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Marked copy**How can India achieve energy independence through clean technology by 2047? How can biotechnology play a crucial role in this endeavour?**

UPSC Civil Services Mains · WRAP evaluation · 10 marks

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5.5 / 10

MARKS	
CRITERION	MARKS
Content Accuracy & Demand Coverage Covered Panchamrit goals and ethanol blending, but missed a few clean tech dimensions	2.5 / 4
Structure & Flow Diagrammatic representation is attempted but structure is somewhat fragmented	1.5 / 3
Value Addition & Examples Mentioned 20% ethanol blending target; could include advanced biofuels or hydrogen economy	1.5 / 3

EXAMINER NOTE

A well-attempted answer with good structural flow that requires greater factual precision and comprehensive coverage Good integration of India's Panchamrit goals and recent ethanol blending achievements Contains a factual error regarding the net-zero target year and lacks broader clean tech scope

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1. There is a factual inaccuracy in the target year for net-zero emissions. Always verify nationally determined contributions and long-term low emission development strategies.

2. Incorrect target year for net-zero emissions. India's target for net-zero emissions is 2070. Ensure strict adherence to official climate policy timelines announced at COP summits.

3. The answer misses discussing green hydrogen as a key clean technology pillar for 2047. Incorporate the National Green Hydrogen Mission and battery energy storage systems.

4. Good linkage of import reduction with decentralized agricultural solar initiatives like PM-KUSUM.

5. Subheadings should integrate analytical dimensions directly rather than acting merely as section labels.

6. The philosophical linkage to inter-generational equity is well conceived, but it needs concrete examples such as green hydrogen missions.

① How can India achieve energy independence through clean technology by 2047? How can biotechnology play a crucial role in this endeavour?

Panchamirth goals of India aims

India to become net zero emissions

by 2070 and Viksit Bharat @ 2047

plans to achieve energy independence by 2047.

Role of clean energy in achieving energy independence

→ Import reduction will strengthen self-reliance for energy [eg] solar pumps for agricultural irrigation.

→ Sustainable system through non-fossil fuel resource energy generation.

→ Inter-generational equity to leave efficient energy mechanism for future.

7. Clear articulation of how biofuel generation diversifies energy baskets and curtails fossil fuel dependence.
8. Excellent inclusion of the 20% ethanol blending milestone, demonstrating sound awareness of recent policy achievements.
9. The environmental benefit is stated correctly, but analytical depth on life-cycle emissions would add significant value. Elaborate on life-cycle emissions and carbon neutrality aspects of advanced biofuels.
10. Addressing high capital costs and technological bottlenecks in advanced biofuels would provide a more balanced critique. Mention economic viability challenges and scaling hurdles for cellulosic ethanol.
11. The way forward appropriately touches upon advanced generations and policy support, but could benefit from mentioning specific biorefinery initiatives. Incorporate specific institutional frameworks like SATAT scheme for compressed biogas.

