Comparison between the Glint Solar PV model and PVsyst

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Results of comparison

This document presents the results of a comparison between the annual energy yield modeled with the Glint Solar PV model and PVsyst. The comparison is performed for four different system configurations (monofacial and bifacial fixed tilt, monofacial and bifacial tracking) and for ten different locations (Figure 1). The approach of this analysis is described in the methodology section following the results. The average deviation between the Glint Solar PV model and PVsyst for the different configurations is shown in Figure 2: **0.02 %** for monofacial fixed tilt, **-1.23 %** for bifacial fixed tilt, **0.58 %** for monofacial tracking, and **0.74 %** for bifacial tracking. On average, the Glint Solar model gives a slightly higher estimate for the annual energy yield for all configurations except for bifacial fixed tilt. The box in the plot ranges from lower

Figure 1: The ten locations where the four configurations are modeled.

energy yield for all configurations except for bifacial fixed tilt. The box in the plot ranges from lower to the upper quartile of the deviation values, showing the range most of deviation values falls within. The blue line represents the mean value, and the whiskers show the range of the data. The modeled annual yield for all countries and the difference between the results of the Glint Solar PV model and PVsyst is displayed in Figure 3.
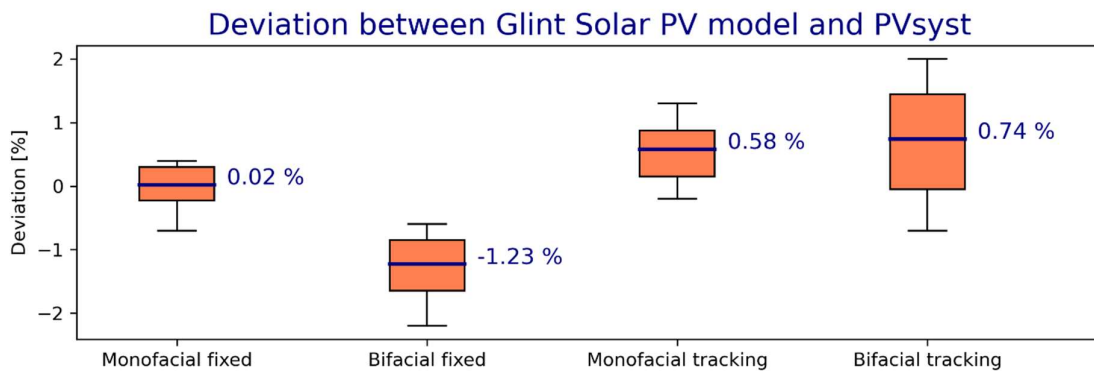

Figure 2: Variation in deviation between in the Glint Solar PV model relative to the PVsyst model across the ten modeled locations. The blue line and corresponding text represent the mean value.
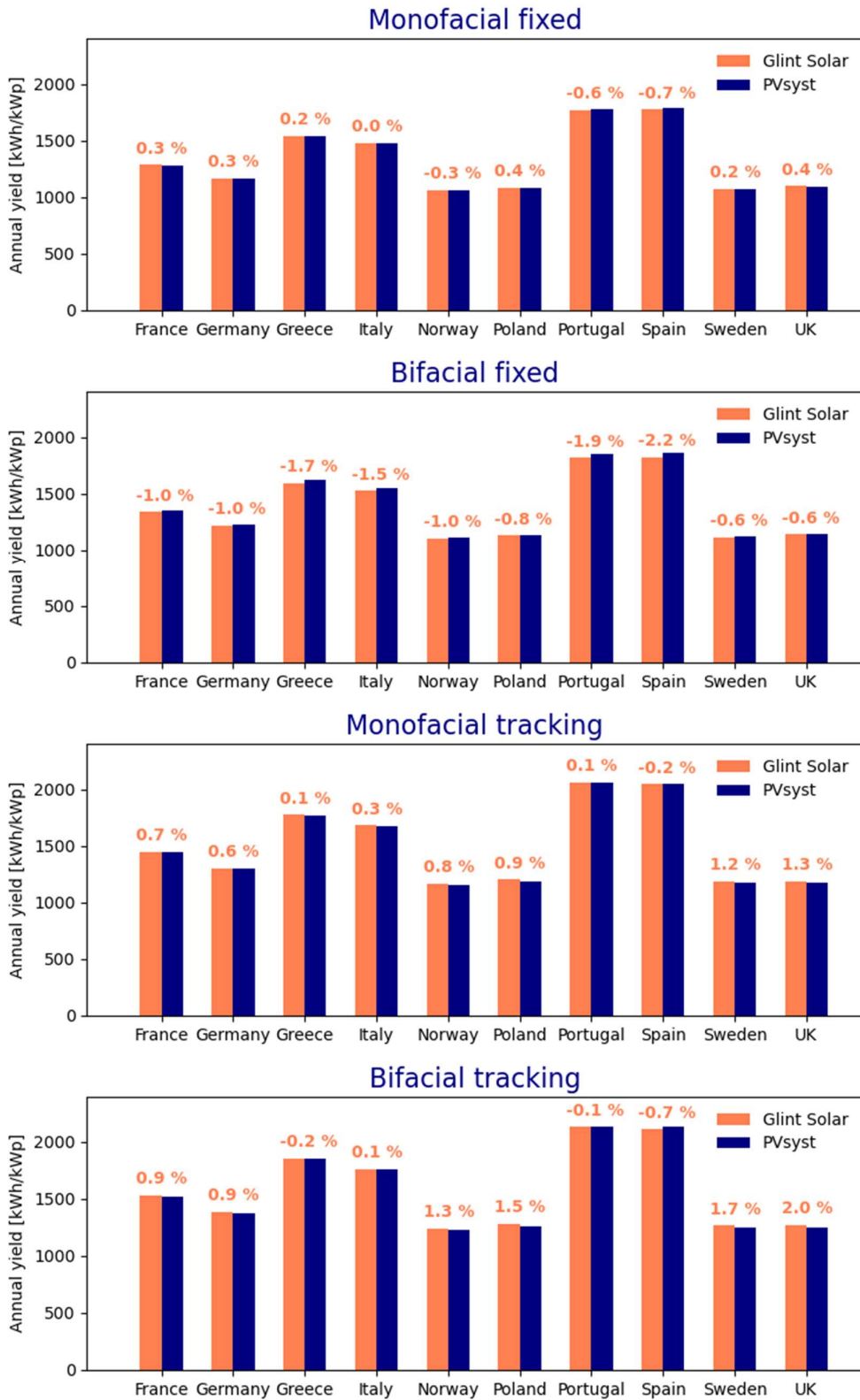
Figure 3: Modeled annual energy yield for the four configurations in the ten different countries. The numbers in the plots show the deviation in the Glint Solar result relative to the PVsyst result.

Methodology

Four different PV system configurations (monofacial and bifacial fixed tilt, monofacial and bifacial tracking) are modeled with Glint Solar PV model and PVsyst 7.4 for ten different locations. Glint Solar provided results from the Glint Solar PV model. IFE performed the modeling in PVsyst and the comparison of results. The modeled systems are identical across all locations, except for tilt which is varied depending on location. The module tilt is varied to reduce interrow shading losses.

The goal of this comparison is to evaluate the models and the implementation of models in the Glint Solar software. Modeled losses are therefore included in the comparison, but constant loss values based on assumptions are set to zero. Loss values set to zero in PVsyst include ohmic losses, LID, mismatch, internal consumption in the inverter, and bifacial mismatch and structure shading. Loss values set to zero in the Glint Solar model include soiling, availability, wiring, LID, nameplate rating, annual degradation, mismatch, connection and snow. Pan files in PVsyst are made based on module datasheet and additional information in the PVsyst database is not used. To model the effect of incidence angle, the default AR coating values in PVsyst are used. If using the default loss assumptions in the two software, or if different input values (module or weather data) are used, the difference in the results can be larger. The comparison only shows the difference in total energy yield. The difference in other calculated values, for example loss values, can be different.

In both models, the Hay Davies model is used for transposition modeling. Circumsolar irradiance is treated separately, and spectral correction is included.

Country	Position (lat, lon)	Module tilt
France	46.29, 0.06	37
Germany	49.22, 11.32	37
Greece	40.29, 23.27	39
Italy	43.29, 10.52	37
Norway	60.55, 12.02	28
Poland	52.03, 21.78	35
Portugal	38.63, -8.85	37
Spain	38.06, -1.31	37
Sweden	56.97, 12.61	30
UK	53.43, 0.05	28

Model input and system configurations

- Weather and irradiance data: Meteonorm 8.2 TMY. Parameters: DHI, DNI, ambient temperature, relative humidity
- Albedo: 0.2
- Inverter: Euro efficiency of 98%. Type of inverter in PVsyst: 1000 kW Generic inverter.
- Heat transfer coefficient: Default value in PVsyst for "free mounted modules with air circulation"
- *Monofacial systems*. PV panels: Jinko solar, Tiger Neo N-type 78HL4-(V), 620 W. Installed capacity: 32.8 MW$_p$.
- *Bifacial systems.* PV panels: JA Solar, JAM72D30, 550 W. Installed capacity: 29.1 MW$_p$.

Fixed tilt systems are South-oriented, and tilt varies with location. Tracking systems have East/West single axis tracking, with backtracking activated and limit angles of 60 degrees in both models. In the shading calculations, the whole area of the module is counted as active in PVsyst.

	Fixed tilt	Tracking
DC/AC ratio	Glint Solar: 1.3 PVsyst: 1.27 (bifacial), 1.26 (mono)	Glint Solar: 1.21 PVsyst: 1.21 (bifacial), 1.22 (mono)
Module orientation	Landscape, 3 panels in row width (3.4 m)	Portrait, 2 panels in row width (4.57 m)
Pitch	8 m	10 m
GCR	0.43	0.46
Elevation	Module: 0.58 m	Axis: 1.71 m