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Andhra Pradesh's ₹22,000-crore Green Energy Corridor (Phase-III)

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Andhra Pradesh's ₹22,000-crore Green Energy Corridor (Phase-III)

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WHY IN NEWS:

Andhra Pradesh Chief Minister N. Chandrababu Naidu unveiled the **₹22,000-crore Green Energy Corridor (Phase-III)** on **May 29, 2026** — to integrate **18 GW of renewable capacity** (~**11 GW solar + ~7 GW pumped-storage hydropower**) into Andhra Pradesh's grid. The project includes **2,261 km of new transmission lines** and **five major pooling stations** (**Mudigubba, Talupula, Ramayapatnam, Porumamilla, Koppaka**) with **combined capacity of 9,500 MW**. AP simultaneously announced India's **first Digital Twin Grid** — built in partnership with the **Pravah AI lab (Stanford-linked)**. The state targets **160 GW renewable capacity** long-term. The project directly supports India's **Panchamrit commitment** of **500 GW non-fossil installed capacity by 2030** (COP26, Glasgow 2021).

WHAT IS A GREEN ENERGY CORRIDOR?

The **Green Energy Corridor (GEC)** programme — launched by the **Ministry of New and Renewable Energy (MNRE)** in **2015-16** — addresses the **biggest structural challenge of India's renewable transition**: **transmission and grid-integration capacity for variable renewable energy (VRE)**.

Solar and wind are **non-dispatchable** — their output depends on irradiance and wind speed. Without transmission upgrades, large RE generation in remote (sunbelt/windy) zones cannot reach demand centres. GEC builds the grid backbone.

PHASE	YEAR	COVERAGE	OUTLAY
Phase-I	2015-16	8 RE-rich states (Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Rajasthan, Himachal Pradesh, MP)	~₹10,141 crore
Phase-II	January 2022 (approved)	7 states (Gujarat, HP, Karnataka, Kerala, Rajasthan, TN, UP) — **10,750 ckm transmission + 27,500 MVA substation capacity**	**₹12,031 crore**
Phase-III (state-level AP)	May 2026	**Andhra Pradesh** — 18 GW RE integration	**₹22,000 crore**

(Note: AP's Phase-III is a **state-led initiative** announced under the national GEC framework; multi-state Phase-III planning at the MNRE level continues separately.)

AP'S PHASE-III — ARCHITECTURE

COMPONENT	DETAIL
Renewable capacity to be integrated	**18 GW** total
Solar	~11 GW
Pumped Storage Projects (PSP)	~7 GW
Transmission lines	**2,261 km new**
Pooling stations (5)	Mudigubba, Talupula, Ramayapatnam, Porumamilla, Koppaka
Combined pooling capacity	**9,500 MW**
Investment	**₹22,000 crore**
Long-term state target	**160 GW renewable capacity**
Digital Twin Grid	First in India; partnership with Pravah AI lab

WHY PUMPED STORAGE MATTERS

Pumped Storage Projects (PSPs) are the workhorse of grid-scale energy storage:

- **How they work**: Use cheap off-peak (often solar-surplus) electricity to pump water from a lower reservoir to an upper one. During peak demand, water releases through turbines to generate electricity (similar to conventional hydropower).
- **Round-trip efficiency**: 70-85%
- **Why critical**: India faces increasing **"duck curve"** problems — solar floods the grid by day, demand peaks after sunset. PSPs bridge that gap.
- **India's PSP pipeline**: ~60 GW in various stages of development (CEA 2024 estimate).
- **National Framework for Promoting PSP** (April 2023, MoP) — accelerated approval process.
- **Major PSPs operational/under-construction**: Tehri (Uttarakhand, 1,000 MW operational + 1,000 MW under construction); Pinnapuram (AP, 1,680 MW); Sharavathi (Karnataka, 2,000 MW planned).

DIGITAL TWIN GRID — WHAT IT MEANS

A **Digital Twin** is a **real-time virtual replica** of a physical asset (here, AP's electricity grid). The Pravah AI lab–built system would enable:

- **Real-time monitoring** of every grid node, line, and substation.
- **Predictive analytics** for outages, congestion, RE intermittency.
- **Scenario simulation** — testing grid responses to load shifts, renewable injection variations, weather events.
- **AI-driven load forecasting** and dispatch optimisation.

This is positioned as **India's first state-level digital-twin grid** — a meaningful step in **grid modernisation under the National Smart Grid Mission**.

INDIA'S RENEWABLES — NATIONAL CONTEXT

PARAMETER	DETAIL
India's non-fossil installed capacity (FY26)	**283.46 GW** (IRENA Renewable Energy Statistics 2026)
India's global rank	**3rd globally** (after China, USA)
Capacity added FY26	+55.3 GW (44.61 GW solar — national record)
50% non-fossil milestone	Achieved **June 2025** — 5 years ahead of NDC 2030 target
NDC 2031-2035 (March 2026 Cabinet approval)	**60% non-fossil capacity by 2035**; **47% emissions intensity reduction by 2035** (from 2005 baseline)
Panchamrit (COP26, Glasgow 2021)	500 GW non-fossil by 2030; 50% non-fossil capacity by 2030 (already done); 1 bn tonne CO_2 reduction by 2030; 45% emissions intensity reduction by 2030 (now 47% by 2035 under updated NDC); net zero by 2070

STRUCTURAL CHALLENGES AHEAD

Even with GEC Phase-III, India's RE transition faces five constraints:

1. **Storage** — PSPs + Battery Energy Storage Systems (BESS) under-deployed; the **National BESS Mission** target ~50 GW by 2030 is ambitious.

2. **Discom finances** — Aggregate Discom losses ~**₹2 lakh crore**; renewable PPAs at risk of curtailment when discoms can't afford take-or-pay obligations. **RDSS (Revamped Distribution Sector Scheme)** addressing.
3. **Manufacturing self-reliance** — India still imports **80%+ of solar modules from China**; **ALMM (Approved List of Models and Manufacturers)** + PLI schemes addressing.
4. **Land + biodiversity conflicts** — Solar parks face land-acquisition issues; **Great Indian Bustard transmission-line litigation** (MK Ranjitsinh, SC 2024) is a defining case.
5. **Critical minerals** — Lithium (BESS), cobalt, rare earths — 100% import dependence; addressed via Quad Critical Minerals Initiative + NCMM.

UPSC RELEVANCE

PAPER	RELEVANCE
GS3	Renewable energy, grid integration, energy security, climate commitments, storage technology
Mains	"Examine the structural challenges in achieving India's NDC target of 60% non-fossil installed capacity by 2035. What role can state-level initiatives like AP's GEC Phase-III play?"
Prelims	GEC launch year (2015-16), Phase-II (2022, ₹12,031 cr, 10,750 ckm), Panchamrit COP26 2021, India 3rd in renewables (IRENA 2026, 283.46 GW), 50% non-fossil milestone (Nov 2025), Pumped Storage National Framework (April 2023), MK Ranjitsinh (SC 2024 — GIB)

FACTS CORNER

GREEN ENERGY CORRIDOR:

Launched: 2015-16 by MNRE

Phase-I: 8 RE-rich states; ~₹10,141 crore

Phase-II: January 2022 approval; 7 states; ₹12,031 crore; 10,750 ckm transmission + 27,500 MVA substation

AP's state Phase-III: ₹22,000 crore; 18 GW RE; 2,261 km transmission; 5 pooling stations

AP PHASE-III POOLING STATIONS (9,500 MW COMBINED):

Mudigubba, Talupula, Ramayapatnam, Porumamilla, Koppaka

INDIA'S RENEWABLE NUMBERS:

Non-fossil installed capacity FY26: 283.46 GW (IRENA 2026; 3rd globally)

+55.3 GW added FY26 (44.61 GW solar — record)

50% non-fossil milestone: June 2025 (5 years ahead of NDC 2030)

Panchamrit (COP26 2021): 500 GW by 2030; 1 bn tonne CO_2 cut; 45% intensity cut by 2030 (now 47% by 2035); net zero 2070

NDC 2031-2035 (Cabinet March 2026): 60% non-fossil + 47% intensity cut by 2035

PUMPED STORAGE:

National Framework launched April 2023 (MoP)

India's PSP pipeline: ~60 GW (CEA estimate)

Round-trip efficiency: 70-85%

Major projects: Tehri 1,000 MW operational; Pinnapuram 1,680 MW (AP); Sharavathi 2,000 MW planned (Karnataka)

OTHER GRID + RE SCHEMES:

RDSS (Revamped Distribution Sector Scheme) — ₹3.03 lakh crore Centre+State outlay

ALMM — Approved List of Models and Manufacturers (anti-China for solar)

PLI for solar PV — ~₹24,000 crore

National Smart Grid Mission (NSGM) — under MoP

CCTS (Carbon Credit Trading Scheme, 2024) — domestic carbon market

DISCOM HEALTH:

Aggregate Discom losses: ~₹2 lakh crore

RPO (Renewable Purchase Obligation) compliance variable across states

LITIGATION HOOK:

MK Ranjitsinh v Union of India (2024) — SC recognised "right to be free from climate change" as a constitutional right under Art. 21 + 14; modified earlier order on undergrounding transmission lines in Great Indian Bustard (GIB) habitat (Rajasthan)

Source: Andhra Pradesh's ₹22,000-crore Green Energy Corridor (Phase-III) — Ujiyari.com | Free UPSC & State PCS Current Affairs

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