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4. Indian Reservoirs Can Host 102 GW Floating Solar Capacity - Economy

India's reservoirs can host about 102 GW of floating solar capacity according to the first comprehensive national assessment by National Institute of Solar Energy (NISE).

1. Floating Solar Photovoltaic (FSPV) offers significant opportunities addressing land acquisition constraints while advancing India's renewable energy targets.
2. The report identifies potential concentrated in Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat reflecting availability of large, technically suitable reservoirs.

1.Understanding Floating Solar Photovoltaic (FSPV)

Definition and Technology

1. Also known as "photovoltaics", FSPV is a technology where solar panels are installed on buoyant structures floating on water bodies like reservoirs, lakes, and dams.
2. The technology combines water management infrastructure with clean energy generation addressing dual resource optimization.

Global FSPV Status

1. Globally, floating solar reached about 9.6 GW by 2024 with nearly 90% of it in Asia.
2. China leads with installations including 120 MW plant on fish farm in Poyang Lake.
3. The Netherlands accounts for roughly three-fourths of Europe's capacity built largely on quarry lakes.

India's Flagship Project

1. Omkareshwar floating solar park on Narmada River in Madhya Pradesh at 278 MW is India's largest with plans to scale to 600 MW.

2.NISE Report - Key Findings

Total Potential

1. India's total floating solar (FSPV) potential estimated at around 102.18 GW using constraint of only 20% of reservoir area.
2. Utilization of merely 20% of reservoir surface area generates massive capacity while preserving water body functionality.

Regional Distribution

1. High concentrations in Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat reflecting availability of large, technically suitable reservoirs.
2. These states combine large reservoir areas with proximity to high electricity demand centers.

Water Conservation Benefits

1. FSPV contributes to water conservation by shading water bodies, reducing evaporation by 30-60%.
2. Large scale projects demonstrate saving nearly 19.5 million cubic meters of water per year addressing India's water scarcity challenge.

Economic Considerations

1. FSPV systems are approximately 25% more expensive upfront than land-based solar due to floating structures, anchoring, and waterproofing.
2. However, higher efficiency, land savings, water conservation, reduced transmission costs, and hybrid integration improve long-term financial viability.

3.Advantages of FSPV over Ground-Mounted Solar

Land-Use Advantages

1. FSPV uses water surfaces with typically low competing demands reducing land acquisition challenges and social conflicts.
2. Ground-mounted solar systems require three to four times more area per megawatt than panels themselves occupy.
3. Land acquisition for ground-mounted solar is costly, prone to conflict with agriculture and habitation creating persistent bottlenecks.

Enhanced Energy Performance

1. Water bodies provide cooling effect on PV modules reducing operating temperatures and potentially increasing energy yield.
2. Cooler temperatures improve solar panel efficiency and extend panel lifespan.

Synergy with Hydropower

1. FSPV can be co-located with hydropower reservoirs allowing shared infrastructure and enabling hybrid generation strategies.
2. Hybrid FSPV-hydropower systems provide complementary generation profiles enhancing grid reliability.

4.India's Energy Targets and FSPV Contribution

Emissions Intensity Reduction

1. India committed to reducing emissions intensity (CO_2 per unit of GDP) by 47% by 2035 from 2005 levels.
2. India already reduced emissions intensity by about 36% between 2005 and 2020 showing progress.

Non-Fossil Fuel Capacity Expansion

1. India committed to achieving 60% of installed electric power capacity from non-fossil fuel sources by 2035.
2. India already achieved more than 50% non-fossil fuel capacity by 2026 ahead of earlier targets.

Carbon Sink Creation

1. India committed to creating carbon sink of 3.5 to 4 billion tonnes of CO_2 equivalent through forest and tree cover by 2035.

Challenges

1. System reliability concerns from wave-induced stress and environmental uncertainties require robust engineering solutions.
2. Lack of long-term performance datasets limits investor confidence and project planning accuracy.
3. Environmental impact assessments on aquatic ecosystems needs rigorous evaluation.
4. Specialized maintenance requirements compared to ground-mounted systems increase operational complexity.

5.Way Forward

1. **Dedicated Solar Potential Portal** - NISE committed to developing dedicated Solar Potential Portal enabling informed, transparent, and actionable planning.
2. **Integration with National Energy Planning** - Periodic assessments linked to national and state energy planning frameworks enabling prioritization of high-potential zones for ultra-mega solar parks.
3. **Policy Support** - Develop dedicated FSPV guidelines and financial mechanisms supporting large-scale deployment.

Source - **https -//www.thehindu.com/news/national/indias-reservoirs-can-host-102-gw-of-floating-solar-says-first-national-assessment/article71085769.ece**