The Outdoor Bifacial Test Facility at Technical University of Denmark

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Background: Since summer 2018, European Energy A/S and DTU have measured the performance of bifacial PV strings mounted on trackers and fixed tilt systems located in Northern Europe (55.6° N, 12.1° E). A new publicly funded project is underway with the intent to evaluate in-house and commercially available bifacial PV performance models. The facility includes several sub-systems where the conditions known to affect bifacial performance are varied including tracker spacing (GCR), albedo (ρ) and module tilt (β).

Equipment and Layout
- Monofacial and bifacial strings of similar front side power mounted side-by-side.
- Horizontal East-West (HSAT) trackers (x8) and south facing 2V racks with adjustable tilt angle (x8).
- Tilted single axis trackers (x2) and dual axis tracker (x1).
- Multiple ground covers under test:
  - Seasonal grass
  - Coarse sand
  - Medium-size gravel
  - White polymeric tarp
  - μ-structured reflector

Sensors and Detailed Monitoring
- Monitoring independent of inverter measurements.
- DC Power meters with isolated surface mount resistors and digital filtering.
- Fixed tilt and HSAT production profile.
- Four panels with 10 individually measured 5" mono-Si cells for studying distribution of rear side irradiance.
- 22 panels (222m long tracker side-by-side).
- Two edge panels (20 measurements).
- Two center panels (20 measurements).
- Fixed tilt string (GCR = 0.22), HSATs at 15m pitch (GCR = 0.28), HSATs at 12m pitch (GCR = 0.40), South facing fixed-tilt rows with adjustable tilt angle (GCR = 0.40).

Performance Modeling
We are using the on-site meteorological data as input to bifacial PV models. The model’s output is then compared to our electrical measurements. View factor models under consideration currently include MoBiDiG (ISC Konstanz), PVsyst, and SAM. Ray trace models currently being tested include Zemax and Radiance.

Model Assumptions
- InputSs (currently only mono-f.

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Partners