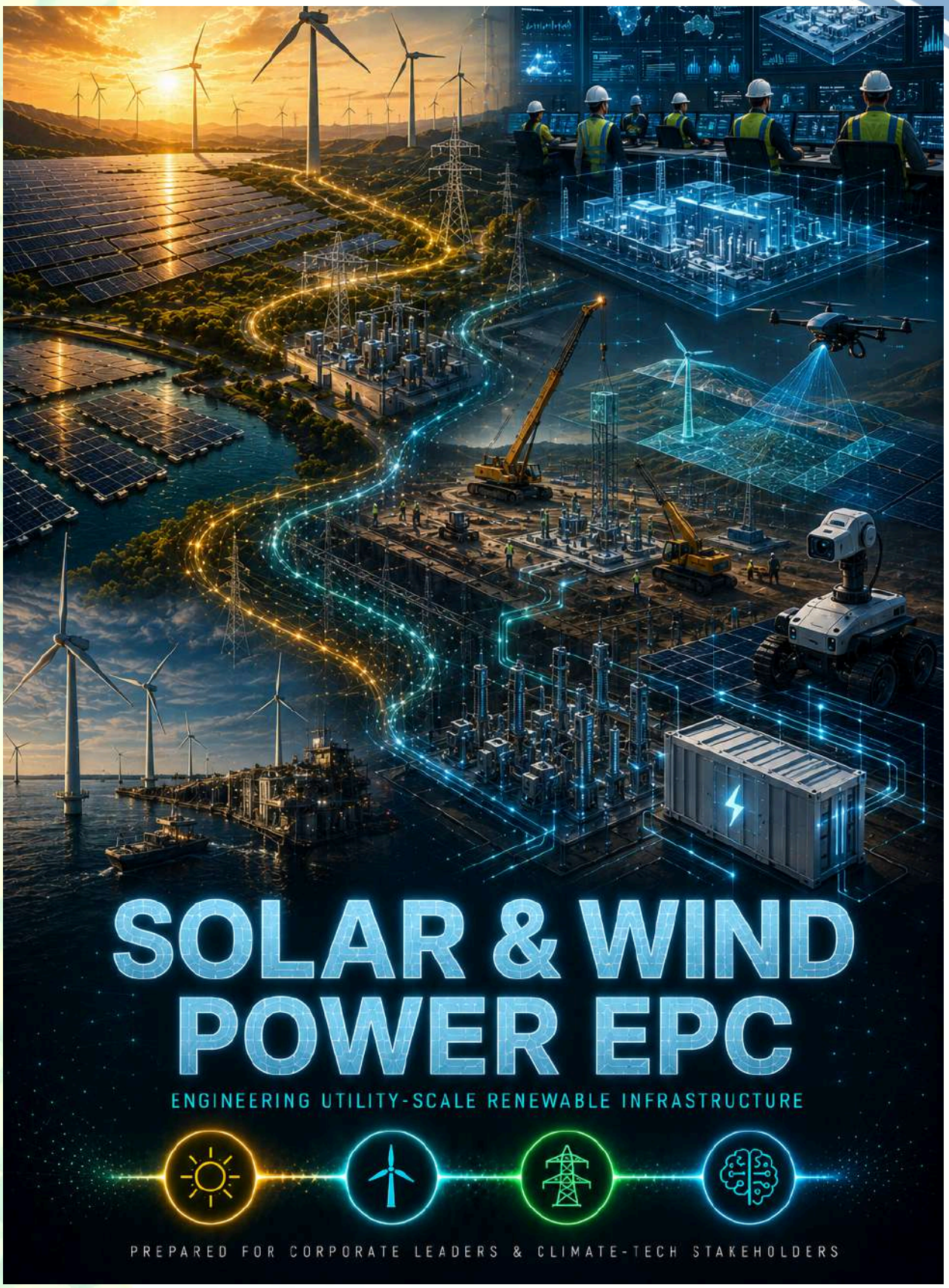
SOLAR & WIND
POWER EPC
ENGINEERING UTILITY-SCALE RENEWABLE INFRASTRUCTURE
PREPARED FOR CORPORATE LEADERS & CLIMATE-TECH STAKEHOLDERS

Solar & Wind

Solar & Wind Power EPC

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

Opportunity Snapshot: Solar & Wind Power EPC

Designs and builds renewable energy projects from procurement to commissioning.

Market Signal

- **Massive project pipeline**, as India targeting 500GW non fossil capacity by 2030
- Growth driven by utility-scale+ hybrid+ RTC projects
- **Annual Market size by 2030:** 30,000- 35,000 ₹ Cr

What Makes or Breaks It?

- **Execution capability at scale** (multi-GW projects, strict timelines)
- **Strong procurement network** (modules, turbines, BoS components)

Why It Matters NOW?

- **Strong pipeline** of large-scale solar parks, wind farms, hybrid projects
- Shift toward **round-the-clock (RTC)** renewable projects increasing EPC complexity
- Increasing private sector participation + developer activity

Well Aligned Opportunity for

- **Infrastructure & construction companies**
- **Existing EPC** contractors scaling into renewables
- **Integrated developers** (IPP + EPC capability)

Key Challenges

- **Margin pressure** due to intense bidding competition
- **Execution challenges:** land acquisition, approvals, supply chain delays
- **Working capital intensity** due to long project cycles

Business Model

- EPC contracts with utility-scale developers (SECI, NTPC, private IPPs)
- Hybrid project execution (solar + wind + storage)
- Strategic partnerships with equipment suppliers + developers

Introduction and Business Case

Engineering, Procurement and Construction (EPC) companies are the execution backbone of India's renewable energy build-out. They deliver utility-scale solar and wind farms, integrating design, procurement, construction and commissioning into bankable assets.

For India, EPC firms implementing solar and wind power plants are critical to meeting the 500 GW renewable targets by 2030, ensuring timely, cost-efficient delivery and enabling hybrid + storage integration. With global capital pouring into RE, strong EPC capacity is a strategic enabler of scale and competitiveness.

Not surprisingly, the Indian renewable energy EPC segment has seen tremendous growth supported by corporate and entrepreneur interest.

Market Potential for Solar & Wind Power EPC in India

Year	Market Size(₹ Cr) - Net revenues	Capacity Outlook	Drivers
2025	15,000-20,000	30-35 GW annual installs	SECI/NTPC auctions, C&I solar demand.
2030	30,000-35,000	50-60 GW annual installs	500 GW RE target, hybrids, RTC tenders.
2040	50,000-60,000	75-80 GW annual installs	Net Zero 2070 pathway, export-led RE clusters.

Market Segments and Applications

Segment	Applications	Business Model	Key Drivers
Utility-scale solar power plants	Large ground-mounted solar parks (100 MW–5 GW+)	EPC, EPC + O&M, EPC + financing support	Largest EPC volume driver
Onshore wind farms	Large wind farms (50 MW–1 GW+)	EPC, EPCM, OEM-led EPC	Core wind EPC segment
Offshore wind farms	Fixed-bottom and floating offshore wind projects	EPC, EPCM, multi-contract	High-margin, high-barrier, fastest-growing wind segment

Hybrid renewable projects	Solar + wind co-located plants	EPC, turnkey hybrid	Optimizes land & transmission; growing rapidly
RTC / Firm renewable power projects	Round-the-clock renewable supply	EPC + long-term O&M	Key to replacing fossil baseload
Solar + battery storage projects	Grid-scale storage, peak shaving	EPC, EPC + performance guarantees	Storage is becoming mandatory in new EPC scopes
Commercial & Industrial (C&I) captive plants	Captive solar/wind for factories & campuses	EPC, EPC + wheeling support	High-margin, repeat corporate customers
Distributed & rooftop solar	Rooftop PV for buildings	EPC, RESCO	High volume, lower ticket size
Repowering & life extension	Wind turbine upgrades, solar revamps	EPC	Cost-effective capacity increase
Government & public sector projects	National solar/wind programs	EPC	Policy-driven scale creation

Typical Project Capacities & Investments Required in India

Project Type	Typical Capacity	Indicative EPC Cost (₹ Cr/MW)	All-in CapEx (₹ Cr)
Utility-scale Solar PV (fixed-tilt / seasonal tilt)	50-500 MWp	3.3-3.8	165-1,900
Utility-scale Solar PV (single-axis tracker)	50-500 MWp	3.7-4.3	185-2,150
Hybrid Solar + Wind (co-located)	100-800 MW	4.0-5.0 (blend)	400-4,000
Onshore Wind (2-4 MW turbines)	50-300 MW	6.0-7.5	300-2,250
Solar + BESS (0.5-2 hours)	50-300 MW + 25-300 MWh	PV: 3.5-4.2; BESS: 3.0-4.5 /kWh	PV + ₹75-270 Cr (for 25-60 MWh)
Wind Repowering (legacy 250-1,000 kW)	50-150 MW	5.5-7.0	275-1,050
C&I Solar (ground/carport)	5-50 MWp	3.5-4.2	18-210

Underlying Technologies & Processes

Element	Options	Key Traits
Solar EPC	Fixed-tilt, single-axis tracking PV farms; rooftop EPC	Drives LCOE; trackers improve yield 15-20%.
Wind EPC	Onshore wind farms; hybrid wind-solar integration	Site-specific logistics; turbine OEM partnerships key.
Hybrid EPC	Solar + wind + BESS	Ensures round-the-clock renewable supply.
Construction processes	Module mounting, cabling, turbine erection	Speed and cost control critical for IRR.
Digital enablement	Drones, AI-based site monitoring, SCADA systems	Improves construction speed, O&M efficiency.
O&M services	Predictive maintenance, cleaning robots, digital twins	Long-term asset reliability and IRR enhancement.
Hybrid Solar-Battery Systems	PV + BESS (DC-coupled / AC-coupled)	Supports energy smoothing, curtailment reduction, higher renewable penetration
SCADA & Forecasting Systems	Weather, load, and generation forecasting	Mandatory for grid compliance; reduces imbalance charges; improves scheduling accuracy
Substation & Evacuation Infra	Step-up substations, transmission lines, pooling stations	Often the bottleneck; determines project viability & commissioning timelines
Asset Performance Management (APM)	Predictive analytics, alarms, degradation tracking	Improves uptime, reduces O&M costs, extends asset life, increases IRR
Repowering & Retrofit	Turbine repowering, inverter replacement, module upgrades	Extends life and boosts output for aging assets, particularly in wind-heavy states

Key Challenges

Challenge Area	Key Issues	Business Impact	India Specific	Strategic Implications
Margin	Aggressive tariff	Reduced	Reverse	Need

Compression & Competitive Bidding Pressure	discovery leading to cost-driven EPC awards; commoditization of EPC services	profitability and working capital strain	auctions by SECI/NTPC; large developer bargaining power	differentiation via engineering, hybridization, lifecycle services
Supply Chain Volatility & Localization Policies	Module/turbine price fluctuations, logistics disruptions, dependency on imports	Project cost overruns and execution delays	ALMM requirements, import duties, domestic manufacturing transition, geopolitical tensions	Strategic procurement planning and supplier diversification essential
Land, Grid Connectivity & Regional Execution Complexity	Land acquisition delays, transmission availability, evacuation constraints	Project timeline risks and cost escalation	State-specific policies, grid congestion in high RE states (Rajasthan, Gujarat, Tamil Nadu)	Early-stage site diligence and grid intelligence critical
Offtaker Risk & Payment Delays	DISCOM financial health affecting payments; contract renegotiation risks	Cash flow uncertainty and financing challenges	State DISCOM payment cycles; curtailment risks; policy changes	Strong counterparty assessment and contract structuring required
Capital Intensity, Execution Risk & Working Capital Needs	Large upfront procurement costs, performance guarantees, and construction risks	Balance sheet pressure for EPC firms	Increasing performance requirements, bank guarantee burdens, rising financing costs	Asset-light models, strategic partnerships, and digital project management needed

Prominent Players in the Indian Market

Company / Entity	Focus Areas
Sterling & Wilson Renewable Energy	India's largest RE EPC; >10 GW solar executed globally.
Tata Power Solar	EPC for large-scale solar + rooftop; integrated modules to projects.

L&T Construction (Power Transmission & Distribution)	Large utility-scale solar, wind and hybrid RE parks.
Adani Infra	In-house EPC for Adani Green's massive RE pipeline.
Mahindra Susten	EPC & Operations & Maintenance (O&M) services.
Shapoorji Pallonji Infra	Solar EPC in India and international markets.
Avaada / ReNew / Azure	Developer-EPC hybrids executing RE parks.
Saatvik Green Energy	Gaining prominence for its high-efficiency modules and growing EPC presence for commercial and industrial projects
Bondada Engineering	Emerging as a notable player in solar project execution
Suzlon Energy	A major Indian wind turbine manufacturer and EPC provider
Vestas India & Siemens Gamesa	Global leaders with strong Indian footprints in wind
Inox Wind	Another significant player in the wind energy sector

Innovation Perspectives

Innovation	Business Opportunity	For Senior Management
From EPC to Energy-Infrastructure Integrator	End-to-end delivery: generation + storage + evacuation + grid services	Controls project outcomes, not just construction
Hybrid & RTC-Focused EPC	Premium EPC for firm, dispatchable renewable power	Utilities want reliability, not just MW
Grid-First EPC Strategy	EPC for substations, transmission, STATCOM, HVDC	Grid EPC is becoming higher value than generation EPC
Asset Aggregation & Portfolio EPC	Portfolio-based EPC for IPPs & corporates	Reduces execution risk & cost volatility
Offshore & Floating Wind Specialization	High-margin, high-barrier EPC niche	Limited capable EPCs globally
EPC + Financing Enablement	EPCs offering bankability support	Faster financial closures
Digital EPC & AI-Led Execution	AI-based scheduling, procurement, quality control	Cuts delays & cost overruns
Floating Solar & Hybrid	EPC for floating solar + hydro	Unlocks new geographies

Water-Energy Systems	hybrids	
Localized Manufacturing-Linked EPC	EPC + supply chain localization	Policy alignment & cost advantage
Energy Transition EPC (Hydrogen-Linked)	EPC for integrated RE-to-H_2 systems	Early mover advantage in H_2

Concentric & Satellite Opportunities

- Land aggregation & social-license firms: Concentric specialists securing contiguous parcels, community buy-in and expedited permits for faster NTP.
- Foundation & geotech innovators: Rapid piling, micro-pile and rock anchor systems reducing civil cost and monsoon risk.
- Erections & heavy-lift logistics networks: Crane pools, blade transport adapters and just-in-time sequencing to compress schedules.
- SCADA/analytics & digital twins: Satellite platforms driving PR/PLF uplift, predictive maintenance and warranty claim intelligence.
- Spare-parts localisation & service hubs: Gearboxes, blades, inverters and trackers with regional depots for <72-hr MTTR.
- Hybridisation & BESS integrators: Adding storage/STATCOMs for peak/ancillary revenues and grid-code compliance.
- Repowering & decommissioning services: Asset recycling, resale of components and environmental compliance at end-of-life.
- Green finance & insurance products: Performance wraps, curtailment cover and FX hedges packaged for EPC + IPP portfolios.

Key Takeaway for Senior Management

Takeaway	**Details**
EPC is no longer a build-only business	Competitive advantage now lies in integration (grid, storage, hybrids), not just construction capability **Why**: Customers and regulators are demanding integrated outcomes (dispatchability, grid compliance, land+evacuation, forecasting), not just MW installed. **Sub-component**s: grid interconnection, SCADA integration, storage coupling, hybrid plant layout, substation works, transmission coordination. **Examples**: SECI's RTC & peak power tenders require solar + wind + BESS integration; DISCOMs require forecasting & scheduling compliance; C&I buyers require metering + billing + open access paperwork.
Value pools have shifted	Grid EPC, hybrid/RTC projects, and lifecycle services offer higher

away from pure MW installation	and more durable returns **Why**: EPC margins are decreasing (commoditization + bid competition + performance guarantees); returns are higher in adjacent areas. **High-value area**s: grid EPC, hybrid/RTC projects, evacuation infra, storage EPC, O&M, repowering, digital asset management. **Examples**: Grid EPC has higher barriers (permits, SLDC coordination, ROW, safety compliance); O&M contracts deliver multi-year annuity revenue; repowering older wind assets provides high IRR.
Capability fit matters more than market size	Focus on areas where existing strengths can be leveraged quickly **Why**: Renewable EPC TAM is large, but competitive advantage depends on capability overlap (not TAM alone). **Examples of capability fit**: • companies with electrical BOP expertise excel in grid EPC • companies with logistics + crane + heavy civil experience migrate into wind EPC • companies with digital + controls excel in hybrid storage projects **That is**: Winning is about adjacency leverage, not broad diversification.
Partnerships are a strategy, not a weakness	Offshore wind, storage-heavy EPC, and hydrogen require JV/acquisition-led entry **Why**: Certain segments require OEM licensing, certification, or global partners — not feasible to build entirely in-house. **Examples**: • Offshore wind EPC: requires partnerships with turbine OEMs + marine contractors (e.g., DEME, Van Oord) • Storage EPC: needs integrators for BESS, PCS, EMS (e.g., Fluence, Wärtsilä, Sungrow) • Hydrogen-linked renewables: requires electrolyzer OEM + ammonia/biofuel offtake partners
Digital and grid expertise are future moats	Software, data, and grid integration skills will differentiate EPCs **Why**: Future competitive differentiation sits in performance + availability + compliance rather than pure construction. **Digital stack examples**: predictive O&M, digital twins, IV curve analytics, SCADA, EMS, drone QA/QC, automated bid/forecasting tools. **Grid expertise components**: load flow modeling, protection systems, scheduling/forecasting compliance, metering, SLDC protocols, dispatch coordination.
Regulatory literacy is becoming operationally critical	**Why**: Execution is bottlenecked by interconnection, open access rules, grid codes, and scheduling penalties — not module supply. **Sub-components**: land conversion rules, open access approvals, banking rules, REC/attribute eligibility, SLDC interface, PPA clauses, deviation penalties, SCADA mandates. **Examples**: Peak & RTC tenders penalize under-generation; C&I

	open access varies by state; hybrid PPAs require specific injection compliance. **That is**: EPC teams without policy competence risk commissioning & payment delays.
Lifecycle monetization opportunities are expanding	**Why**: Post-completion phases offer recurring revenue and IRR enhancement for project operators. **Sub-components & monetizable items**: • O&M contracts (10–25 years) • predictive maintenance services • repowering / component retrofits • digital asset management platforms • warranty & performance assurance **Examples**: Wind repowering in Tamil Nadu; robotic PV cleaning in arid regions; digital twins improving dispatch & degradation models. **That is:** Lifecycle services convert EPC from a transactional to a platform revenue business

Next Steps for Corporate Leaders

Solar and wind EPC markets are expanding as corporate clean energy demand grows through captive projects, group captive structures, open-access PPAs, and utility-scale procurement. EPC capabilities are maturing across engineering design, procurement, logistics, construction, and O&M, while supply chains continue to adapt to localization mandates, quality expectations, and asset lifecycle requirements.

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