

DAILY NEWS ANALYSIS

Powering India's Green Grid: PM-DHARA Scheme and the Next Leap in Renewable Energy Transmission

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PM-DHARA is a major green-energy transmission and storage programme aimed at strengthening electricity networks within States and Union Territories. Its principal objectives are to: - develop stronger intra-state transmission systems, - facilitate evacuation of renewable electricity, - reduce grid congestion, - support large-scale battery storage, - improve grid flexibility, - and enable greater integration of solar and wind power. The scheme is expected to facilitate the evacuation of up to 135 GW of renewable energy capacity across States and Union Territories.

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UPSC Brief Summary

PM-DHARA is a **₹1.86 lakh crore green-energy infrastructure programme** aimed at strengthening intra-state transmission, enabling evacuation of up to **135 GW of renewable power** and deploying **50 GWh of battery storage**.

For UPSC, the scheme links renewable-energy integration with energy security, infrastructure, battery technology, climate action and green growth.

GS Paper III

Energy Infrastructure

Prelims

Government Schemes

Environment

Climate Action

Economy

Green Growth

What is the PM-DHARA Scheme?

PM-DHARA — PM-Developing Harmonized and Accelerated Renewable-energy Access is a major green-energy transmission and storage programme.

It aims to strengthen electricity networks within States and Union Territories while improving India's ability to integrate large quantities of renewable electricity into the grid.

Stronger Transmission

Develop stronger intra-state transmission systems.

Renewable Evacuation

Facilitate movement of renewable electricity from generation centres to the grid.

Grid Decongestion

Reduce transmission bottlenecks and congestion.

Battery Storage

Support large-scale Battery Energy Storage Systems.

Grid Flexibility

Improve balancing and reliability of the electricity network.

Solar & Wind Integration

Enable greater integration of variable renewable-energy sources.

PM-DHARA: Key Numbers for UPSC Prelims

₹1,86,405 Cr

Total Project Outlay

135 GW

Renewable Evacuation Capacity

50 GWh

Battery Storage Capacity

₹1,36,378 Cr

Transmission / GEC Phase III

₹50,000 Cr

BESS Component

₹54,082 Cr

Central Financial Support

Component	Provision
Total Project Outlay	₹1,86,405 crore
Intra-State Transmission / Green Energy Corridor Phase II	₹1,36,378 crore
Battery Energy Storage Systems	₹50,000 crore
BESS Capacity	50 GWh
Renewable Energy Evacuation Capacity	Up to 135 GW
Central Financial Support	₹54,082 crore
Target Completion	FY 2032-33

Why Does India Need Green Energy Transmission?

Renewable-energy generation is often concentrated far from major centres of electricity demand.

Solar potential may be high in Rajasthan and Gujarat, while wind generation can be concentrated in coastal and southern States. Electricity demand, however, is distributed across cities, industries and agricultural regions.

The Transmission Challenge

Generating more renewable electricity is not enough if the electricity network cannot transport that power efficiently to consumers.

Generation ? Transmission Bottleneck ? Curtailment ? Wasted Renewable Energy

A stronger green grid changes the equation:

Renewable Generation ? Efficient Grid Evacuation ? Storage ? Consumers

What is Renewable Energy Evacuation?

Electricity evacuation refers to transporting generated electricity from the power-generation facility into the wider electricity grid so that it can ultimately reach consumers.

Substations

Transmission Lines

Transformers

Grid-Control Equipment

Without adequate evacuation infrastructure, renewable-energy projects may generate electricity that the grid cannot efficiently absorb or transmit.

Green Energy Corridor Phase III

A major component of PM-DEHARA is the development of **Intra-State Transmission Systems under Green Energy Corridor Phase III**

₹1,36,378 Crore

Earmarked for the transmission / Green Energy Corridor component

Renewable Energy Zones ? State Grids ? National Electricity Network

12 Noon — Store Energy

7 PM — Release Energy

The Problem of Renewable Intermittency

Solar and wind generation are inherently variable. Solar generation falls after sunset, while wind generation changes according to weather conditions.

Electricity demand, however, continues throughout the day. This creates a mismatch between when renewable electricity is generated and when consumers need electricity.

Role of Storage

Battery storage helps bridge the time gap between renewable generation and electricity demand.

How BESS Can Help the Grid

Peak Demand

Support electricity supply during peak-demand periods.

Non-Solar Hours

Supply stored electricity after solar generation declines.

Lower Curtailment

Reduce wastage of available renewable electricity.

Frequency Regulation

Help maintain grid stability.

Congestion Management

Support better management of electricity flows.

Emergency Support

Provide additional grid support during disruptions.

Central Financial Support

₹54,087 Crore

Central Financial Support

The financial assistance is intended to reduce the burden of intra-state transmission costs and help contain electricity costs for consumers.

Government Support ?

Lower Transmission Burden ?

Renewable Integration ?

Consumer Benefit

How Will PM-DHARA Projects Be Implemented?

Greenfield Projects

New transmission projects will use a competitive project-allocation framework.

Tariff Based Competitive Bidding — TBCB

Brownfield Projects

Existing transmission-network strengthening and augmentation will follow the applicable cost-based framework.

Cost Plus Basis — CPB

Role of State Transmission Utilities

State Transmission Utilities (STUs) are envisaged as the overall implementing agencies.

Transmission Service Providers selected through competitive bidding can develop projects using the **Build-Own-Operate-Maintain (BOOM)** model.

UPSC Linkage

This is useful for answers dealing with infrastructure financing, competitive bidding and public-private participation in India's electricity sector.

PM-DHARA and India's 2035 Energy Target

900 GW

Installed non-fossil fuel capacity target by 2035

The scheme highlights an important reality of India's energy transition:

Generation + Transmission + Storage = Reliable Green-Energy Transition

Why PM-DHARA Matters for Energy Security

Expansion of domestic renewable-energy infrastructure can strengthen India's energy security by supporting:

Lower Fossil-Fuel Dependence

Greater domestic renewable capacity can reduce dependence on conventional fuel sources.

Energy Diversification

A broader electricity mix improves resilience.

Price Resilience

Domestic clean energy can reduce exposure to international fuel-price volatility.

Lower Carbon Emissions

Renewable integration supports long-term decarbonisation.

PM-DHARA and Climate Action

A stronger renewable grid can create wider benefits across India's climate and development strategy.

Electric Mobility

Cleaner electricity can strengthen the environmental benefits of EV adoption.

Green Hydrogen

Reliable renewable electricity can support green-hydrogen production.

Industrial Decarbonisation

Clean electricity can reduce industrial carbon intensity.

Urban Energy

Greater renewable integration can support cleaner city electricity.

Green Manufacturing

Reliable low-carbon electricity can support cleaner manufacturing.

Climate Commitments

Transmission and storage can improve the usability of non-fossil electricity.

Economic and Employment Impact

Expansion of transmission and storage infrastructure can generate direct and indirect opportunities across:

Electrical Equipment
Technical Services

Battery Production

Construction

Transmission

O&M

Grid Management

Major Challenges

Land Acquisition

Transmission infrastructure can cross multiple districts and landholdings.

Right-of-Way

Permissions for transmission lines can delay implementation.

Battery Supply Chains

Critical battery minerals and components remain an important strategic challenge.

Technology Costs

Large-scale grid storage remains capital-intensive.

State-Level Coordination

Implementation requires coordination among governments, regulators and utilities.

Battery Recycling

Large-scale BESS deployment requires a strong circular-economy and recycling ecosystem.

Full Form:

Total Outlay:

Renewable Evacuation:

BESS Capacity:

Green Energy Corridor:

Central Financial Support:

Target:

Implementing Agencies:

Greenfield Model:

GS Paper III Relevance

Energy Infrastructure

Renewable Energy

Electricity Transmission

Battery Storage

Climate Change

Energy Security

Infrastructure Investment

Green Growth

UPSC Mains Answer Enrichment

“India’s energy transition is no longer only a renewable-generation challenge; it is equally a transmission and storage challenge.”

“A resilient green grid is the bridge between renewable-energy potential and reliable electricity supply.”

“Battery storage converts variable renewable energy into dispatchable and dependable electricity.”

Possible UPSC Mains Questions

Q1

Why is expansion of transmission infrastructure essential for India's renewable-energy transition? Explain with reference to PM-DHARA.

Q2

Examine the role of Battery Energy Storage Systems in addressing renewable-energy intermittency.

Q3

India's energy transition requires coordinated investments in generation, transmission and storage. Discuss.

Q4

How can green-energy corridors strengthen India's energy security and climate commitments?

Conclusion: From Renewable Capacity to a Reliable Green Grid

PM-DHARA represents an important shift in India's renewable-energy strategy—from merely adding generation capacity toward building the infrastructure required to make that capacity reliable and usable.

With a project outlay of **₹1.86 lakh crore**, renewable-energy evacuation capacity of up to **135 GW** and **50 GWh of battery storage**, the programme seeks to build a stronger, more flexible and future-ready electricity grid.

For UPSC aspirants, PM-DHARA provides an excellent contemporary case study connecting **renewable energy, infrastructure, energy security, battery technology, climate action and green growth**.

Green Generation • Smart Transmission • Energy Storage • Reliable Power

Prepare Current Affairs the UPSC Way

Civil Service Gurukul connects current developments with Prelims facts, Mains analysis, GS syllabus mapping and answer-writing value addition.

Explore Civil Service Gurukul

SEO Topics:

PM-DHARA PM DHARA UPSC Green Energy Corridor Renewable Energy BESS Battery Storage Energy Security
Green Grid India Solar Energy Wind Energy Climate Change Infrastructure Green Growth UPSC Current Affairs
GS Paper III Civil Service Gurukul

Frequently Asked Questions

What is the PM-DHARA Scheme?

PM-DHARA stands for PM-Developing Harmonized and Accelerated Renewable-energy Access. It focuses on strengthening intra-state transmission, renewable-energy evacuation and battery storage infrastructure.

What is the total outlay of PM-DHARA?

The total project outlay stated for PM-DHARA is ₹1,86,405 crore.

How much renewable energy can PM-DHARA help evacuate?

The scheme is designed to facilitate evacuation of up to 135 GW of renewable-energy capacity.

How much battery storage is proposed under PM-DHARA?

The programme provides for 50 GW of Battery Energy Storage Systems, with ₹50,000 crore allocated to the BESS component.

Why is PM-DHARA important for UPSC?

PM-DHARA connects several GS Paper III themes, including renewable energy, electricity infrastructure, battery storage, energy security, climate action, infrastructure investment and green growth.

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