

WEEK-3

Day-3

Site Assessment & Solar Resource Analysis

Why Site Assessment Matters

- Site assessment is the foundation of a successful solar PV project.
- It involves evaluating sunlight availability, shading, and site suitability.
- Key aspects include roof/land tilt, area, and load-bearing capacity.
- Poor assessment can lead to reduced output and wasted investment.
- A reliable assessment ensures performance and financial viability.

Solar Geometry Basics – Angles That Matter

- Solar geometry defines the sun's position relative to Earth.
- Important angles include declination, zenith, azimuth, and altitude.
- These angles vary with time, season, and geographic location.
- They guide optimal panel tilt and orientation, especially in India.
- Accurate geometry is essential for simulations and layout tools.

Types of Solar Irradiance – GHI, DNI, DHI

- Irradiance is the solar power received per unit area.
- GHI includes all sunlight on a flat surface; most common in PV systems.
- DNI measures direct sunlight on tracking systems; used in CSP.
- DHI captures diffused sunlight; important on cloudy or shaded sites.
- Understanding irradiance types helps in yield estimation and technology selection.

Measuring Solar Resource – Tools and Data

- Solar resource data is crucial for performance prediction.
- Instruments like pyranometers and sun trackers measure irradiance.
- Databases like NASA-SSE, PVGIS, and Meteonorm provide modeled data.
- TMY data helps simulate long-term average conditions for planning.
- Tools like RETScreen and SAM assist in accurate simulations.

Seasonal Variation in Solar Energy

- Solar energy varies with seasons due to sun angle and day length.
- Summer brings high sun angles and longer days → more energy.
- Winter has lower sun paths and shorter days → less energy.
- Optimal system design accounts for year-round variation.
- Proper tilt and sizing prevent seasonal performance dips.

Shading and Obstructions

- Shading can drastically reduce PV system performance.
- Common obstructions include trees, buildings, and water tanks.
- Tools like SunEye or drone surveys help map year-round shadows.
- Arrays should be shade-free between 9 AM and 3 PM.
- Use microinverters or bypass diodes for shade mitigation.

Rooftop Assessment Parameters

- Rooftop assessments determine feasibility and layout.
- Evaluate orientation, tilt, roof type, usable area, and load capacity.
- South-facing roofs are ideal in India for maximum output.
- Ensure access for maintenance and proper wiring/inverter placement.
- Final designs must comply with local safety and structural codes.

Ground-Mounted Site Considerations

- Ground-mount systems suit large or institutional solar projects.
- Assess land size, soil condition, slope, and flood risk.
- Ensure good accessibility and proximity to grid infrastructure.
- Row spacing prevents self-shading and improves airflow.
- Ground-mounts allow flexible orientation and tracking integration.

Pre-Design Layout Planning

- Early layout planning improves design and cost estimation.
- Use tools like Helioscope or SketchUp for 3D layout simulations.
- Include string configuration, inverter positions, and cable routes.
- Simulate energy yield and shade impact using software tools.
- Layout planning helps define BoM and optimize project budgeting.

Review Questions:

Ques 1: Given two potential sites: one with high GHI and minimal DHI, and the other with moderate GHI but high DHI due to persistent cloud cover, which site is more suitable for a rooftop fixed-tilt PV system and why?

Ques 2: If two systems in the same city show significantly different performance despite similar size and orientation, what site-related factors would you investigate to explain the discrepancy?

Ques 3: What are some tools or methods that can be used to identify shading on a rooftop?

**Feel free to reach
out with any
questions!**

Email

samaydora.energyitb@gmail.com

sushant.energyitb@gmail.com

Contact No.

8847603399

6391275528