# Project abstract 'IP-Solar'

## General information

- IP-Solar: 'Intelligent Platform for long-term automated quality assurance and energy output monitoring of solar plants'.

- Austrian R&D project, project start: April 2008, project end: December 2011

- Logos, pictures and this document are available online under [www.ip-solar.com](www.ip-solar.com), menu 'Press'.

## Flashlight

The R&D project 'IP-Solar' develops the scientific and technical basis for the prototype of an automated monitoring system for solar thermal installations. The main features of this system are automatic evaluation, operational surveillance and quality assurance of solar thermal plants. Comprehensive diagnostics detect system faults at an early stage and send notifications to the plant operator. Users of IP-Solar get detailed up-to-date and historical plant evaluations on an inter-net platform. IP-Solar is aimed at end users, plant operators and public institutions like e.g. funding authorities.

## Abstract

Large solar thermal systems (LSTS) are currently not being used to their full capacity. Besides huge unused potentials on the market (cf. 'Solar Roadmap 2020'), the inventory of existing installations is not satisfying as well: experience has shown that the energy yields of many LSTS are considerably below expectations.

Permanently stable energy yields can only be achieved in a well-maintained installation. This requires ongoing evaluations of measuring data and the surveillance of plant operation and energy yields. If any, such evaluations are only conducted by highly trained expert staff and cause high expenses in both time and human resources. Hence, plant evaluations are often cancelled, and faults in the LSTS remain undetected for a long time. This causes economic losses and a loss of confidence in solar companies and the solar technology in general.

### Overview and Objectives

For these reasons, the project IP-Solar intends to standardize and automate the evaluation and operational surveillance of solar energy supply systems. This guarantees a high standard of quality for the plant's performance combined with low running costs.

IP-Solar develops the scientific basis, the technical fundamentals and a software prototype for such a system. The main part of the work consists in the development of fully automated evaluation and diagnostics methods. In case of need, IP-Solar will provide the user with a quick and specific notification by SMS or email.



The modular design of IP-Solar allows processing many common types of LSTS. Bearing in mind that it is not reasonable optimizing only some parts of a system while disregarding the others, IP-Solar takes a look not only at the solar circuit, but at the entire energy supply system. In concrete terms, e.g. also auxiliary heating, hot water generation and distribution net are analyzed. IP-Solar is aimed at LSTS with a collector area of over 50 m², but in principle it is applicable also for smaller installations.

The web-based design of IP-Solar provides customers with an easy-to-use and maintenance-free software. All information and plant evaluations are thus available at any internet-connected PC. This means that the software can be distributed easily worldwide, a prudent point considering the international interest the project is already receiving.
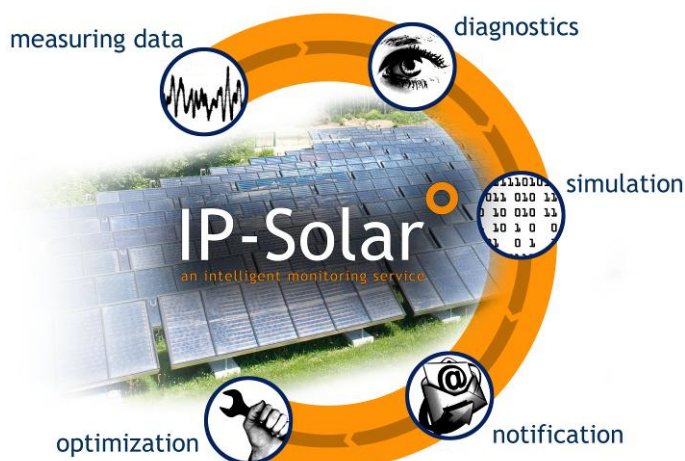
**Details and Results**

Extensive market analysis into existing LSTS lead to a modular approach which is suitable for modeling numerous common LSTS system types. The acquisition of measuring data has been prepared in a way that permits the integration of IP-Solar with numerous customer systems. The requirements on customer-side measuring instrumentation are rather low, and IP-Solar automatically adapts to the existing measuring concept.

The diagnostics and evaluations of the solar energy supply systems are based on years of experience of the project partners. The partners' backgrounds are both academic research and practical experience in facility operation. Established industrial methods are used to systematically specify and analyze system failures, as well as their effects and causes. Subsequently, proper computer-based methods and algorithms for system diagnostics are developed. These are used to calculate standardized performance figures and to identify system failures. There is also the option to run automated TRNSYS simulations in the background to calculate energy flows and target-performance comparisons.

The IP-Solar diagnostics procedure is rather flexible and can be adapted to suit the user requirements of each LSTS. On the IP-Solar internet platform, users can change personal settings and adjust the graphic representations of results. All key figures and monitoring data are prepared in detail for further analysis and may also be printed and downloaded. In the course of the project, the described approach is tested with three pilot installations of different types ('hot water generation', '2-line-system' and 'district heating supply').

**Benefits**

IP-Solar offers the opportunity for an automated and ongoing surveillance of the system operation. The result is a standardized and low-cost system for the evaluation of LSTS and operational control. By sending targeted notifications, in the case a fault occurs, IP-Solar creates a clear increase in the reliability of LSTS and contributes to their optimization, not only in terms of energy output but also in terms of service and maintenance cost: maintenance activities can be planned in advance and become more efficient, running costs are reduced. IP-Solar allows for a simple and consistent comparison of different LSTS. Another benefit is the comprehensive documentation of an installation's behavior; this is possible due to the long-term storage of plant data and results in a central database.

Consistently higher and better monitored solar energy yields lead to smaller operational risk, optimized economics and maximum savings in fossil fuels. This contributes to improving the acceptance of solar installations in public and to increasing the spread of this technology. IP-Solar supports public institutions such as funding authorities in the targeted use of subsidies, based on real energy yields, and offers them a concise survey of existing LSTS. The further development of IP-Solar in a follow-up project is being prepared.

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