Bristol Airport Silver Zone

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Bristol Airport is delivering a large-scale off-grid solar lighting scheme across its Silver Zone long-term car park, replacing traditional grid infrastructure with 348 permanent solar street lights designed to improve resilience, reduce energy use and support long-term operational performance.

WHY A SMARTER LIGHTING APPROACH?

As part of its ongoing commitment to sustainable growth, operational resilience and passenger safety, Bristol Airport continues to invest in infrastructure improvements that reduce environmental impact while supporting a growing volume of passengers and vehicle movements.

The airport's long-term car parks are a critical part of the landside operation – operating continuously, exposed to the elements and requiring reliable, consistent lighting throughout the year to ensure safety, security and a positive customer experience.

Traditionally, this type of infrastructure relies on grid-connected lighting, bringing with it high installation costs, ongoing energy consumption, carbon emissions and vulnerability to power outages.

To support its sustainability objectives and futureproof landside infrastructure, Bristol Airport explored alternatives to conventional lighting that could deliver robust, compliant illumination without increasing energy demand or operational complexity.

CHALLENGES IN A LIVE AIRPORT CAR PARK

The Silver Zone long-term car park presented a combination of technical, environmental and operational challenges:

Carbon and energy reduction
Bristol Airport is actively reducing emissions across its estate. Conventional grid-powered lighting contributes to Scope 2 emissions and rising electricity costs, conflicting with long-term net-zero ambitions.

Complex installation environment
Installing or upgrading mains-powered lighting would require:

- Trenching and cabling across a live operational car park
- Coordination with DNO connections
- Significant civils work, disruption to parking capacity and extended installation programmes

These activities increase cost, programme risk and operational disruption.

Safety, security and lighting performance
The car park requires consistent lighting levels to support:

- Pedestrian and vehicle safety
- CCTV visibility and personal security
- Operation throughout winter months and periods of low daylight

Any alternative solution had to meet British Standards for external lighting while maintaining reliability in UK weather conditions.

Environmental sensitivity and light control
Given the airport setting, careful control of light spill, glare and upward light output was essential, particularly along landside and airside boundaries. The solution needed to minimise light trespass while still delivering effective illumination across large open areas.

OFF-GRID SOLAR INNOVATION

Following detailed engagement with the Bristol Airport team, Prolectric designed and proposed a fully off-grid solar street lighting solution, centred around the installation of 348 AE3 solar street lights across the Silver Zone long-term car park.

Bespoke lighting design and engineering

- A full lighting design was developed to meet the site's operational requirements and relevant British Standards, including BS 5489-1.
- Column positions, heights and spacings were optimised to provide uniform illumination across parking bays, drive aisles and pedestrian routes.
- Particular attention was given to perimeter areas, with shielding solutions incorporated where required to control light spill and protect sensitive boundaries.

AE3 solar street lighting technology
Each AE3 unit integrates:

- A high-efficiency monocrystalline solar panel
- Long-life lithium battery storage, designed for 7–9 years of operation
- Advanced low-wattage, high-lumen LED light heads
- A smart controller with passive infrared (PIR) sensing

The split-type design allows the solar panel and luminaire to be optimally positioned for maximum energy capture and lighting performance.

Year-round, UK-specific performance modelling
To guarantee reliability:

- Detailed energy calculations were undertaken using solar radiation data, site location, expected footfall and operating profiles
- Battery capacity and panel sizing were selected to maintain lighting performance throughout winter and periods of low solar input
- A safety factor was applied to ensure resilience during prolonged poor weather

This approach ensures the lights deliver consistent performance from dusk to dawn without reliance on grid power.

Minimal-disruption installation

- Root-mounted columns were installed without the need for trenching, cabling or DNO connections
- Installation was phased to maintain car park operations and minimise disruption to passengers
- Prolectric's in-house installation team carried out testing, commissioning and worked closely with Bristol Project Management, Operations and Air Traffic control teams throughout the project to ensure the mode of operation of the new lighting columns complied with their regulations and were non-disruptive to the ongoing operations of the airport.

PROJECTED SAVINGS AND IMPACT

Measurable sustainability impact

- Zero operational carbon emissions from lighting – all 348 units operate entirely on solar energy
- Elimination of long-term electricity consumption associated with conventional car park lighting
- Reduced embodied carbon compared to traditional installations by avoiding extensive civils, cabling and infrastructure works

Operational resilience and reliability

- Lighting remains operational during grid outages, improving resilience and passenger safety
- High-capacity batteries and efficient LEDs ensure consistent performance even during winter months
- ULOR of approximately 0.5% significantly reduces upward light and sky glow

Improved safety and user experience

- Uniform lighting levels enhance visibility for drivers and pedestrians
- PIR-based operation increases light output when activity is detected, supporting personal security without unnecessary energy use
- Low-glare optical design minimises discomfort while maintaining effective illumination

Reduced maintenance and long-term value

- Self-cleaning solar panels and robust IP-rated components minimise maintenance requirements
- Modular design allows replacement of individual components, extending asset life and reducing whole-unit replacement
- A bespoke 5-year warranty provides assurance and long-term confidence for the airport operator

Scalable, future-ready infrastructure

The project demonstrates how large-scale, permanent solar lighting can be successfully deployed within a complex airport environment. The solution is:

- Fully scalable across other landside assets
- Suitable for replication at airports across the UK and internationally
- Aligned with long-term sustainability, cost and resilience objectives

WHY THIS PROJECT STANDS OUT

This installation represents one of the largest permanent off-grid solar street lighting deployments within a UK airport car park environment.

It showcases how engineering-led innovation, proven clean technology and close collaboration between supplier and client can deliver infrastructure that is safer, more sustainable and operationally robust - without compromise.

By replacing traditional grid-dependent lighting with a solar-first solution, Bristol Airport has taken a practical, measurable step toward lower-carbon aviation infrastructure while improving the experience for passengers and operators alike.

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Case Study Bristol Airport Silver Zone

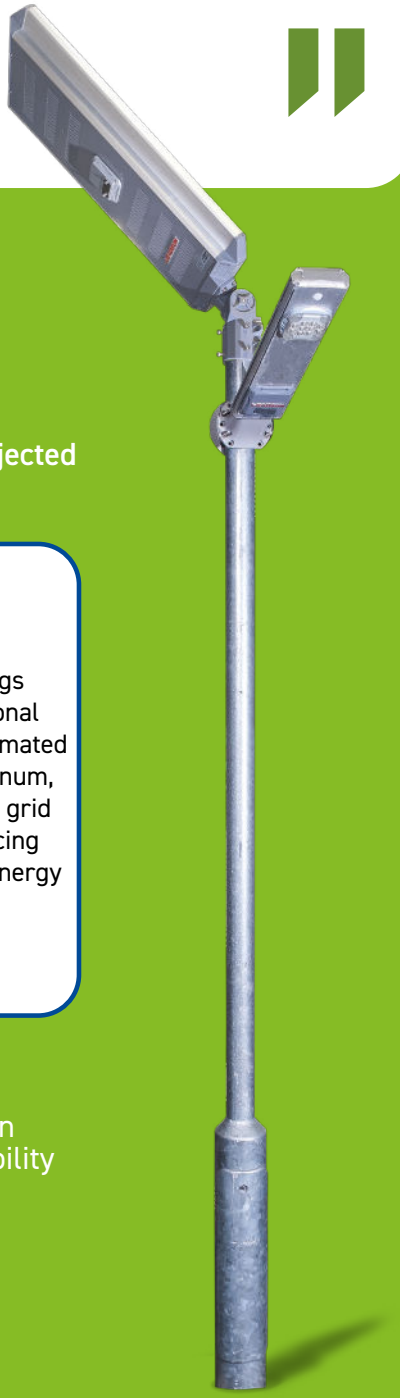
Rather than pursuing incremental efficiency improvements to conventional lighting, the project team adopted a fundamentally different approach by removing the need for mains power entirely.

To achieve this, Bristol Airport partnered with Prolectric Services Ltd to design and deliver a low-carbon alternative that eliminated reliance on grid electricity. The project involved the installation of 348 permanent AE3 solar street lights, providing full off-grid illumination across the Silver Zone car park using 100% renewable energy.

Sustainability was central to the project from the outset. A full lighting design was developed to meet British lighting standards for car parks while minimising energy demand and material use. Column spacing, heights and orientations were optimised to deliver uniform illumination using efficient, low-wattage LED light heads.

This reduced both operational energy requirements and embodied carbon associated with over-engineered or oversized infrastructure.

Seb Winter
Intermediate Development Project Manager
Bristol Airport



IMPACT

By adopting Prolectric's solar street lighting solution, Bristol Airport is projected to achieve the following benefits:

Compared to a standard mains-powered street light, the newly installed solar units are expected to save approximately £23,778 per year in avoided electricity costs, based on an average commercial tariff of 26p per kWh.

By switching to solar lighting, Bristol Airport is forecast to reduce emissions by approximately 11,523 kg of CO_2e per year, directly supporting its net-zero operational objectives.

Total energy savings compared to traditional street lighting are estimated at 91,454 kWh per annum, while also improving grid resilience and reducing reliance on external energy infrastructure.

Prolectric's off-grid renewable lighting solution provides both practical and financial advantages, demonstrating how permanent solar infrastructure can reduce operating costs, improve resilience and support long-term sustainability objectives within a live airport environment.