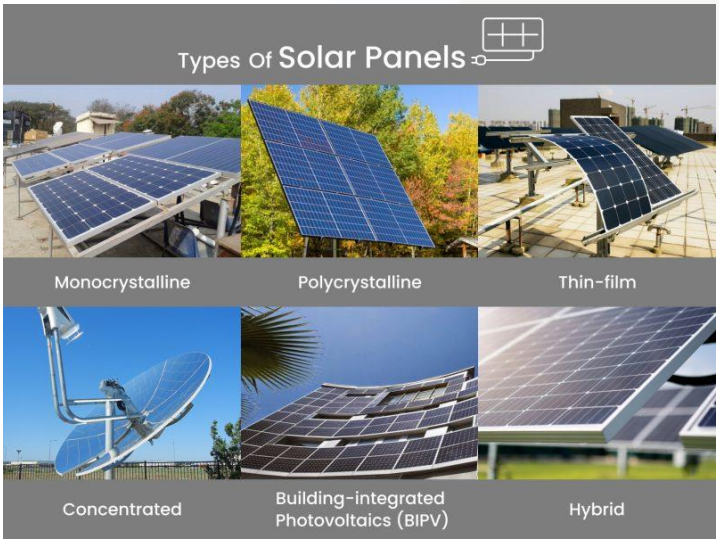
Solar Energy

Solar facility designs can be tailored to site conditions, equipment types, and energy output needs. Panel technology may vary based on applicant preferences, market conditions, costs, and regulatory requirements.

Components

Typical Characteristics

- Solar cells which are condensed into solar panels and in turn configured in arrays
- Mounting systems and piles
- Electrical collection equipment
- Access roads, fencing, security systems, stormwater controls, operations and maintenance areas
- Interconnection equipment: inverters, switchyard/substation, tie-in line.



Source: Halcol Energy

Each array may contain multiple panels with photovoltaic (PV) cells, which use semiconductors to convert sunlight directly into electricity. Photovoltaic cells are commonly on one side but can be double-sided. Electricity generation varies by panel size, technology, and number of PV cells.

The amount of sunlight an area receives is the largest consideration for siting solar facilities.

South-facing panels are the most effective. Where this orientation is infeasible, panels may face east and/or west, and increase the number of panels used or use tracker systems to tilt the panels throughout the day. Flat terrain is generally preferred but slopes steeper than 15 percent may be feasible with additional grading and geologic studies to assess potential impacts.

Access needs commonly include one or more improved driveway entrance, internal gravel access roads, and emergency access routes. Because solar components may be factory assembled and transported for installation, haul route impacts are often associated with construction traffic volume, although transformers and substation equipment may require specialized transport for heavy equipment.

Solar Facility Configurations

Mounting

The mounting location affects potential project scale, siting considerations, and the amount of land disturbed.

Ground mounted solar arrays are often used for larger solar facilities, with their scale typically determined by site conditions and the number and size of panels.

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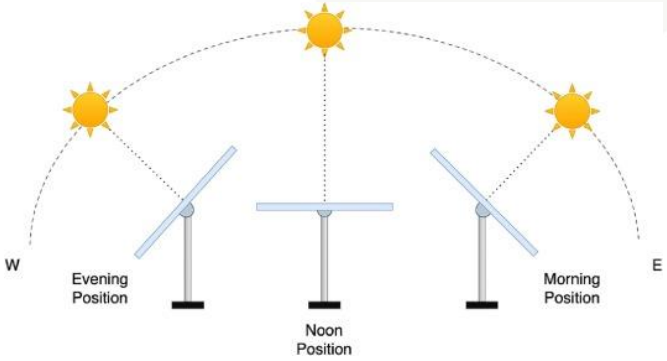
Solar arrays **mounted on structures** and rooftops are constrained by available surface area, orientation, slope, whether a surface is flat or angled in a certain direction, and shading. Solar arrays can be located on diverse buildings types including individual homes to multifamily housing, commercial office buildings, community facilities, and large warehouses.

Tilt

With **fixed-tilt** systems, the ideal tilt angle in Washington State is between 45 to 48 degrees given the state's latitude and accounting for potential snow loads.

Tracker systems optimize electricity generation by adjusting panel orientation to follow the sun throughout the day or account for seasonal changes in sun exposure. Depending on the design, trackers may rotate along an east-west axis or along both east-west and north-south axes. Although tracker systems are more commonly associated with ground mounted solar arrays, they may also be used with rooftop installations on large buildings with flat roofs.



Source: Phiri et al., 2023, DOI: 10.1016/j.solener.2023.111803.

Height

Height measurements for solar arrays often include the tilt of the array as part of the measurement. For arrays with tracking systems, height measurements may account for the maximum tilt.

- Typical heights for ground mounted fixed solar arrays are around 10 feet.
- Ground-mounted tracking solar arrays may reach approximately 15 feet at their highest tilt.

Ground-mounted solar facilities use piles to stabilize arrays under wind, snow, and seismic loads. Depending on soil conditions, piles are typically 4 to 10 feet deep and may extend 12 feet above grade. End-row piles are usually deeper to provide additional wind resistance.

Dual Use

Solar facilities can operate alongside other land uses such as parking lots (solar carports or canopies), water bodies (floating photovoltaics). Depending on the associated land use, the design, layout, supporting infrastructure, operational requirements, and potential impacts may vary to account for both energy generation and the continued use of the land for its primary function.

Source: Cincinnati Zoo, 2024, New Solar Array Over Second Parking Lot at Cincinnati Zoo Pumps Out Power and Provides Shade for Cars -

Eligible agricultural uses include crop production, grazing, animal husbandry, and dedicated beekeeping areas with pollinator habitat. Dual use of solar on agricultural lands involves additional considerations under the Growth Management Act to support the conservation of agricultural lands. Solar facilities must not degrade the agricultural or ecological productivity of the land.

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