



SOLAR & WIND PROJECT DEVELOPMENT

UTILITY-SCALE RENEWABLE INFRASTRUCTURE PLATFORMS



PREPARED FOR CORPORATE LEADERS & CLIMATE-TECH STAKEHOLDERS

Solar & Wind

Solar & Wind Power Project Development

This section provides key inputs on the Indian Solar & Wind Power Project Development Opportunities for corporate leaders.

Highlights

- Strong capacity addition opportunity driven by national RE targets, competitive tenders, and increasing corporate procurement of green power via open access, GTAM, and bilateral structures
- Attractive long-duration returns supported by declining build costs, maturing PPA frameworks, and demand visibility from utilities and C&I consumers
- Development capabilities becoming key bottlenecks across land aggregation, permitting, grid connectivity, financing, PPA contracting, and resource/variability risk management
- Portfolio scale and financing sophistication emerging as differentiators as developers aggregate multi-site assets and utilize structured equity/debt solutions
- Ecosystem collaboration increasing with strategic investors, OEMs, DISCOMs, and energy traders as markets transition toward hybrid, RTC, and storage-linked tenders

Key recommendations for corporate leaders include:

- Pursuing platform-based entry through acquisition or JV structures to gain development capabilities in land, grid, and PPA contracting
- Build portfolio aggregation strategies across hybrid, RTC, and storage-enhanced assets to unlock improved risk-weighted returns
- Develop differentiated commercialization pathways via C&I open access, corporate PPAs, and green attribute monetization (RECs/GTAM/carbon credits) to improve price realization beyond regulated tariffs

Opportunity Snapshot: Solar & Wind Power Projects Development

Develops, owns, and operates renewable energy assets generating revenue via power sales.

Market Signal

- **Massive capacity buildouts** with annual additions of 35-50 GW solar and 10-15 GW wind
- Shift toward **RTC (round-the-clock) and hybrid projects**
- **Annual Market size by 2030:** 2,00,000- 2,50,000 ₹ Cr



What Makes or Breaks It?

- **Payment security** through long term PPA's with reliable counterparties
- **Access to low-cost capital** (debt + equity) to improve project IRRs
- **Execution capability** in land acquisition, approvals, and grid connectivity

Why It Matters NOW?

- Strong demand from **DISCOMs & corporates**
- **Net-zero commitments** driving C&I renewable procurement (open access)
- **Hybrid and storage integration** improving grid reliability & returns



Well Aligned Opportunity for

- **Independent Power Producers (IPPs)**
- **Infrastructure funds / sovereign wealth funds**
- **Large corporates** (captive renewable consumption)



Key Challenges

- Land acquisition and permitting delays
- **DISCOM payment delays** causing counterparty risks
- **High capital intensity with long gestation periods**



Business Model

- Participate in SECI/NTPC auctions for utility-scale projects
- Develop C&I open access projects for corporate clients
- Building of hybrid portfolios (solar + wind + storage)

Introduction and Business Case

Project developers are the owners of India’s renewable energy assets, responsible for land acquisition, permits, financing, design, construction and operation. They convert policy targets into bankable projects, driving long-term cash flows through power purchase agreements (PPAs).

For India, solar and wind project developers are central to achieving the 500 GW renewable target by 2030, reducing fossil dependence and meeting corporate and utility demand for round-the-clock green power.

A wide variety of business stakeholders across India have invested in becoming renewable energy developers.

Market Potential for Solar & Wind Power Project Development in India

Year	Market Size (₹ Cr)	Capacity Outlook	Drivers
2025	1,25,000-1,50,000	30-35 GW annual installs	SECI/NTPC auctions, C&I demand, hybrid projects.
2030	2,00,000-2,30,000	50-60 GW annual installs	500 GW RE target, RTC RE PPAs, storage integration.
2040	3,00,000-3,50,000	75-80 GW annual installs	Net Zero 2070 pathway, green hydrogen hubs, export-linked clusters.

Market Segments and Applications

Segment	Applications	Business Model	Key Drivers
Utility-scale solar power projects	Large ground-mounted solar parks (100 MW–5 GW+)	Long-term PPAs, auctions	Core volume driver
Onshore & offshore wind power projects	Wind farms (50 MW–1 GW+) & Fixed-bottom & floating offshore wind farms	PPAs, merchant + PPA & Contracts for Difference, PPAs	Stable, mature segment with repowering upside & High-barrier, high-capex, long-term value
Hybrid renewable projects	Co-located solar + wind plants	Hybrid PPAs	Better land & grid utilization
Solar + battery	Grid-scale storage,	Capacity	Storage becoming

storage projects	peak shifting	payments, PPAs	mandatory
C&I captive / open-access projects	Captive solar & wind plants	Captive PPAs, Open Access	High-margin, sticky customers
Floating solar projects	Reservoirs, dams, water bodies	PPAs	Solves land constraints
Green hydrogen-linked projects	Renewable supply to electrolysers	Long-term supply contracts	Emerging large-scale demand
Public-sector renewable programs	National renewable missions	Tenders, PPAs	Policy-driven scale
Data center & hyperscale power	24x7 clean power for Data Centers	Long term PPAs	High-credit, premium pricing
Portfolio acquisition & platform build-up	Buying operating & pipeline assets	M&A, asset recycling	Scale & capital efficiency

Typical Project Capacities & Investments Required in India

Project Type	Typical Capacity	Indicative All-in CapEx (₹ Cr/MW)	Program Size (₹ Cr)
Utility-Scale Solar PV (fixed/trackers)	50-500 MWp	3.6-4.5	180-2,250
Onshore Wind (2-4 MW turbines)	50-300 MW	6.5-8.0	325-2,400
Co-located Solar-Wind Hybrids	100-800 MW	4.6-6.2 (blend)	460-4,960
Solar + BESS Hybrids (0.5-2 h)	50-300 MW + BESS	PV: 3.8-4.6; BESS: 3.2-4.8/kWh	PV + ₹80-320 Cr (25-70 MWh)
Solar Parks (developer-led cluster)	500-2,000 MWp	3.4-4.2	1,700-8,400
C&I Open Access / Group Captive	5-50 MWp	3.8-4.8	19-240

Underlying Technologies & Processes

Element	Options	Key Traits
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Solar PV	Utility-scale ground-mount, floating solar	Proven, low LCOE; floating solar saves land.
Wind power	Onshore wind (2-5 MW turbines), offshore (early-stage)	Onshore mature; offshore emerging with high potential.
Hybrid projects	Solar + wind + BESS	Firm, dispatchable RE; aligns with RTC tenders.
Project development	Land acquisition, permits, PPA structuring, EPC tie-ups	Determines bankability and execution speed.
Financing models	Corporate PPAs, SECI/state PPAs, InvITs	Long-term visibility; attracts global capital.
Digital enablement	SCADA, AI-based forecasting, digital twins	Improves yield, reduces curtailment, enhances IRR.
Energy Trading & Markets	LFP, NMC, flow batteries, LDES (emerging)	Enables peak pricing, arbitrage, grid services; improves dispatchability and merchant optionality
Grid Interconnection	Substations, ISTS/STS connectivity, SLDC integration	Determines curtailment, scheduling penalties, and PPA bankability; often the key bottleneck
Storage System (BESS)	LFP, NMC, flow batteries, LDES (emerging)	Enables peak pricing, arbitrage, grid services; improves dispatchability and merchant optionality

Key Challenges

Challenge Area	Key Issues	Business Impact	India Specific	Strategic Implications
Land Acquisition & Grid Connectivity Constraints	Securing contiguous land parcels and timely grid evacuation approvals	Project delays, increased development costs, risk of stranded assets	State-level land policies, transmission bottlenecks, high congestion in RE hubs (Rajasthan, Gujarat, Tamil Nadu)	Early-stage site diligence and strong grid intelligence essential
Offtaker & Contractual Risk (DISCOM / Corporate PPAs)	Payment delays, curtailment risk, PPA renegotiation concerns	Revenue uncertainty and financing challenges	DISCOM financial health, policy variability across states, evolving open-access regulations	Diversified offtaker mix and strong contract structuring required
Financing & Capital Intensity	High upfront development capital, long	Balance sheet pressure and slower scaling	Rising interest rates, currency risk for imported	Platform-scale portfolios and innovative

	gestation periods, refinancing dependence		components, evolving green finance landscape	financing structures critical
Supply Chain & Technology Timing Risk	Module/turbine price volatility, technology upgrades, domestic content rules	Cost escalation or suboptimal technology selection	ALMM mandates, localization push, geopolitical dependencies on imports	Strategic procurement timing and supplier partnerships needed
Policy Uncertainty & Regional Execution Complexity	Changing regulations, approval delays, and state-specific compliance requirements	Development pipeline unpredictability	Variations in open access charges, land norms, and incentives across states	Policy monitoring and geographic diversification become strategic advantages

Prominent Players in the Indian Market

Company / Entity	Focus Areas
Adani Green Energy	India's largest RE developer; >10 GW operational, >15 GW pipeline.
ReNew Power (ReNew Energy Global)	Utility-scale solar, wind, hybrid and storage projects nationwide.
Tata Power Renewable Energy	C&I and utility RE development; >4 GW operational capacity.
Azure Power	Utility-scale solar parks; early entrant with SECI and state PPAs.
Greenko Group	RE + pumped hydro hybrids; 50 GWh storage-linked projects by 2030.
NTPC Renewable Energy Ltd.	State-owned RE developer; large utility-scale projects.
JSW Energy	Scaling the renewable pipeline across solar, wind and hybrids.
Sembcorp Green Infra	Singapore-backed developer with multi-GW wind/solar portfolio.
Suzlon Energy	A veteran in wind turbine manufacturing and hybrid solutions
Inox Wind	Wind turbine manufacturer with high demand
Vestas India & Siemens Gamesa	Global turbine manufacturers with strong Indian presence
GE Renewable Energy	Key international player in wind

CleanMax and Fourth Partner	RE developer focussed on C&I
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Innovation Perspectives

Innovation	Business Opportunity	For Senior Management
From MW deployment to firm power delivery	RTC / firm renewable power platforms	Enables premium PPAs vs auction tariffs
Hybrid-first development strategy	Co-located solar + wind projects	Better land & grid utilization, higher PLF
Storage-led project development	Solar/Wind + BESS-led projects	Storage unlocks new revenue streams
Offshore & floating wind specialization	Focused offshore wind platforms	High-entry-barrier, long-life assets
Green hydrogen-linked renewables	Dedicated RE-to-H ₂ power blocks	Strategic optionality for next decade
Data-center & hyperscaler solutions	Customized firm power for data centers	High-credit, long-term customers
Floating solar & water-energy nexus	Reservoir-based solar + hydro hybrids	Unlocks new geographies
Digital-first development & operations	AI-led forecasting, predictive ops	Improves IRR over asset life
Portfolio-based customer solutions	Multi-country, multi-asset PPAs	Sticky, long-term relationships
Corporate decarbonization platforms	End-to-end corporate PPA + ESG solution	Moves sales to CFO/Board level

Concentric & Satellite Opportunities

- Land & community consent platforms: Digital title diligence, drone surveys and benefit-sharing toolkits that compress NTP timelines and de-risk disputes.
- Grid & market analytics engines: AI tools co-optimising site selection, curtailment risk and RTC/peak bids with BESS sizing.
- Hybridisation & repowering studios: Packages to add BESS or repower wind, lifting CUF and unlocking new revenues without new land.
- ESG & biodiversity services: Avifauna/CRZ assessments, mitigation design and continuous monitoring for permits and lender compliance.

- Localised logistics & heavy-lift pools: Blade/tower transport adapters, shared crane fleets and monsoon-proof execution playbooks.
- Performance & warranty intelligence: Drone thermography, SCADA twins and claim analytics to defend PR/PLF and reduce O&M drift.
- Corporate PPA marketplaces: Structured OA/group-captive match-making with standard contracts, payment security and REC/ICM stacking.
- Floating solar anchors/Offshore wind buoys: Modular mooring for reservoirs/canals; Wave/current sensors for monopile/site feasibility.

Key Takeaway for Senior Management

Takeaway	Details
Shift from capacity developer → reliable clean energy solution provider	<p>Compete on firm, reliable power and decarbonization outcomes—not lowest tariffs</p> <p>Why: Value is migrating from “capacity installed” to energy delivered, dispatchability, and carbon outcome guarantees.</p> <p>Examples: SECI Round-the-Clock (RTC) tenders; Peak power tenders; C&I buyers demanding 24×7 RE supply; hybrid PPAs.</p> <p>Competitor shift: Developers differentiate on firm power, integration, and availability, not just lowest tariff bids.</p> <p>That is: Corporate buyers pay premium for reliable delivery + carbon outcomes, not just electricity</p>
Storage is no longer optional	<p>Future-proof portfolios by embedding storage and dispatch capability early</p> <p>Why: Curtailment, scheduling/imbalance penalties, and RTC tenders are making storage a standard design element.</p> <p>Examples: BESS paired with wind/solar; DC/AC coupling; co-located battery sites; storage-based ancillary services.</p> <p>Investor implication: Storage adds optional revenue stack — peak pricing, arbitrage, grid services, reduction in deviation penalties.</p> <p>That is: Storage makes portfolios future-proof and merchant-ready as India moves toward market-based dispatch</p>
Corporate PPAs are a strategic growth engine	<p>Move from auction dependence to long-term, high-credit corporate customers</p> <p>Why: C&I buyers are decarbonizing voluntarily to meet CBAM/SBTi/RE100/ESG pressures.</p> <p>Examples: Open Access, Group Captive, Direct Bilateral PPAs, Virtual/Financial PPAs (emerging), Green Attribute bundles.</p> <p>Investor advantage: High-credit corporate offtakers unlock premium pricing vs regulated auctions and reduce counterparty risk.</p> <p>That is: Corporate PPAs reduce tender dependence and enable long-term platform scaling</p>

<p>Offshore wind and hydrogen are selective bets</p>	<p>Offshore wind and hydrogen are selective bets Why: These sectors require capex-heavy infrastructure, OEM specialization, policy certainty and global partnerships, unsuitable for broad-based deployment. Examples: Offshore requires subsea cables, foundations, marine EPC; hydrogen requires electrolyzers + ammonia/fuels + storage. Strategic approach: Best entered via JV/acquisitions, not greenfield. That is: These are optionality investments for corporates with balance sheet strength, not growth plays applicable to all.</p>
<p>Data and digital tools lift lifetime IRR</p>	<p>Forecasting, optimization, and predictive O&M materially improve asset value Why: Digital improves Plant Load Factor(PLF), availability, and risk-adjusted returns across the lifecycle. Examples: Forecasting engines, optimization tools, digital twins, predictive maintenance, PLF benchmarking, curtailment analytics. Investor relevance: Uplifts IRR through yield gains, O&M cost reduction, and lifetime degradation management. That is: Digital transforms renewables from static infrastructure plays into optimized financial assets.</p>

Next Steps for Corporate Leaders

Solar and wind project development is accelerating as corporates pursue decarbonization, RE100 commitments, and long-term cost visibility through captive, group captive, and open access models. Development pipelines are maturing across land banking, interconnection studies, permitting, financing, and PPA origination, while policy evolution and storage economics shape the next wave of firm/dispatchable clean power offerings.

This could be an attractive climate tech opportunity for industries and firms in specific sectors and industries keen on catering to this fast growing market.

Connect with Team EAI to know more about this opportunity and take your corporate's initial steps. Send a note to consult@eai.in or talk to Muthukrishnan - 9952910083