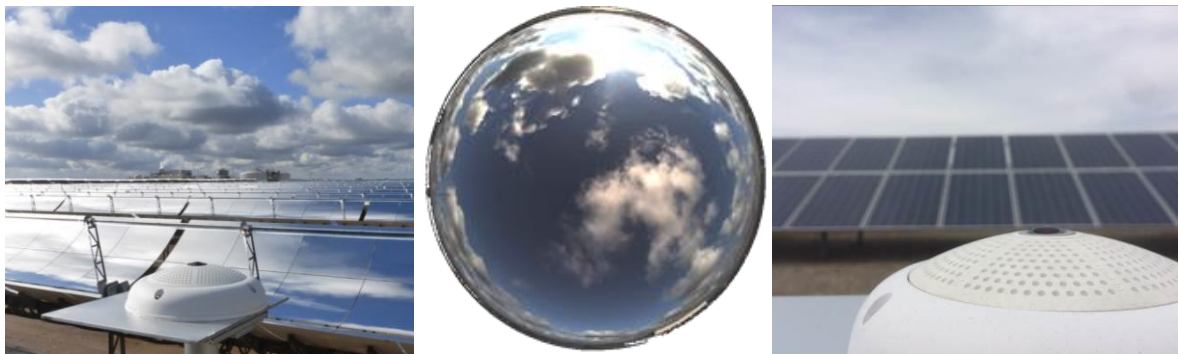


WobaS – Nowcasting System

All-Sky Imager Derived Irradiance Forecasts for the Upcoming 15 Minutes

Knowing the irradiance conditions in the near future is beneficial for the operation of solar power plants. This information supports the operation, increases efficiency and decreases wear of components. It makes solar power more cost-effective and predictable. Nowcasting systems predict the short-term development of the irradiance. The WobaS nowcasting system was developed together with DLR and is based on all-sky imagers. These cameras with 180-degree fisheye lenses take pictures of the sky above the power plant to provide spatially resolved irradiance forecasts.



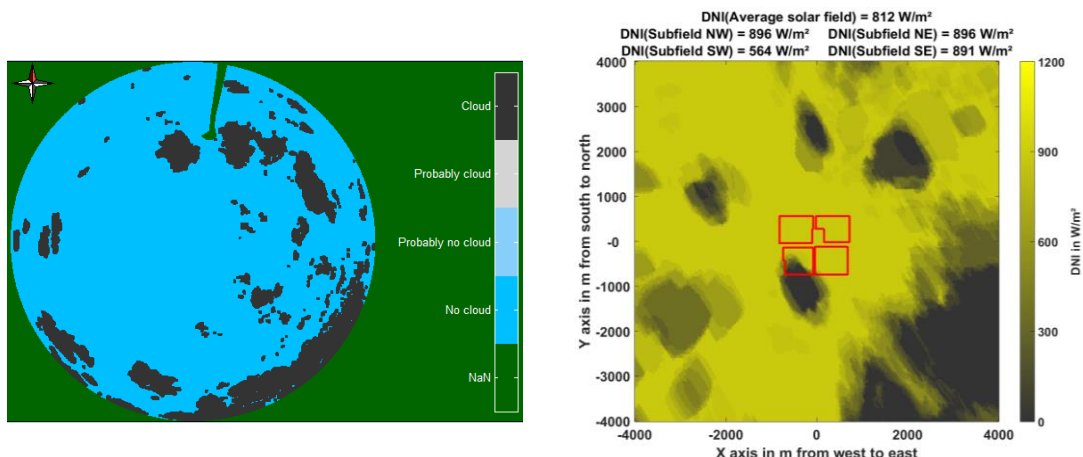
All-sky camera in CSP plant (left), in PV plant (right) and all-sky image of the cloud cover (middle)

Key Features of WobaS

- Real-time irradiance forecasts for the upcoming 15 minutes provided every 30 seconds
- Spatially resolved irradiance maps (DNI, GHI and GTI)* for an area of 8x8 km²
- Average irradiance values for the plant and defined subareas with up to 25 m² resolution
- Radiation transmittance through clouds taken into account
- Four or two camera versions for exact calculation of cloud positions, heights and motion vectors lead to significantly improved forecasts compared to simple one camera systems
- One camera version available for specific applications and cases with cloud height data
- System validated at the Plataforma Solar de Almería (PSA) and in a CSP plant in Spain

Key Benefits

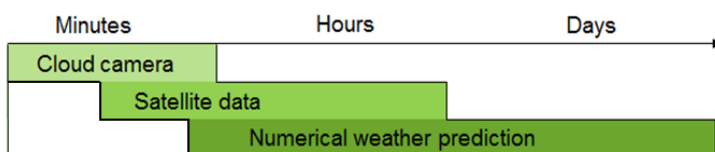
- Operation support to increase plant efficiency and decrease wear of components
- Improved power output predictions and ramp rate control



Cloud view (left) and DNI map with solar field quadrants and DNI averages (right), available as live view and forecast sequence for the next 15 minutes

Forecasting System

The combination of the nowcasting system WobaS with satellite data and numerical weather prediction (NWP) models enhances the forecast horizon to several hours and days. This can be integrated in WobaS by combining it with the FoSyS system, which is developed by TSK Flagsol and uses sophisticated algorithms by DLR's German Remote Sensing Data Center. FoSyS provides mid-term irradiance forecasts every 15 minutes for up to seven hours ahead in 1-minute resolution based on satellite data. It also provides long-term weather forecasts up to 14 days ahead in hourly resolution via a numerical weather prediction model. This forecast is updated four times per day.



Different forecasting methods and corresponding time horizon

Key Features

- Highly accurate forecasts with cloud cameras (15 minutes, 30-second resolution), satellite data (7 hours, 1-minute resolution) and NWP (14 days, hourly resolution)
- Cloud motion evaluation and visualization by cloud camera and satellite data information
- Detection of aerosols (e.g. due to Sahara storm)
- Integrated validated power plant model PCTrough (for CSP plants), other models can be integrated optionally
- Production forecast for participation in the electricity market
- Consideration of actual plant status by safe data link to the control system

Key Benefits

- Different time horizons of forecast allow production-optimized power plant operation, day-ahead electricity market participation and maintenance planning for additional revenues
- Operation support and output predictions enable dispatchable power supply and fulfilling of ramp rate regulations
- Improved predictability increases profitability and acceptance of solar power plants

The WobaS nowcasting system is available as stand-alone camera based version or in combination with the FoSyS forecasting system.

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