

Photovoltaic Power Plants.

Your investment.
Our commitment.



Your profit outlook: sunny. Photovoltaics – a promising investment.

Photovoltaic (PV) power plants offer a clean and sustainable way of turning the free power of the sun into electricity. PV technology is mature, system costs are low and the price of the electricity produced is the same or below that of the traditional grid. These conditions make PV power plants an attractive and profitable investment.

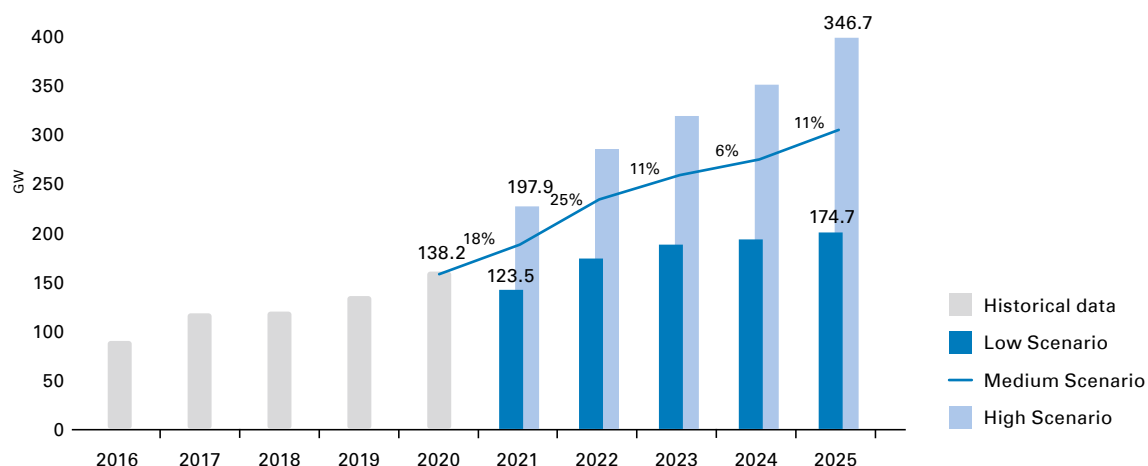
INCREASING CONFIDENCE

Not every PV power plant is the same. That's why independent assessments and monitoring of the underlying assets should be carried out before investment takes place. And that's how TÜV Rheinland reduces risks and increases confidence.

ENHANCING PERFORMANCE

Professional technical evaluations are also important for PV plants that are already in operation. We can assess the value of the system and advise on how to enhance its performance.

WORLD ANNUAL SOLAR PV MARKET SCENARIOS 2021 - 2025



Source: SolarPower Europe Research Global Market Outlook For Solar Power 2021-2025





Our advice: solid. Securing return on investment in photovoltaics.

Effective technical risk management and supervision through an independent engineer decrease project-related risks and assure on-plan performance. TÜV Rheinland safeguards financial stakeholders' interests in all aspects of project financing.

HOW TO ASCERTAIN THE VALUE OF A PV PROJECT

We perform technical due diligence and provide independent technical analyses of PV (power) plants in terms of technical design, quality, safety and performance.

Based on these analyses, we provide independent reports for lenders and investors to take decisions on the financing of investments. We provide advice on all technical aspects of set-up and analyse relevant project financing parameters, figures and risks.

- Setting clear quality objectives
- Assessing the planning, design and execution of PV plant project
- Advising on the use of safe and durable components
- Reviewing contracts: engineering procurement and construction (EPC), operation and maintenance (O&M) and credit agreements
- Construction monitoring and support during drawdown processes
- Reviewing and monitoring O&M



Turning risks into opportunities

Technical risk management reduces project failures at a very early stage. We can identify and optimize the following factors to safeguard your investment and maximize your return.

Early stage risks	Opportunities
On-site	• Identify weather and environmental factors that can influence product ageing and upgrade components to prevent losses.
Technical	• Our decades of experience in PV product evaluation testing enable us to discover potential weak points and recommend alternatives that enhance performance and yield.
Safety	• We raise safety levels by preventing risks concerning the health and safety of the employees and the integrity of the installations.
Logistical	• We advise on how to avoid production delays caused by external factors, such as shipping problems or lack of raw materials.
Planning	• Precise project assumptions and feasibility studies ensure realistic energy yield predictions and increase investment confidence.

GLOBAL SUPPORT ALL ALONG THE VALUE CHAIN

The PV value chain is usually spread over different regions. For example: production taking place in China, project development in Spain and plant installation in South America.

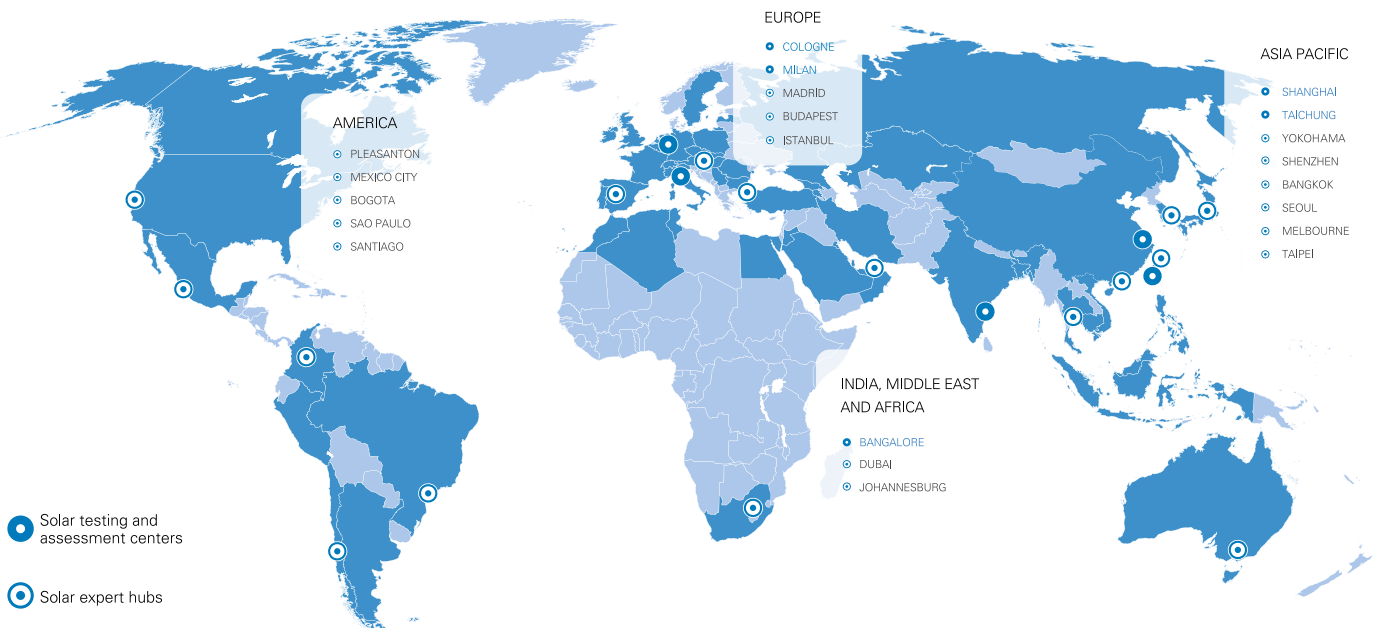
We offer standardized services all along the PV power plant value chain. Our global presence ensures clients can enjoy consistent quality and processes all over the world.

WHAT MAKES TÜV RHEINLAND SPECIAL?

Over 35 years' experience in laboratory tests and certification has given us in-depth knowledge of the quality of PV modules and components.

We understand the inherent weaknesses in the production processes and failure mechanisms. The in-depth knowledge about degradation, safety issues, technology risks and environmental concerns are part of our DNA.

TÜV RHEINLAND – QUALITY AND SAFETY AROUND THE WORLD





Services for investors, lenders, owners and operators.

TÜV Rheinland provides a one-stop shop service for all stakeholders involved in PV power plants. As a third-party advisor and as a lender's technical advisor (LTA), we can help you achieve and maintain the profitability of PV systems by ensuring quality, safety and reliability during all project phases.

TECHNICAL DUE DILIGENCE

We provide technical due diligence (TDD) reports for lenders and investors to take decisions on the financing of investments. This includes independent technical analyses of PV systems in terms of technical design, quality, safety and performance.

TECHNICAL ADVISORY

As an owner's engineer (also known as a client's or independent engineer), we provide independent advisory, analysis, engineering and testing services, including inspection, supervision, measurement and risk analyses.

TÜV RHEINLAND SOLUTIONS FOR YOUR PV INVESTMENT AT A GLANCE:

Development	Feasibility study Design review Evaluation of site conditions Energy yield assessment
Engineering	Technical requirements for a successful PV project Design and plant optimization Components check Review of interconnection design and facilities Production estimate
Procurement	Product and vendor qualification for risk minimization Factory audits Review of purchase agreements Module and component quality tests in TÜV Rheinland laboratories
Construction	Inspection and construction monitoring Detailed design review, verification of procurement activities and construction monitoring Check of civil, mechanical, electrical engineering, technical execution and performance Quality control and conformity inspection Progress and critical milestone monitoring
Commissioning	Safety, quality and power control before grid connection Safety-related inspection Functional check of the PV plant Hotspot determination with IR camera, thermography
Acceptance	Final acceptance and asset certification Performance ratio (PR) assessment and evaluation Provisional and final acceptance tests and certification Completeness of the technical documentation
Operation	Regular monitoring, securing of a stable cash flow, highest performance and internal rate of return (IRR) Review of O&M reports Offtake agreements and refinancing Periodic power and warranty inspections

A long history of independent quality assurance.

Founded 145 years ago, TÜV Rheinland is a global leader in independent inspection services. The Group maintains a worldwide presence with more than 20,000 employees. The independent experts stand for quality and safety for people, technology and the environment in nearly all aspects of life. TÜV Rheinland inspects technical equipment, products and services, oversees projects, helps to shape processes and information security for companies. Since 2006, TÜV Rheinland has been a member of the United Nations Global Compact to promote sustainability and combat corruption.

SUPPORTING SOLAR POWER PROJECTS AROUND THE WORLD

With our decades of hands-on experience in PV power plants, we support you in all project phases and ensure plant safety, performance and reliability. We also advise you on achieving and maintaining profitability for large-scale PV systems – from choosing the right site to optimized operations.

We offer you a comprehensive range of services related to PV plants, from PV value chain management, site assessment and inspection, over supervision of construction to plant monitoring with yield check and yield evaluation to performance enhancement.

A LEADER IN PHOTOVOLTAICS

TÜV Rheinland, as a third party, has been working with the financial industry, investors and operators worldwide for decades. TÜV Rheinland has the experience to guide a PV plant from inception, planning, PV supply chain management, construction, commissioning, to O&M and resale. You can count on more than 35 years of experience in photovoltaics, a global laboratory network, and the know-how of our globally recognized experts worldwide.

Number **1** in PV module and component testing worldwide

More than **35** years of experience in PV

Adviser to PV projects around the globe, representing more than **20** GW

Power plant inspections since **1990**

PV product testing since **1982**

6 Photovoltaic test laboratories worldwide and several outdoor test fields

More than **250** PV experts worldwide



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