus Basis.
- **Implementing agencies:** State Transmission Utilities.
- **Private participation:** TSPs through the BOOM model.
- **UPSC GS linkage:** GS-III — Energy, Infrastructure, Environment, Climate Change, Science & Technology, and Centre-State coordination.