

Canal-Top Solar Photovoltaics (CTPV)

Mains: GSIII - Infrastructure

Why in News?

India is exploring Canal-Top Photovoltaics (CTPV) to expand solar power while saving land and reducing water evaporation through its extensive canal network.

What is Canal-Top Photovoltaics?

- **CTPV** - It involves installing solar panels on elevated structures above irrigation and water-supply canals.
 - Unlike floating solar, panels are mounted on structures rather than floating on water.
- Structures are designed according to canal width, orientation and geometry while ensuring uninterrupted water flow.
- **Potential of CTPV in India** - A 2024 assessment estimated India's combined CTPV and canal-bank solar potential at around 131 GW.
 - Potential was assessed considering:
 - Solar irradiation
 - Canal characteristics
 - Grid connectivity
 - Distance from substations
- **Protected areas** - States with the highest potential include:
 - Uttar Pradesh
 - Bihar
 - Karnataka
 - Andhra Pradesh
 - Punjab

Canal-Top Photovoltaics (CTPV)

More Solar Power | No Extra Land | Less Water Loss

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 **Same Canals
More Benefits
A Brighter India**

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Advantages of CTPV



Saves Land – Uses existing canal infrastructure and requires virtually no additional land.
• A 20-MW installation in Punjab is estimated to have saved nearly 100 acres.



Conserves Water – Solar panels provide shade over canals and can reduce evaporation losses, particularly valuable in water-stressed regions.



Improves Solar Performance – Water beneath the panels can provide a cooling effect, potentially improving panel efficiency during hot conditions.



Supports Renewable Energy Expansion – Enables additional solar generation without competing significantly with agricultural and other land uses.



Multiple Use of Existing Infrastructure – Converts existing irrigation infrastructure into energy-generating assets, supporting the broader land-neutral energy transition.

Challenges in Scaling CTPV



High Capital Cost – CTPV is generally more expensive than ground-mounted solar. Elevated structures require additional structural steel, foundations and infrastructure.



Difficult Maintenance – Cleaning, repair and replacement of panels become more difficult because installations are elevated above operational canals.



Canal Geometry – Irregular canal paths and changes in direction can increase construction and power-transmission costs.



Grid Connectivity – Distance from substations and transformers can reduce economic viability.



Institutional Coordination – Projects require coordination among renewable-energy agencies, irrigation departments, State governments and distribution companies.



Our Canals Can Do More | Canal-Top Solar for a Cleaner, Greener, Brighter India

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Policy Support measures

- MNRE launched a pilot-cum-demonstration scheme in 2014 for grid-connected CTPV and canal-bank projects.
- It targeted 50 MW each for CTPV and canal-bank projects.
- Financial assistance was provided subject to specified limits.
- Punjab has invited proposals for 40 MW of CTPV projects across its canal network.
- Haryana is also exploring CTPV over selected irrigation canals.
- The PM Surya Sarovar Yojana (PM-SSY), aimed at expanding floating solar on reservoirs and inland water bodies, could also strengthen policy interest in other land-efficient solar technologies.

What is the Way Forward?

- **Identify Suitable Canal Stretches** - Prioritise locations based on Solar potential, Canal geometry, Land scarcity, Electricity demand, Grid connectivity.
- **Provide Viability Gap Funding** - Use low-cost finance and viability gap funding to overcome high initial costs.
- **Standardise Designs** - Develop standard technical specifications for structures, safety, and maintenance and canal operations.
- **Strengthen Institutional Capacity** - Build capacity among State nodal agencies, irrigation departments and DISCOMs.
- **Promote Public-Private Participation** - Encourage private investment through predictable policies and long-term project frameworks.
- **Scale through Learning** - Use pilot projects to develop standardised designs, reduce costs and improve maintenance practices.

What lies ahead?

- Canal-top photovoltaics can help India pursue the energy transition without intensifying competition for land and water.
- Although higher costs and maintenance challenges limit large-scale deployment, better institutional coordination can unlock its potential.
- CTPV should complement—not replace—rooftop, ground-mounted and floating solar, forming part of India's diversified renewable-energy strategy.

Reference

[The Hindu| Canal-Top Solar Photovoltaics \(CTPV\)](#)



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