



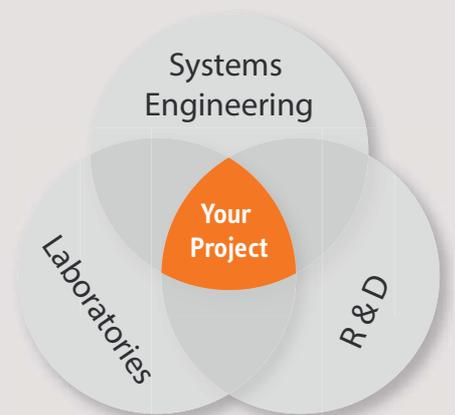
PV Systems

PI Photovoltaik-Institut Berlin AG

The name PI Berlin stands for experience and quality. Our proven independence from manufacturers, construction companies, suppliers and project financiers is essential both for creating high quality solutions, and for winning and retaining customer trust.

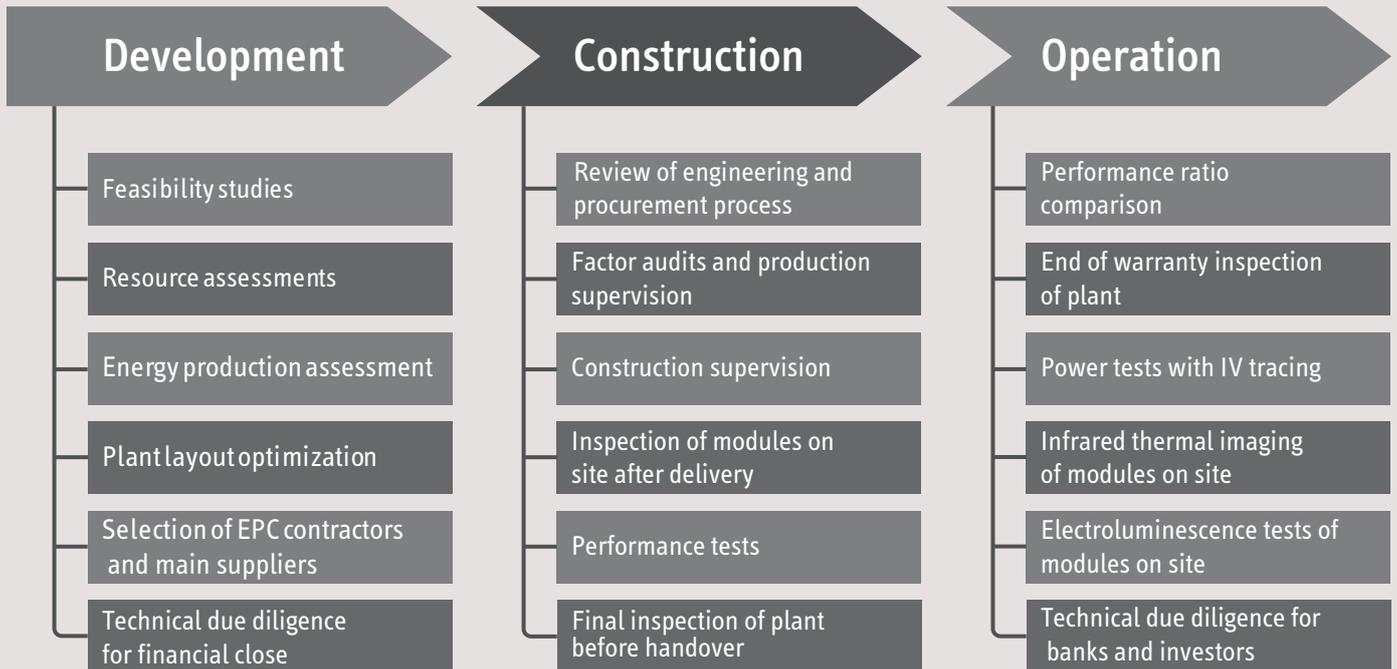
Systems Engineering

With the knowledge and insights gained through years of experience in the field, laboratory testing and R&D, PI Berlin offers a full range of engineering services for PV plants from the development and construction phases through project operation.



From solar cells to the power plant – customer-oriented independent expert

SERVICES



✓ **Services along the entire value chain**

✓ **Backed by internal lab and R&D team**

CASE STUDY

Project Name: Confidential

Project Description: Total installed power: 6 MW
24000 poly and mono-crystalline modules
Ground mounted grid connected plant

Project Location: Italy

Challenge: Feasibility study and preliminary design of PV plant

Services Provided:

Site analysis

- Inspection on-site of ground conditions and surroundings
- Study of potential shading

Definition of technical components

- Module type
- Design of the module supporting structure
- Inverter and transformer type
- DC Cabling characteristics
- Monitoring and communication system type
- Meteorological Station
- Cable trenches

- Plant access
- Security system type

Electro-mechanical description of the plant

- Estimation of the optimum tilt angle and shading angle
- Solar rows geometry
- Electrical sizing for arrays, inverters and cabling
- Electrical scheme of the plant

Plant specific production and PR value

- Resource assessment
- System losses
- Energy yield simulation



DEVELOPMENT

During the early stages of project development, PI Berlin offers a wide range of services to minimize your risk exposure including feasibility studies, resource assessments, energy production assessment and plant layout optimization. With PI Berlin's strong reputation with a number of international commercial and institutional lenders, you can rest assured that our results will be recognized and trusted within the financial and investor communities.

Ready to Build

As your project gets closer to realization, PI Berlin provides preliminary engineering services and supports your selection of EPC service providers and main component suppliers based on years of

experience gained in the field. In particular our in-house developed quality assurance plan minimizes the risks of component defects and installation deficiencies, which can be built into your service and supply agreements.

Financial Close

On behalf of investors and lenders, PI Berlin offers a comprehensive technical due diligence review to ensure all project benefits and risks are well understood and that your money is placed only in projects of the highest quality.



-  **Protection of your development capital**
-  **Optimal and reliable system configurations**

CONSTRUCTION

Before your project breaks ground and components are delivered to site, our specialized engineers provide services to review and monitor the engineering and procurement process. In particular our factory audits of main components such as the PV modules, inverters and support structures ensure that only high quality products are delivered to your site.

Module Inspection

We recommend batch testing either on site or at our laboratories once the modules are delivered and after installation completion to ensure proper benchmarking and a successful operation start.

Pre-takeover Inspection

During project construction, PI Berlin provides construction supervision, performance tests and final inspection before handover all in accordance with the relevant norms and project contracts.

Power Plant Certificate

As an additional product, PI Berlin provides a unique in-house developed PV-Power Plant Certification which verifies that the project has been built using the highest quality standards available in the industry. This certificate can be used by EPC companies or developers to provide comfort and security to their clients, investors and lenders.



-  **Minimize risk before completion**
-  **Engineers with worldwide experience**

OPERATION

In operation, PI Berlin is ideally suited to monitor, evaluate, inspect and test your power plant to ensure that your investment is providing the revenue expected and is operating in a safe and reliable manner. Our complete power plant inspection methods identify deficiencies and defects that could lead to under performance.

On-site Module Tests

In addition to sample module testing in our laboratories, we are able to conduct STC power tests (IV tracing), infrared thermal imaging and electroluminescence tests on site for up to 100% of modules in the plant. These tests are of particular importance considering the long term warranties associated with the modules.

PI Berlin also provides industry tested solutions in order to repair and optimize power plants to increase their performance such as automated cleaning methods and regeneration of PID affected modules.

Technical Due Diligence

Complete technical due diligence packages are available that are founded in PI Berlin's breadth of experience of inspecting PV power plants around the world. As independent inspectors, we have acted on behalf of lenders to protect their security, of investors looking to acquire plants and of insurers investigating root causes of significant damages.



✓ Quality assurance before final acceptance

✓ Reliable and fast reaction time

References

Technical consulting for over 2 GW of projects

- Over 25 countries including: Germany, Italy, France, Spain, Greece, Chile, Argentina, South Africa, Algeria, USA, Japan, China and India
- Over 20 module suppliers including: mono and polycrystalline as well as thin film
- 5 major banks including: KfW, Deutsche Bank and ADB
- Over 10 investors/project developers including: rc-partners, re-cap, Mainstream Renewable Power
- Over 10 international EPCs including: Saferay, SunEdison, Guascor, juwi and ET Solutions



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