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Solar Resource Assessment with Rotating Shadowband Irradiometers (RSI)

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Large-scale solar power plant projects require diligent solar resource assessments in order to perform a thorough and sustainable technical and economic design of the plant. This is especially important for concentrating solar power plants with their focus on direct beam irradiation. Unfortunately (direct) solar beam irradiance data are scarcely available in regions which are attractive for solar energy applications. Ground measurement data usually show much higher accuracies than satellite derived irradiance data. However, satellite data serve well in combination with ground data to estimate interannual variability and long-term climate changes. Appropriate irradiance sensors for ground measurements must be selected in consideration of general surrounding conditions for equipment and maintenance to gain and maintain the necessary accuracy over the entire operation period. Typically used high-precision instruments like pyrheliometers and pyranometers as specified in ISO norms are severely affected by soiling. Due to their low soiling susceptibility and low power demand, Rotating Shadowband Irradiometers (RSI) show significant advantages over the typical precision equipment under the measurement conditions of remote weather stations. Their initially lower accuracy is notably improved with proper calibration of the sensors and corrections of the systematic deviations of its response. Main causes of the systematic deviations are limited spectral sensitivity and temperature effects which can be corrected by using several accessible parameters. Also, the use of twin-sensors proved to increase the measurement accuracy. A new RSI version has been developed suitable to operate also without need of an external datalogger. Newest analyses concerning the expectable measurement accuracy and operation experiences are presented.