Webinar: Albedo, bifacial PV gains and project bankability

Álvaro Payán

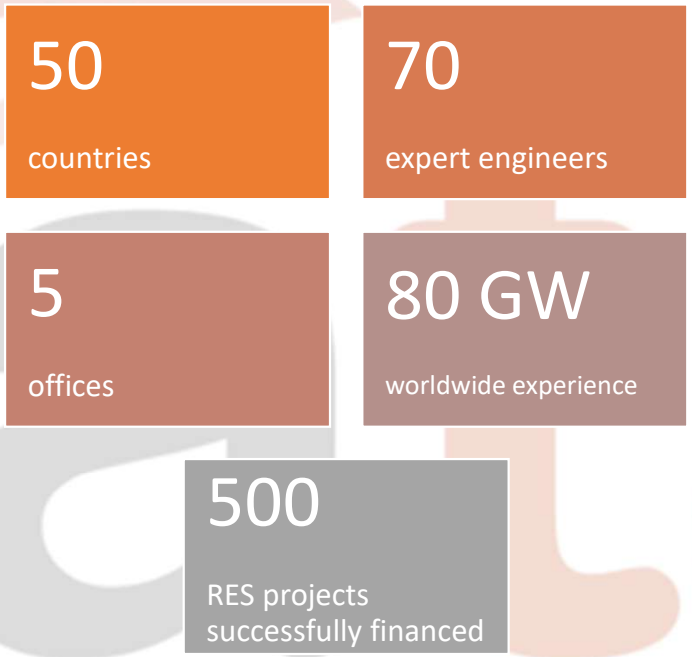
General Manager ATA Renewables

ATA RENEWABLES

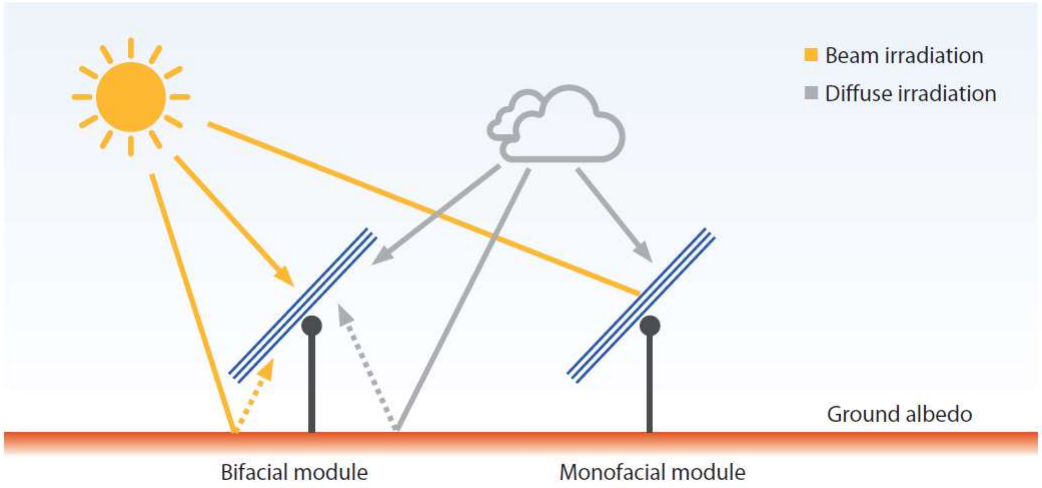
We supply independent technical services in Renewable Energy Sources (RES) with highest quality advisory, engineering, construction supervision for PV Solar, CSP and Wind Plants.

- Advisory Services (TDD, LTA, Tests on site, Performance analysis, EYA)
- Engineering Services (OEs, Design Review, Construction monitoring)

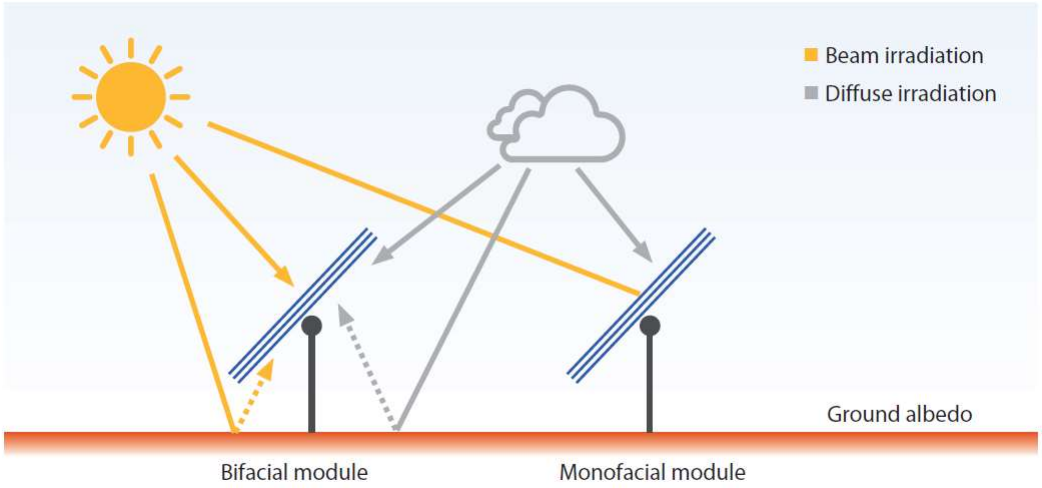
Global success



BI-FACIAL TECHNOLOGY

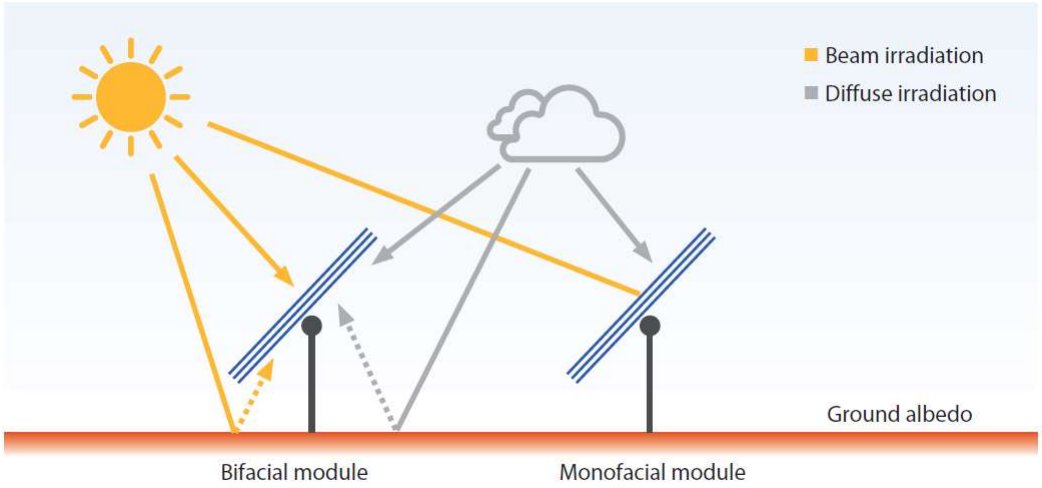


BI-FACIAL TECHNOLOGY



MAIN BANKABILITY ISSUES

BI-FACIAL TECHNOLOGY



MAIN BANKABILITY ISSUES

- Technology (Bi-Facial Modules)
- Contracts (Guarantees)
- Yield Estimations
  - ➢ Technical Hypothesis (PV SYST)
  - ➢ **Albedo TMY**

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Simple?

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Simple?

Intra-Annual Variability

- Changes in the terrain (vegetation, others)
- Position of the Sun
- Solar Spectrum variations

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Simple?

Intra-Annual Variability

- Changes in the terrain (vegetation, others)
- Position of the Sun
- Solar Spectrum variations

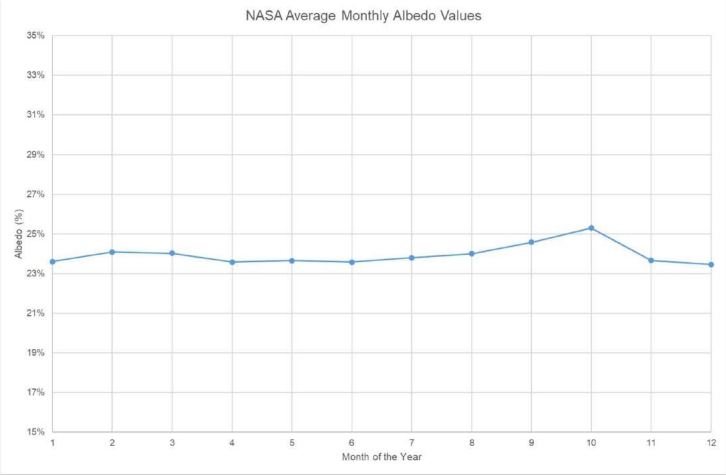


Fig: Intra-Annual Variability for a given site (source NASA)

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Simple?

Inter-Annual Variability

- Changes in the terrain due to climatic conditions
- Changes in the “atmosphere”

Albedo

Albedo can be defined as the ratio of the reflected irradiance (RI) compared to the global horizontal irradiance (GHI) received by the ground surface

Simple?

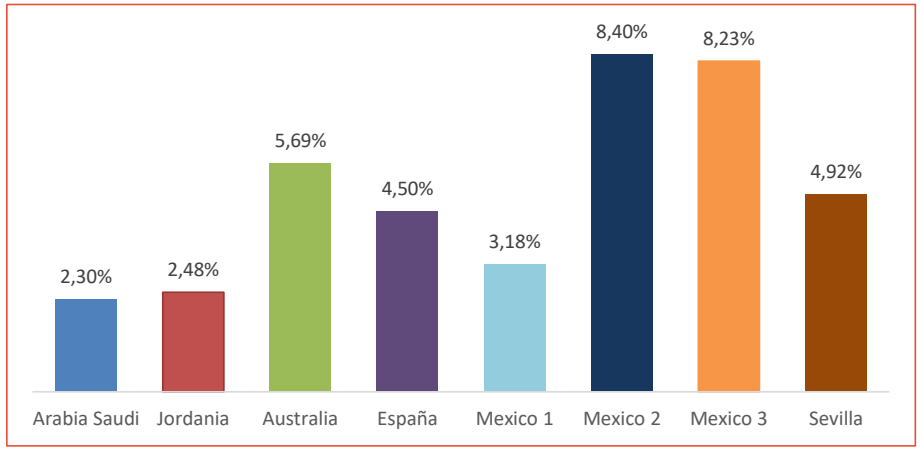


Fig: Inter-Annual Variability for different Project sites

Inter-Annual Variability

- Changes in the terrain due to climatic conditions
- Changes in the “atmosphere”

HOW TO ESTIMATE ALBEDO?

HOW TO ESTIMATE ALBEDO?

Terrestrial Databases, however…

- Albedo is very depending on the specific site

HOW TO ESTIMATE ALBEDO?

Terrestrial Databases, however…

- Albedo is very depending on the specific site

Satellite Databases, however…

- Spatial resolution
- Accuracy (Uncertainty)

HOW TO ESTIMATE ALBEDO?

Terrestrial Databases, however…

- Albedo is very depending on the specific site

Satellite Databases, however…

- Spatial resolution
- Accuracy (Uncertainty)

Onsite Measurement, however…

- Long Term campaign would be required

HOW TO ESTIMATE ALBEDO?

Terrestrial Databases, however…

- Albedo is very depending on the specific site

MIX?

Satellite Databases, however…

- Spatial resolution
- Accuracy (Uncertainty)

Onsite Measurement, however…

- Long Term campaign would be required

ATA'S METHOD FOR ESTIMATING ALBEDO TMY

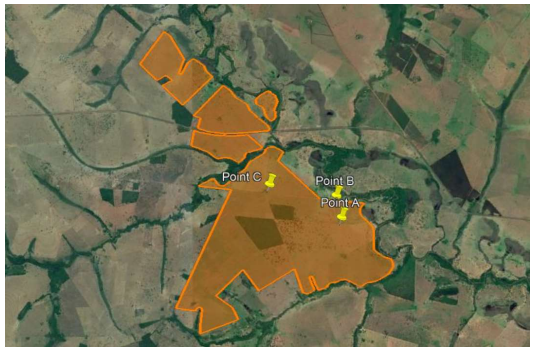
→ SHORT-TERM MEASUREMENT CAMPAING + CORRELATION WITH SATELLITE DATABASE

ATA'S METHOD FOR ESTIMATING ALBEDO TMY

→ SHORT-TERM MEASUREMENT CAMPAING + CORRELATION WITH SATELLITE DATABASE

Measurement → Data Processing → Data Correction → Extrapolation

- Equipment
- Duration
  - Days
  - Hours
- Measurement Point (s)
- Climatic Conditions

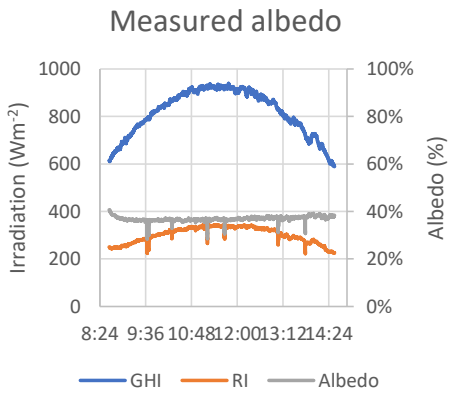


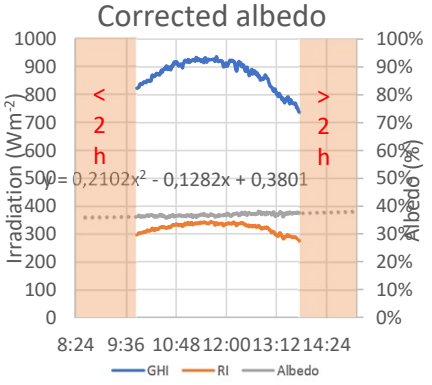
ATA'S METHOD FOR ESTIMATING ALBEDO TMY

→ SHORT-TERM MEASUREMENT CAMPAING + CORRELATION WITH SATELLITE DATABASE

Measurement → **Data Processing** → Data Correction → Extrapolation

- Cleaning measurement errors or voltage out of range

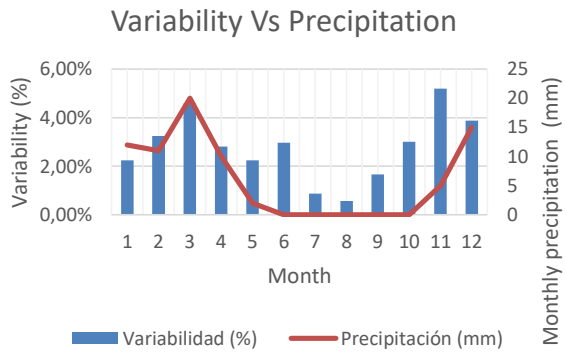




ATA'S METHOD FOR ESTIMATING ALBEDO TMY

→ SHORT-TERM MEASUREMENT CAMPAING + CORRELATION WITH SATELLITE DATABASE

Measurement → Data Processing → **Data Correction** → Extrapolation



- Precipitation
- Others

ATA'S METHOD FOR ESTIMATING ALBEDO TMY

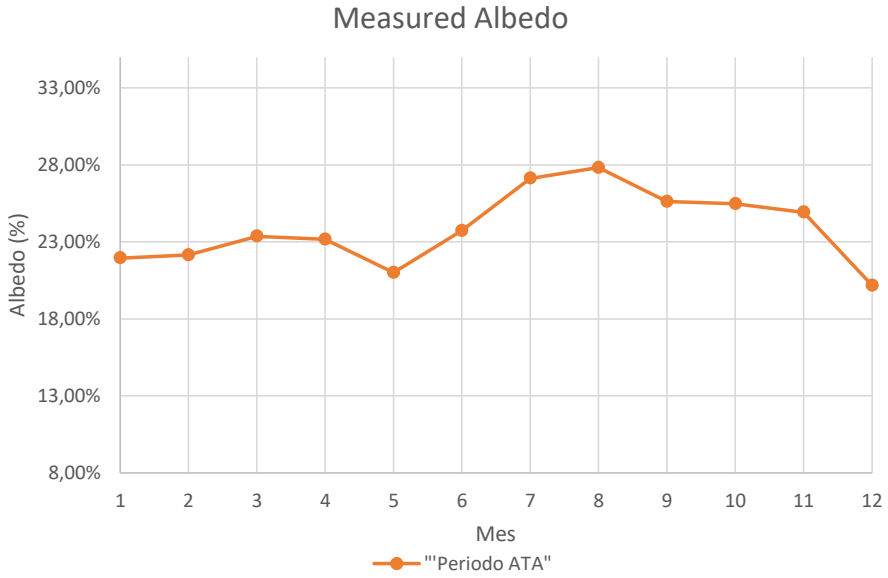
→ **SHORT-TERM MEASUREMENT CAMPAING + CORRELATION WITH SATELLITE DATABASE**

- DataBase?
- Extrapolation Method

VALIDATION OF THE METHOD

VALIDATION OF THE METHOD

- Annual Measurement Campaign carried out on a given site



VALIDATION OF THE METHOD

- Annual Measurement Campaign carried out on a given site

- More than 15 satellite data bases and more than 70 methods tested

VALIDATION OF THE METHOD

- Annual Measurement Campaign carried out on a given site

- More than 15 satellite data bases and more than 70 methods tested

- It was concluded that a standard deviation of 1.39% should be considered when calculating the monthly Albedo TMY of any site

CONCLUSSION

- **Albedo TMY estimations, that are relevant for Bi-facial Projects bankability, can be performed maintaining low uncertainty by combining satellite data-bases with short term measurement campaign.**

- **However……**

……

……Not a simple process!

READ THE FULL REPORT

https://atainsights.com/ata-renewables-methodology-for-estimating-albedo

Fig: Sample of Sites measured by ATA