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Q9

To what factors can be the recent dramatic fall in equipment cost and tariff of solar energy be attributed? What implications does the trend have for thermal power producers and related industry?

UPSC Civil Services Mains 2015 · GS III · 12 marks · Infrastructure

Infrastructure: Energy, Ports, Roads, Airports, Railways etc.

Core demand of the question

- Attribute the fall in solar equipment cost and tariffs to technology, China-scale manufacturing, and reverse bidding in India
- State implications for thermal generators, coal, equipment makers and the grid

Revision summary

Solar module and balance-of-system costs fell with Chinese scale and technology learning.

India's National Solar Mission used reverse bidding, which passed those cost drops into lower tariffs.

Zero fuel cost and cheaper finance also cut the levelised tariff.

Thermal plants risk lower **plant load factor** and stranded high-cost capacity in daylight hours.

Coal, BHEL-type equipment and DISCOM PPAs must adjust; flexible thermal and storage remain necessary after sunset.

Introduction

Solar power in India moved in a few years from a costly niche to **tariffs** that began to undercut new **thermal** plants in some bids. The drop was not a miracle. It came from cheaper **modules worldwide**, scale in **China**, and **reverse auctions** under the **Jawaharlal Nehru National Solar Mission**. That trend rewrites the business of coal plants and their suppliers.

Body

Why equipment cost and tariffs fell

- **Crystalline silicon** module prices collapsed as global capacity, especially in China, outran demand; polysilicon and wafer costs followed.
- **Balance-of-system** costs (inverters, mounting, cables, land use) fell with standardisation and larger park size.
- India's **JNNSM** and State policies used **competitive reverse bidding**, so developers bid down the tariff to win the power-purchase agreement.
- Cheap global **finance** after the financial crisis, and later dollar liquidity, lowered the cost of capital for solar, which is almost all upfront capex and **zero fuel**.
- **Accelerated depreciation** and renewable purchase obligations created a domestic buyer; solar parks cut land and evacuation delay.

- Oil and LNG price falls after 2014 did not cause the solar drop, but they changed the relative politics of energy; solar's driver remained **technology and auction design**.

Implications for thermal power and related industry

- New **coal plants** face a shrinking room in the merit order when solar runs in daylight; **plant load factor** of thermal units can fall.
- Existing plants with high fixed costs and take-or-pay coal or gas contracts risk becoming **stranded assets** if DISCOMs prefer cheaper solar daytime power.
- **Coal India**, washeries, and rail-coal logistics see slower growth in domestic thermal coal demand than old plans assumed.
- **Bharat Heavy Electricals** and private boiler-turbine makers lose orders if capacity addition shifts from supercritical coal to solar modules (many of them imported).
- The grid still needs **flexible thermal, hydro and, later, storage** to back solar after sunset; a simple shutdown of coal is not the implication.
- DISCOMs must redesign **PPAs** and forecasting or they will pay for idle thermal capacity and cheap solar at once.
- Domestic module manufacturing lags China, so the tariff gain can widen the **import bill** unless local cell-module capacity is built.

Flow diagram

Cheaper global modules -> Reverse auctions JNNSM
 Reverse auctions JNNSM -> Low solar tariffs
 Low solar tariffs -> Thermal PLF and new orders fall
 Low solar tariffs -> Grid still needs flexible backup

Conclusion

Solar equipment and tariffs fell because modules got cheaper worldwide and India bought them through reverse auctions, not because coal suddenly vanished. Thermal producers face lower utilisation and fewer new orders; they remain needed for night and peak. Policy must pair cheap solar with a flexible coal-and-storage mix and with domestic manufacturing if the trend is not to export India's equipment jobs.

Facts & figures

JNNSM

Jawaharlal Nehru National Solar Mission: Union solar scale-up using competitive bidding and solar parks.

Reverse auction

Developers bid the lowest tariff to win a solar PPA; this mechanism drove Indian solar prices down.

Module price crash

Global crystalline-silicon module prices fell sharply in the early 2010s as Chinese manufacturing capacity surged.

Plant load factor

Utilisation of a thermal station; it comes under pressure when cheap daytime solar is must-run on the grid.

RPO

Renewable Purchase Obligation: forces DISCOMs to buy a rising share of renewable power, creating demand for solar bids.

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