

# Solar PV Modules

## ANMD-MRS8-071 · Advanced Energy Technologies

### A Global Sustainability Due Diligence & Market Research Study

History 2020–2024 · Base Year 2025 · Forecast 2025–2032 · Outlooks 2035 / 2040 / 2050 · Currency US\$

## WHY THIS REPORT

Solar PV modules are the workhorse of the clean-energy transition — the panel that converts sunlight into electricity and anchors every utility, commercial and rooftop array. This decision-grade study sizes the global market three ways — value, shipped capacity and module area — across cell technology, module format and application, across seven regions and four scenarios to 2032, with outlooks to 2050.

## SUSTAINABILITY & SDG IMPACT — THE ANMD LENS

Sustainability is this report's backbone, not an afterthought. Solar PV modules deliver measurable clean-energy generation, falling cost-per-watt and rising efficiency, while terawatt-era manufacturing and circular module design strengthen the energy-transition story.

### Mapped Sustainable Development Goals:

<b>SDG 7</b> Affordable Clean Energy	<b>SDG 9</b> Industry & Innovation	<b>SDG 11</b> Sustainable Cities	<b>SDG 12</b> Responsible Consumption	<b>SDG 13</b> Climate Action
---	---------------------------------------	-------------------------------------	--	---------------------------------

### Measurable sustainability outcomes assessed:

- Clean-energy generation and avoided emissions
- Falling cost-per-watt and rising efficiency
- Longer warranted lifetimes and bankable yield
- Manufacturing energy, silver/silicon sourcing and module end-of-life recyclability as material risks

**Framework alignment:** Double materiality mapped to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, with greenwashing and SDG-washing screens applied throughout.

## WHAT'S INSIDE AT A GLANCE

<b>53</b> Chapters	<b>9</b> Report Parts	<b>7</b> Regions Covered	<b>40+</b> Country Markets
<b>2025–32</b> Forecast Horizon	<b>4</b> Forward Scenarios	<b>25+</b> Companies Profiled	<b>5</b> SDGs Mapped

## REPORT COVERAGE

**Geographic scope:** North America, Europe, Asia Pacific, Latin America, Africa, Middle East and Rest of World — with named country intelligence. Asia Pacific is the scale engine (China, India, Japan) on manufacturing and deployment; Europe leads on technology and demand (Germany, Spain, Netherlands); North America is the value leader (United States, Canada) on IRA support; other regions assessed on their own merits.

## MARKET OVERVIEW

**From commodity oversupply to technology-differentiated value — where modules go TOPCon, HJT and bifacial glass-glass.**

Solar PV modules are moving from commodity oversupply to a technology-differentiated market. Demand is driven by the global energy transition, record installation pipelines, and policy support across China, Europe, North America and India, even as price compression and trade measures reshape margins. The market is read three ways — value, shipped capacity and module area — and forecast under four scenarios, each region reported separately.

- **Asia Pacific is the scale engine** — China and India, on manufacturing dominance and installation pipelines
- **Europe is the demand leader** — Germany, Spain and the Netherlands, on deployment and trade policy
- **North America is the value leader** — United States, on reshoring, IRA support and premium pricing
- **Technology is the differentiator** — TOPCon and HJT efficiency plus bifacial glass-glass bankability

## REGIONAL OUTLOOK

Across seven reporting regions, the report separates early commercialisation leaders from high-growth and emerging markets — each profiled in full rather than aggregated into Rest of World.

Region	Stage	Lead Markets & Drivers
Asia Pacific	Scale engine	China, India, Japan — manufacturing, deployment
Europe	Technology / demand leader	Germany, Spain, Netherlands — deployment, policy
North America	Value leader	United States, Canada — IRA support, premium pricing
Middle East	High-growth	Saudi Arabia, UAE — utility-scale solar investment
Latin America	Emerging	Brazil, Chile — renewable-energy expansion
Africa	Emerging	South Africa, Egypt — clean-energy access, build-out

## KEY MARKET DRIVERS & RESTRAINTS

Drivers	Restraints
<ul style="list-style-type: none"> <li>• Energy-transition + installation-pipeline convergence</li> <li>• Falling cost-per-watt &amp; rising efficiency</li> <li>• Policy support (IRA, EU targets, India PLI)</li> <li>• Bankability &amp; warranted-yield value</li> <li>• TOPCon, HJT &amp; bifacial technology gains</li> </ul>	<ul style="list-style-type: none"> <li>• Price compression &amp; margin pressure</li> <li>• Trade measures, tariffs &amp; supply-chain localisation</li> <li>• Polysilicon &amp; silver input-cost volatility</li> <li>• Module end-of-life &amp; recyclability gaps</li> <li>• Grid-interconnection &amp; permitting bottlenecks</li> </ul>

## SEGMENTATION SNAPSHOT

<b>By Cell Technology</b>	Mono-PERC · TOPCon · heterojunction (HJT) · thin-film (CdTe / CIGS) · bifacial & specialty
<b>By Module Format</b>	Glass-backsheet · glass-glass bifacial · large-format (182 / 210mm) · high-power (>600W)
<b>By Application</b>	Utility-scale · commercial & industrial · residential · off-grid
<b>By End User</b>	IPPs · utilities · EPCs · C&I owners · households
<b>By Business Model</b>	Module sales · OEM supply · PPA-linked · premium-efficiency
<b>By Scale</b>	Distributed · commercial · utility-scale

## TABLE OF CONTENTS — PARTS & CHAPTERS

The full report is organised into nine parts across 53 chapters, listed below. Detailed sub-headings, country tables and directories are provided in the full report.

### Part I — Report Foundation, Discovery and Strategic Intelligence

- › Chapter 1. Scope, Methodology and Report Architecture
- › Chapter 2. Industry Discovery Summary — Solar PV Modules
- › Chapter 3. Executive Intelligence and Decision Dashboard
- › Chapter 4. Strategic Findings, Materiality and Investment Verdict Preview

### Part II — Market Intelligence, Sizing, Forecasting and Segmentation

- › Chapter 5. Industry Overview and Market Evolution
- › Chapter 6. Market Dynamics
- › Chapter 7. Global Market Size and Forecast, 2020–2032
- › Chapter 8. Market Segmentation Analysis
- › Chapter 9. End-User and Demand-Side Intelligence
- › Chapter 10. Pricing, Cost and Commercial Model Intelligence

### Part III — Regional and Country Intelligence

- › Chapter 11. Global Regional Intelligence Framework
- › Chapter 12. North America Market Intelligence
- › Chapter 13. Europe Market Intelligence
- › Chapter 14. Asia Pacific Market Intelligence
- › Chapter 15. Latin America Market Intelligence
- › Chapter 16. Africa Market Intelligence
- › Chapter 17. Middle East Market Intelligence
- › Chapter 18. Rest of World Market Intelligence

### Part IV — Technology, Innovation and Category-Specific Intelligence

- › Chapter 19. Technology Landscape and Architecture
- › Chapter 20. Emerging and Next-Generation Technology Intelligence
- › Chapter 21. Category-Specific Intelligence Module
- › Chapter 22. Research, Innovation and Funding Landscape

## Part V — Company, Competition, Patent and Project Intelligence

- › Chapter 23. Competitive Landscape
- › Chapter 24. Company Profiles
- › Chapter 25. Mergers, Acquisitions, Partnerships and Ecosystem Intelligence
- › Chapter 26. Patent Landscape and Intellectual Property Intelligence
- › Chapter 27. Project, Deployment and Case-Study Intelligence

## Part VI — Sustainability, ESG, SDG, Climate and Natural-Capital Intelligence

- › Chapter 28. Sustainability Intelligence Suite
- › Chapter 29. ESG Intelligence and Double Materiality
- › Chapter 30. ESG and Sustainability Framework Alignment
- › Chapter 31. SDG Intelligence
- › Chapter 32. Carbon, Net-Zero and Climate-Mitigation Intelligence
- › Chapter 33. Water, Biodiversity and Natural-Capital Intelligence
- › Chapter 34. Circular Economy and Resource-Security Intelligence
- › Chapter 35. Social Impact, Human Capital and Community Intelligence
- › Chapter 36. Climate Risk, Adaptation and Resilience Intelligence

## Part VII — Supply Chain, Policy, Legal, Economics and Finance

- › Chapter 37. Value Chain, Supply Chain and Geopolitical Intelligence
- › Chapter 38. Policy, Regulation and Incentive Intelligence
- › Chapter 39. Legal, Contracting and Risk-Allocation Intelligence
- › Chapter 40. Unit Economics, CAPEX, OPEX and Return Analysis
- › Chapter 41. Investment, Sustainable Finance and Bankability Intelligence

## Part VIII — Scenario, Future Intelligence and Final Due Diligence Verdict

- › Chapter 42. Scenario Analysis and Future Intelligence
- › Chapter 43. Sustainability Due Diligence Framework and Data-Room Index
- › Chapter 44. Risk Register, RAG Rating and Anti-Greenwashing Screen
- › Chapter 45. Bottom-Line Verdict and Strategic Recommendations
- › Chapter 46. Implementation Roadmap and Stakeholder Playbooks

## Part IX — Annexes, Directories and Reference Material

- › Chapter 47. Methodology Annex
- › Chapter 48. Corporate Directory and Company Intelligence Annex
- › Chapter 49. Patent Directory and Patent Intelligence Annex
- › Chapter 50. Project Intelligence Annex
- › Chapter 51. Forecast Annex
- › Chapter 52. Sustainability KPI Annex
- › Chapter 53. Reference Annexes

## COMPETITIVE & INVESTMENT SNAPSHOT

The competitive field spans global clean-energy majors, specialist solar pv modules makers, and emerging innovators. Deal activity — M&A, technology acquisition and platform expansion — signals a market consolidating around scalable, scale, efficiency and bankability.

### Representative players profiled in the full report:

LONGi Green Energy Technology Co., Ltd. · JinkoSolar Holding Co., Ltd. · JA Solar Technology Co., Ltd. · Trina Solar Co., Ltd. · First Solar, Inc. · and 20+ further profiled players across manufacturers, developers and emerging innovators.

**Investment intelligence:** venture, infrastructure, development, climate and blended finance, green bonds and sustainability-linked loans — culminating in a bankability assessment and a Go / No-Go / Conditional-Go investment verdict.

## KEY QUESTIONS THIS REPORT ANSWERS

- ? How large is the global solar pv modules market, and how fast will it grow to 2032?
- ? Which regions, countries and segments offer the strongest risk-adjusted opportunity?
- ? How do efficiency, yield and bankability change project economics versus incumbent technology?
- ? Who leads, and where is the competitive and patent white space?
- ? Is the investment case bankable — and under what conditions?
- ? How does the category align with the SDGs, energy-access and just-transition and disclosure regulation?

## WHY ANMD — THE DIFFERENCE

*Most market studies stop at units and revenue. This report is built as a sustainability due diligence instrument — fusing market sizing with ESG, SDG, climate, water and natural-capital intelligence and a decision-ready bankability verdict in a single architecture.*

- **Triangulated sizing** — every market read three ways so value, volume and capacity views reconcile rather than conflict.
- **Region-honest forecasting** — Latin America, Africa and the Middle East reported in full, never hidden inside Rest of World, every forecast resolved to the 2025 base year.
- **Integrated evidence base** — company, patent and project databases linked to the analysis, with published-filing patents and FTO treated as an indicator, not a legal conclusion.
- **No-fabrication discipline** — every estimate carries a data-confidence rating and disclosed sources; gaps are flagged for further diligence, never filled with invented numbers.
- **Anti-greenwashing rigour** — SDG-washing and greenwashing screens plus claim-substantiation checks built into the ESG and project analysis.
- **Decision-first structure** — 9 Parts and 53 Chapters culminating in stakeholder playbooks and a clear Go / No-Go / Conditional-Go investment verdict.

## WHO SHOULD BUY THIS REPORT

Investors and infrastructure / PE funds, IPPs, utilities and EPC contractors, manufacturers and OEMs, project developers and asset owners, off-takers and corporate buyers, regulators, policymakers and lenders, and corporate strategy and ESG teams.

### Access the Full Report

The complete report delivers all 53 chapters in full, with every sub-heading, country table, company and patent directory, forecast model and due diligence checklist.

Purchase at [www.anewmarketdynamics.com](http://www.anewmarketdynamics.com) · Standard & Premium licences · Single-Site (SSL) and Global-Site (GSL) options at checkout.

### Want the Complete Detailed Table of Contents?

This prospectus lists the nine parts and 53 chapters. The complete detailed table of contents — every sub-heading, country table, exhibit, company and patent directory and annex — is available on request to registered users. To receive it, register with your official company email at [www.anewmarketdynamics.com](http://www.anewmarketdynamics.com). The full detailed table of contents will be sent directly to your registered company email address.