In the past few years, Potential Induced Degradation (PID) has been recognized as a failure mechanism that can cause substantial power loss in different PV module types and decrease the power plant performance ratio. In some cases, corrosive PID also becomes visible in module appearance.

Fraunhofer ISE offers comprehensive services to module manufacturers, EPCs (Engineering, Procurement, Construction) and operators of PV power plants in order to:

- develop modules with low sensitivity to PID
- avoid PID in advance
- determine if a plant is already affected
- identify the initiating factors and predict field PID behavior of modules
- allocate procedures to reverse degradation effects on module and system level.

**PID Diagnostics in PV Power Plants**

Prediction and early detection of PID at the system level are of particular interest for owners and operators of PV power plants.

A PV power plant’s susceptibility to PID can be determined within our comprehensive test program either before plant commissioning or during operation. Deficiencies can be identified even before performance degradation is observed.

At the system level, the PID investigation starts with a streamlined field examination, which includes IR (thermographic) inspection and voltage or I-V curve measurements to identify modules with affected cells. The plant topology, in particular ground potential, inverter type and electrical layout, is evaluated on-site. Local environmental risk factors are assessed as well. Optionally, representative affected modules are selected for laboratory tests. In most cases, it is reasonable to follow up with laboratory tests of selected modules to understand the specific effect and to analyze the recovery characteristics of the module types in use.
Beyond accelerated laboratory testing, the PID behavior of modules can also be examined under real operating conditions. We perform comprehensive outdoor PID monitoring at our test sites worldwide or at customer sites. A fundamental requirement for sound degradation analysis is highly precise module characterization. Our accredited CalLab PV Modules provides worldwide leading measurement accuracy with an uncertainty down to 1.6 %.

Recovery from PID Degradation

Power degradation caused by PID may be partly or fully reversible. By initiating suitable measures, it is possible to regain a large part of the original power. The recovery rates of modules vary depending on the level of degradation. At Fraunhofer ISE, we examine the recoverability in a dedicated recovery test. Furthermore, we offer recovery services for modules in field operation, providing consultancy in system design adjustment and recovery strategies, as well as independent monitoring and reports on the success of the initiated changes.

The level of power, which can be regained due to recovery measures, strongly depends on the level of power loss due to PID. It is recommended to execute adequate measures as early as possible.

Note: PID strongly depends on the material composition of a PV module. The PID test applies to the specific bill of materials (BOM) which was tested.