Navigating FAA Glare Regulations & Maximizing Perimeter Space with Vertical Solar

A White Paper for Airport Sustainability, Facilities, and Operations Leaders — examining the FAA regulatory framework for solar glare, the role of glare simulation tools in project approval, and how vertical bifacial solar can help airports meet sustainability goals while maintaining uncompromising aviation safety.

AVIATION SAFETY | FAA COMPLIANCE | VERTICAL SOLAR | PERIMETER INFRASTRUCTURE

Executive Summary

Airports are under increasing pressure to reduce carbon emissions, stabilize long-term energy costs, and meet ESG commitments — all while maintaining uncompromising safety standards and operating within tightly constrained land footprints. Solar energy presents a compelling solution, but traditional photovoltaic (PV) installations introduce a critical aviation risk: glare. Solar glare has been severe enough in real-world cases to disrupt airport operations and force mitigation or removal of installations near runways and approach paths, demonstrating that reflection risk is not theoretical — it is operational.

This white paper examines the Federal Aviation Administration (FAA) regulatory framework for solar glare, the role of glare simulation tools in project approval, and how vertical bifacial solar — deployed along airport perimeters — can help airports meet sustainability goals while minimizing glare risk, maximizing land use, and aligning power production with airport demand patterns.

The Problem

Traditional PV installations create upward glare vectors that can disrupt pilots and air traffic control personnel — with real-world consequences including forced removal.

The Regulation

FAA policy requires site-specific glare analysis and Form 7460-1 submission. Projects that skip simulation risk costly redesigns or compliance action after construction.

The Solution

Vertical bifacial solar deployed along perimeter infrastructure redirects reflected light laterally, aligns generation with demand peaks, and consumes zero additional land.

The Glare Problem & FAA Compliance

FAA Solar Glare Policy Overview

The FAA's solar policy exists to ensure photovoltaic installations do not create hazardous glare for pilots or air traffic control personnel. Airport sponsors proposing solar installations must evaluate the visual impact of reflected sunlight and confirm that the project will not produce glare that could affect aviation safety. Critically, if glare issues are discovered after construction, the airport is responsible for mitigation at its own expense and may face compliance action — making upfront analysis not just best practice, but a financial imperative.

The FAA does not prescribe a single universal design standard for airport solar projects. Compliance is based on site-specific glare analysis and safety assessment, which means every airport must conduct its own rigorous review tailored to its unique runway orientations, tower positions, and approach corridors.

Key FAA Compliance Requirements

- Analyze potential glint and glare impacts on Air Traffic Control (ATC) towers and final approach flight paths (typically within ~2 miles)
- Submit FAA Form 7460-1 (Notice of Proposed Construction or Alteration) confirming no visual hazards will be created
- Accept full financial responsibility for post-construction mitigation if glare is discovered

Glint vs. Glare — A Critical Distinction

Glint is a momentary reflection lasting typically only seconds — an annoyance, but not necessarily a safety hazard.

Glare is a sustained reflection capable of causing visual impairment or after-image effects — the FAA's primary concern is this *ocular impact*, intense enough to temporarily compromise vision for pilots or controllers during critical operational phases.

Because glare risk depends on solar angle, panel tilt, aircraft approach path, and observer location, computer modeling is required to predict and mitigate risk before construction begins.

The Role of SGHAT / ForgeSolar in FAA Approval

The industry-standard method for evaluating solar glare near airports is the **Solar Glare Hazard Analysis Tool (SGHAT)**, now commercially provided and expanded through ForgeSolar. This simulation platform has become the de facto compliance tool accepted by the FAA for airport solar permitting and safety reviews. SGHAT modeling predicts precisely when and where glare may occur based on the intersection of sun position, panel geometry, and observer sightlines — giving project teams actionable data before a single panel is installed.

The tool evaluates whether predicted glare causes no impact, low potential for after-image, or a potential ocular hazard. Projects that receive a "potential ocular hazard" finding must either redesign the array geometry, adjust tilt and orientation, or select locations that keep reflections out of critical sightlines. Solar projects near airports have been shut down or modified after construction when glare was discovered — making simulation during the design phase essential for risk mitigation and budget certainty.

01

Sun Position & Panel Geometry Input

SGHAT ingests panel tilt, orientation, and geographic coordinates to model sun angles throughout the year at the specific site.

02

Flight Path & Tower Location Mapping

Approach corridors, ATC tower positions, and critical observer locations are mapped to define the sightlines that must remain glare-free.

03

Glare Hazard Classification

The model outputs a hazard classification — no impact, low after-image potential, or ocular hazard — for every hour of the year and every observer location.

04

FAA Form 7460-1 Submission

Simulation results inform the formal FAA notice, providing the safety justification required for project approval and construction authorization.

Best Practice Standard: Any solar installation near flight paths, control towers, roadways, or public areas should undergo a full glare simulation *before design finalization* — not after permits are submitted.

The Vertical Solution: Changing the Physics of Reflection

Why Traditional Tilted Solar Creates Risk

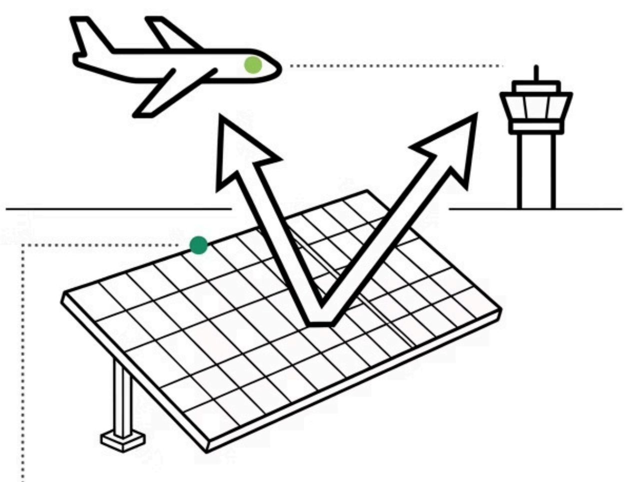
Traditional solar arrays are tilted at 20–35°, creating a reflection vector that can direct sunlight upward toward aircraft on approach, control towers, and nearby roadways. Because glare occurs when the angle of incidence equals the angle of reflection, tilted panels can reflect sunlight directly into critical aviation sightlines during morning or evening hours — precisely when aircraft are most active and when pilot visibility is most operationally critical.

This geometry is not a flaw in the panels themselves — it is a consequence of optimizing for maximum direct solar capture. The tilt angle that maximizes energy production is, in many cases, the same angle that maximizes upward reflection risk. This creates a fundamental tension between energy optimization and aviation safety for conventional flat-plate installations near airports.

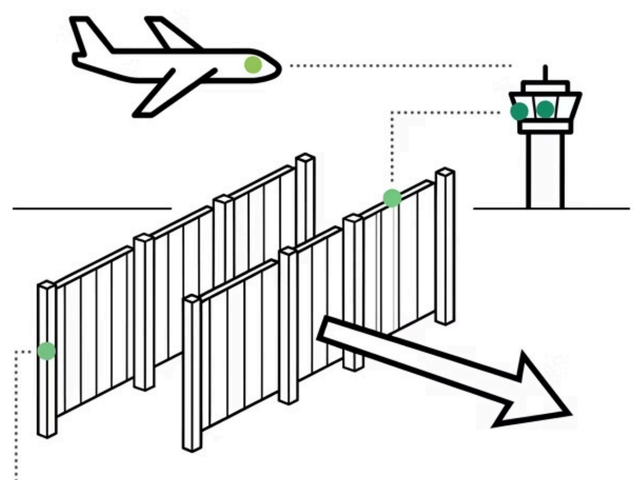
How Vertical Solar Mitigates Upward Glare

Vertical bifacial solar panels are mounted at a **90° angle**, fundamentally changing the reflection geometry. Where tilted panels send reflected light skyward, vertical panels redirect reflected light **east-west and horizontally** — along the ground plane rather than toward aircraft altitude.

This means vertical solar redirects reflected light laterally instead of upward, significantly reducing the probability of glare impacting aircraft or control towers. Vertical orientation does not eliminate the need for glare modeling — but it dramatically reduces upward reflection risk, which is the FAA's primary concern and the most common cause of project rejection.



TILTED PANELS (20-35°) REFLECTION UPWARD. CREATES OCULAR HAZARD RISK.



VERTICAL PANELS (90°) REFLECTION EAST-WEST ON GROUND. DRAMATICALLY REDUCES AVIATION GL.RISK.

Surviving the Elements: Wind & Aerodynamic Stability

Airports are high-wind environments with large open corridors, jet blast exposure, and crosswind conditions that place extraordinary structural demands on any perimeter infrastructure. Any solar installation along an airport fence line must be engineered not just for energy production, but for structural survival under extreme loading conditions that would compromise a conventional ground-mount solar array.

Vertical solar installations designed for airport environments must demonstrate structural wind resistance, minimal lift forces, and stable aerodynamic behavior across the full range of conditions encountered at an active airfield. Computational Fluid Dynamics (CFD) modeling shows that vertical solar structures can experience negligible lift forces even at wind speeds of 27.2 m/s (approximately 61 mph), with structural systems engineered for wind survivability up to 105 mph.

From an engineering standpoint, vertical solar behaves more like **perimeter fencing** than traditional solar arrays — reducing uplift risk and simplifying structural design in high-wind zones. This aerodynamic profile is a critical differentiator from conventional tilted-rack installations, which present a larger projected area and greater susceptibility to wind-induced uplift and vibration failures at the post-and-rail connections most vulnerable to fatigue loading.

CFD-Validated Performance

Computational Fluid Dynamics modeling confirms negligible lift forces at 27.2 m/s (≈61 mph) sustained wind speeds — the standard design condition for most airport perimeter environments.

105 mph Survivability

Structural systems are engineered for wind survivability up to 105 mph, exceeding ASCE 7 requirements for most U.S. airport locations and providing a meaningful safety margin.

Fence-Like Aerodynamics

Vertical orientation means the structure behaves aerodynamically like perimeter fencing — familiar infrastructure category with well-established structural engineering precedents at airports.

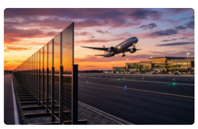
Jet Blast Resistance

Perimeter deployment keeps vertical panels outside active blast zones, and the structural profile minimizes dynamic loading from intermittent high-velocity jet exhaust events near taxiways.

Maximizing Perimeter Footprints: Zero-Conflict Land Use

Airports face uniquely complex land-use constraints that make conventional solar farm deployment extremely difficult or outright impossible. Runway safety areas, taxiway object-free zones, approach path height restrictions, security perimeters, noise barriers, parking lots, and buffer zones all compete for the same finite land resource. Traditional solar farms require dedicated, unencumbered land area — and at most airports, such land simply does not exist in the quantities needed for meaningful energy production without conflict with operational requirements.

Vertical solar transforms this constraint into an opportunity. Rather than requiring dedicated land, vertical bifacial panels can be co-deployed on infrastructure that airports must already build and maintain. Every linear foot of perimeter fencing, noise barrier, parking lot boundary, and access road buffer zone becomes a potential energy generation asset — without consuming a single square foot of additional operational land.



Perimeter Fencing

Vertical solar panels replace or augment standard security fencing along airport boundaries — generating energy where a physical barrier is already required by FAA and TSA security standards.

Parking Lots & Structures

Perimeter boundaries of surface parking lots and structured garages offer extensive linear footage for vertical deployment, often in locations already served by electrical infrastructure.

Noise Barriers

Airports required to construct noise mitigation barriers along community boundaries can integrate bifacial solar directly into barrier construction — turning a compliance cost into a revenue-generating asset.

Access Roads & Buffer Zones

Buffer zones and access road corridors where structures are already required or permitted provide low-conflict deployment pathways with proximity to electrical infrastructure serving terminals and support facilities.

Power Alignment: Matching Airport Demand Curves

Beyond glare safety and land efficiency, vertical bifacial solar offers a third structural advantage that is frequently overlooked in early-stage feasibility discussions: its generation profile aligns remarkably well with airport electricity demand patterns. This alignment has direct implications for energy cost savings, grid independence, and the economic case for the project.

Vertical bifacial solar panels face **east and west simultaneously**, producing a distinct "two-peak" generation curve — strong output in the morning as the east face captures direct radiation, moderate output at midday from diffuse light on both faces, and strong output again in the late afternoon as the west face receives direct sun. This profile stands in sharp contrast to conventional south-facing solar, which concentrates the vast majority of its production in a narrow midday window.

Vertical Solar Generation Profile

1

Morning Peak

East face captures direct radiation — high output during morning departure rushes and early HVAC ramp-up

2

Midday Moderate

Both faces receive diffuse light — sustained moderate output during mid-day terminal operations

3

Afternoon Peak

West face captures direct radiation — high output during afternoon arrival peaks and peak HVAC loads

4

Evening Taper

Generation tapers as sun sets — aligned with reduced airport activity after last evening banks

Airport Demand Systems Served at Peak

- Morning departure boarding and gate operations
- Terminal HVAC systems (heaviest load during peak occupancy)
- Baggage handling and conveyor systems
- Jet bridge and ground support equipment charging
- Afternoon arrival baggage and passenger processing
- Parking facility lighting and revenue systems

Traditional south-facing solar peaks at midday — when airport energy demand is often at a relative trough between morning and afternoon operational peaks. Vertical east-west solar shifts production precisely toward those operational peak demand periods, improving on-site energy utilization and reducing demand charge exposure.

Conclusion: Safety, Compliance, and Smarter Land Use

Airports evaluating solar must solve three distinct challenges simultaneously: aviation safety, land constraints, and energy demand alignment. FAA policy makes clear that glare risk is the primary regulatory hurdle, and glare simulation is the primary compliance tool. Projects that fail to account for glare risk can face costly redesigns, mitigation, or removal after construction — outcomes that are financially damaging and operationally disruptive for airport sponsors.

Vertical bifacial solar, deployed along perimeter infrastructure, represents a structurally coherent answer to all three challenges. Its reflection geometry reduces upward glare risk. Its fence-line deployment model consumes no operational land. Its two-peak generation profile aligns production with the hours airports need power most. And its aerodynamic profile makes it survivable in the high-wind, jet-blast environments that characterize active airfields.

Aviation Safety

Vertical orientation redirects reflected light laterally rather than upward — dramatically reducing the probability of ocular glare hazard for pilots on approach or controllers in ATC towers. Glare modeling remains required, but the starting geometry is fundamentally safer than tilted arrays.

Land Constraints

Fence-line and perimeter deployment transforms existing required infrastructure into energy assets with zero additional land consumption — resolving the primary land-use conflict that disqualifies conventional solar at most airports.

Wind Resilience

CFD-validated aerodynamic performance and structural engineering rated to 105 mph wind survivability ensure that perimeter solar installations remain intact and operationally safe across the full range of airport weather conditions.

Energy Demand Alignment

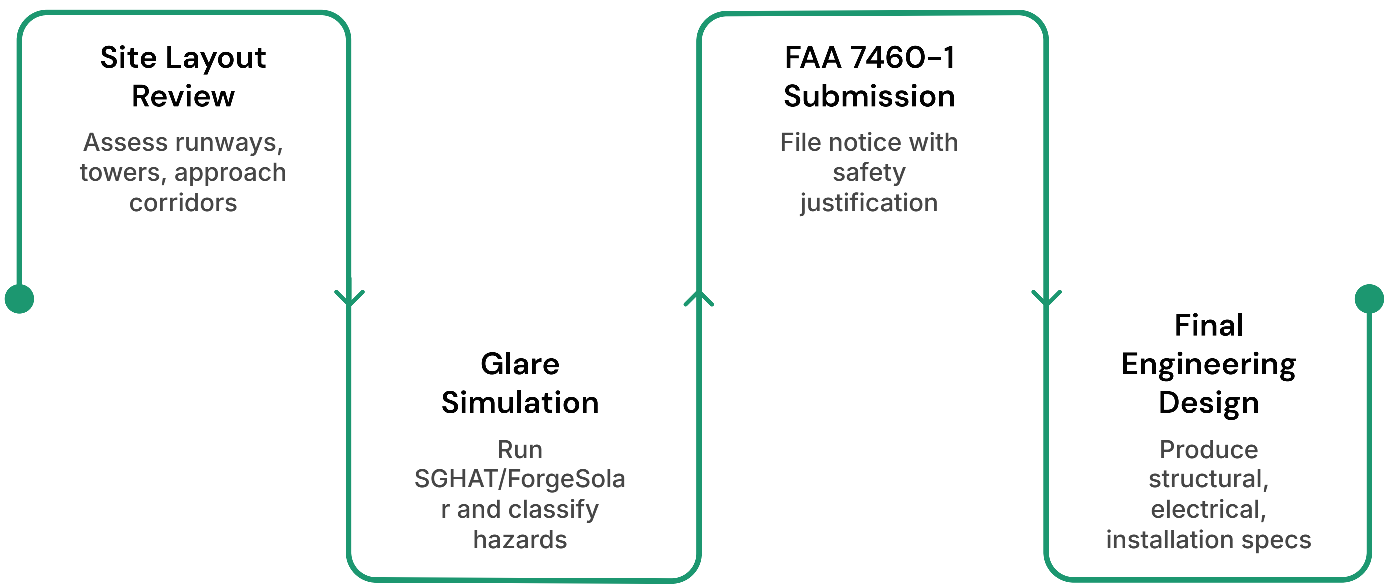
The two-peak east-west generation curve of vertical bifacial panels shifts production toward morning departure and afternoon arrival peaks — improving on-site utilization and reducing grid dependence during high-demand periods.

Challenge	Requirement	Vertical Solar Response
Aviation Safety	No ocular glare impact on pilots or ATC	Lateral reflection geometry; SGHAT-validated
Land Constraints	No interference with operational areas	Fence-line deployment; zero additional land
Energy Demand	Power when airports need it most	Two-peak east-west generation profile

Start with a Site-Specific Assessment

Because every airport has unique runway orientations, tower locations, and approach paths, solar feasibility cannot be determined from a standard layout or industry averages. What works safely at one airport may create an unacceptable glare hazard at another — and the only way to know is through site-specific simulation and analysis tailored to your facility's geometry.

The correct process — from initial feasibility to construction authorization — follows a clear four-step pathway. Each step builds on the last, ensuring that no project moves to construction without the safety verification and regulatory approval required for FAA compliance. This process protects airport sponsors from post-construction liability while providing the documentation needed to move through FAA review with confidence.



Each step in this process reduces project risk — financial, regulatory, and operational. Site layout review identifies constraints before design investment. Glare simulation validates safety before permits are filed. FAA Form 7460-1 submission establishes the regulatory record before construction begins. Final engineering design locks in specifications that reflect all safety findings.

Next Step: Request a **site-specific glare simulation and perimeter feasibility assessment** to determine whether vertical solar can be safely deployed at your airport without impacting flight operations. This assessment will identify viable deployment zones, predict glare outcomes across all hours and seasons, and provide the SGHAT documentation needed to initiate FAA Form 7460-1 submission.

This white paper is intended for airport sustainability directors, facilities leaders, and operations executives evaluating solar energy deployment under FAA safety constraints. It focuses on risk mitigation, regulatory compliance, and infrastructure optimization rather than energy production alone.