

# Strategic Factory Placement in Maharashtra: Capturing India's Commercial and Industrial Solar Market

A Feasibility Framework for Local Module Manufacturing

Content Partner: J. v. G. technology GmbH

*Turnkey solar module production lines — since 1997*

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# Technical Overview: Strategic Factory Placement for Maharashtra's C&I Solar Market



Created as part of the PVKnowHow Knowledge Network



Prepared by J.v.G. Technology GmbH



European specialists in turnkey solar module production lines

# Key Project Data

**25–50 ...**

## Annual Capacity

Target scale for semi-automated flexible module manufacturing

**C&I**

## Market Focus

Commercial & Industrial rooftop solar — factories, warehouses, offices

**9–12 mo**


## Ramp-Up Period

Estimated time from factory setup to full production capacity

**MH**

## Target Region

Maharashtra, India — Mumbai-Pune industrial corridor

 Factory type: Semi-automated / flexible module manufacturing · Market: C&I rooftop solar · Source: PVKnowHow / J.v.G. Technology GmbH

# India Rooftop Solar: Market Context

## Growth Trajectory

- Cumulative rooftop solar capacity reached 13.7 GW at end of 2024
- Record 3.2 GW installed in 2024 — highest single-year figure to date
- Market projected to grow at ~28% CAGR through 2034
- National target: 40 GW rooftop solar by 2026; 500 GW total renewables by 2030

## C&I Segment Position

- C&I sector accounts for ~60–75% of rooftop solar installations
- Solar LCOE as low as ₹2–3/kWh vs. industrial grid tariff of ₹7–9/kWh
- Large creditworthy segment maturing; MSMEs represent the next growth wave
- Driven by economics, not subsidies — business owners seek energy independence

# The C&I Rooftop Opportunity

## Market Driver

- Not driven by government tenders — driven by direct business economics
- High industrial grid tariffs create compelling payback case
- Time-of-Day (ToD) tariff regime mandated from 2025 further accelerates adoption

## Module Requirements

- Non-standard roof spaces require flexible module dimensions
- Higher efficiency technologies (half-cut cell, PERC) maximize W/m<sup>2</sup>
- Robust construction for industrial environments — heat, chemicals, mechanical load

## Manufacturing Implication

- C&I ≠ commodity volume production; quality and adaptability matter more than lowest price
- Flexible, semi-automated lines suited to varied product mix
- Proximity to customer base is a competitive differentiator

# Why Maharashtra: Location Rationale

## Market Proximity

- Maharashtra ranks 2nd nationally in cumulative rooftop solar installations
- Mumbai-Pune corridor: dense concentration of industrial parks, logistics hubs, and corporate campuses
- Core principle: build where the customers are

## Logistics Infrastructure

- JNPT (Jawaharlal Nehru Port Trust) near Mumbai – one of India's largest container ports
- Enables efficient import of solar cells, glass, and encapsulants not yet locally available
- Highway network connects factory to regional suppliers and end customers

## Financial Ecosystem

- Mumbai is India's financial capital – access to banks, PE firms, and investment funds
- Proximity facilitates investor relations, project finance, and working capital structuring
- MSME financing products for solar increasingly available in Maharashtra

# Manufacturing Strategy: Semi-Automated vs. Fully Automated

Criterion	Semi-Automated (25–50 MW)	Fully Automated (100+ MW)
Loading / Unloading	Manual by trained operator	Robotic handling systems
Throughput	~100–300 modules/hour	Up to ~600 modules/hour
Best Suited For	C&I market entry; product mix flexibility	Commodity / high-volume lines
Capital Expenditure	Moderate — lower entry threshold	Higher upfront; lower cost/module at scale
Flexibility	High — multiple module formats possible	Lower — optimized for fixed formats
Ramp-Up Time	9–12 months to full production	12–18 months typical

# Tailored Module Production for C&I Rooftops

## Format Flexibility

- Range of module dimensions to maximize output on non-standard roof spaces
- Semi-automated line supports product mix without retooling downtime
- Glass-backsheet and glass-glass configurations both feasible

## Cell Technology

- Half-cut cell and PERC technology increase  $W/m^2$  — critical for constrained rooftops
- TOPCon-ready configurations available for next-generation efficiency targets
- Technology selection should match local supplier availability and margin targets

## Durability Focus

- Industrial environments require resistance to heat, chemicals, and mechanical stress
- Correct encapsulant selection (EVA, TPO) essential for 25+ year field lifetime
- IEC-compliant lamination and framing process supports certifications required for C&I clients

# Turnkey Factory Implementation: Phase Overview

- 1 — Site Selection & Feasibility**

Maharashtra industrial corridor site assessment — grid, logistics, land  
Financial modelling: capex, opex, projected revenue at 25–50 MW scale
- 2 — Equipment Specification**

Line layout designed by an experienced European turnkey provider  
Semi-automated configuration selected for C&I product mix flexibility
- 3 — Factory Build & Installation**

Civil works, equipment delivery, and installation — typically 4–6 months  
Laminator, stringer, framing, testing equipment integrated as a complete line
- 4 — Commissioning & Training**

On-site team training by turnkey provider — no prior manufacturing experience required  
First production runs and quality validation against IEC standards
- 5 — Ramp-Up to Full Capacity**

Phased production increase to 25–50 MW annual output over 9–12 months  
Ongoing process optimization and local supplier development

# Supply Chain & Logistics Considerations

## Input Supply

- Solar cells: primarily imported (China, Southeast Asia) via JNPT
- Glass and backsheet: mix of imported and domestic procurement possible
- Encapsulants (EVA, TPO), frames, junction boxes: domestic options growing
- JNPT port access reduces lead times and import logistics cost

## Output Distribution

- Maharashtra highway network enables regional customer delivery
- Proximity to industrial customers reduces freight cost and enables faster service
- Local manufacturing avoids import duties on finished modules
- Domestic content supports eligibility under government procurement schemes

# Financial Ecosystem & Investment Access

## Capital Sources

- Mumbai financial hub: direct access to banks, private equity, and investment funds
- Green bonds and solar-linked financing instruments increasingly available
- CAPEX model dominates (88% of installations) – confirms investor appetite for solar assets

## Revenue Visibility

- C&I clients typically purchase on CAPEX basis – predictable order flow for manufacturer
- Long-term PPAs and RESCO structures provide bankable offtake visibility
- High industrial electricity tariffs (₹7-9/kWh) sustain strong demand fundamentals

## Risk Factors

- Grid charge impositions in Maharashtra can affect C&I solar economics – monitor policy
- Module price volatility tied to global cell supply – local content strategy mitigates exposure
- MSME financing still developing – lenders continue to assess rooftop solar risk profiles

# Investment Feasibility Summary

1

## Market Pull

Strong, policy-independent C&I demand — driven by tariff economics and energy independence objectives

2


## Location Advantage

Maharashtra provides logistics, financial, and customer-proximity advantages that are difficult to replicate elsewhere

3

## Proven Concept

A proven turnkey manufacturing concept reduces execution risk — on-site training included, no prior PV manufacturing experience required

 This analysis draws on composite scenarios derived from real project data. All figures should be validated through a formal feasibility study prior to investment commitment.

# About the Content Partner

## **J. v. G. technology GmbH** – The DESERT Company

Founded in 1997 in Bavaria, Germany. Family-owned engineering company specializing in turnkey solar module production lines.

More than 90 factory projects delivered worldwide.

On-site team training included – no prior manufacturing experience required.

### **Key areas:**

Turnkey PV manufacturing lines | DESERT Technology® |  
TÜV-certified module designs | Factory planning to production

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