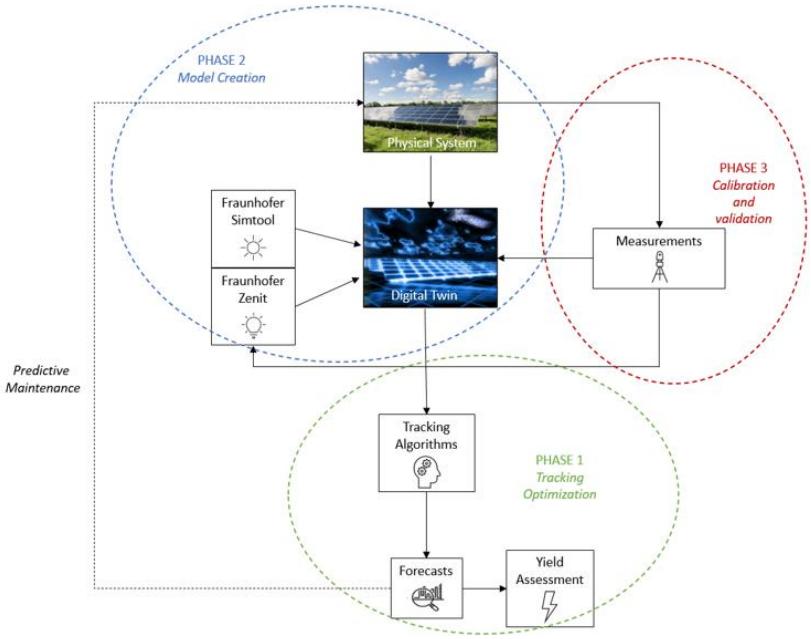
PV-System simulation

The Fraunhofer ISE offers comprehensive services and R&D for the simulation and analysis of photovoltaic systems. The core services include yield simulations for ground-mounted PV systems, C&I rooftop systems and integrated photovoltaics. In addition, the institute carries out technology benchmarking and comparisons.

Our yield assessments are based on precise radiation and weather data as well as a detailed simulation of the system design. Yield-reducing factors such as soiling and row shading are precisely analysed. For bifacial PV modules, which use light from both sides and potentially deliver higher yields, we can also use special simulation tools to accurately predict the irradiation on the back of the modules and the associated yield increases. For our glare reports, we use special software to analyse the potential glare effects of PV systems near traffic routes or residential areas and whether these are within legal limits. Digital twins enable a detailed and almost real-time analysis of the system behaviour of PV systems and provide meaningful information for risk assessment and the development of risk mitigation strategies.

SmartCalc.Module (formerly SmartCalc.CTM): is a software tool developed by Fraunhofer ISE for fast, precise simulation of cell-to-module (CTM) power losses and gains. It enables designers to optimize wide range of PV module designs, PV technologies and materials, and performance – ex as bifacial or shingled cells - without physical prototyping

Digital Twin: The digital twin is based on Fraunhofer ISE's Zenit™ platform. This Python-based electrical PV simulation tool is used on a daily basis to provide scientifically sound economic analyses for project developers, investors, EPCs and many different industry partners along the solar energy value chain. In addition, it is regularly developed and validated in research projects, demonstrating a high degree of flexibility in terms of the types of solar power plants that can be accurately simulated.



[Image: Digital twinning – the combination of a virtual representation of a PV system and its physical counterpart, who are exchanging data in near-Realtime offer the possibility of a multicriteria system behaviour analysis, thus supporting risk assessment and risk mitigation strategies]

The goal of the digital twinning method is to create a baseline calculation of performance to detect deviations from expected behavior. Using this information, unusual drops in performance that could be associated with unexpected component faults or degradation can be used for maintenance actions such as cleaning or repair. In addition, the twin's forecasting module provides predicted yields for the next three days based on locally available weather forecasts.

Fraunhofer ISE provides services to both industrial companies and public sector clients, including:

- Yield simulation of PV rooftop systems and power plants
- Feasibility of new module and cell concepts in the system
- Investigation of new power plant concepts,
- Integrated PV technologies, Agri-PV and floating PV
- Technology benchmarking and comparisons

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Kindly get in touch with us if you are interested in this technology or require further information.
Thanks and Regards,

Ms. Anandi Iyer
Director, Fraunhofer Office India

Mr. Sanmati Naik
Sr. Manager - Energy (RE), Fraunhofer Office India
405-406, 30 MG Road, Bengaluru – 1
e-Mail: sanmati.naik@fraunhofer.in
Tel: +91 80 40965008/09, Mob: +91 7996425980
www.fraunhofer.in www.fraunhofer.de