



Sustainable Lighting Upgrade

Comprehensive Case Study - Multi-national energy provider

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A major project demonstrating the strategic value of lighting remanufacturing over traditional replacement approaches in large-scale commercial facilities.

This case study explores how a large multi-national energy provider's Aberdeen headquarters transformed 2,116 fluorescent panel fittings into high-performance, energy-efficient LED assets whilst achieving substantial carbon reduction and financial returns.

The project saw the lighting upgraded to the latest technology, featuring an automated emergency lighting system that self-tests and generates a log-book, while the project was delivered in accordance with BS8887-221 requirements.



Introduction & Project Stakeholders

This case study explores the process of delivering 44% energy reduction on the existing panel fittings, a five-year payback period, and £207,423 net benefit over seven years, while improving workplace lighting quality. With respect to carbon, the project delivered 149 tCO₂e estimated avoided embodied carbon versus new-equivalent procurement, and 300 tCO₂e estimated avoided operational carbon versus the previous fluorescent installation over seven years.

Typical lighting remanufacturing projects deliver energy reductions of between 40 and 70%; at 44%, this project sits within that established range. The differentiation here isn't the percentage — it's what came with it: brighter, better-controlled light, automated emergency lighting, supporting compliance with relevant regulations, achieved without the embodied carbon or disposal cost of full replacement.

 Client Confidential multi-national energy provider - Aberdeen headquarters facility requiring comprehensive lighting modernisation across 2,116 panel fittings.	 Property Management JLL (Jones Lang LaSalle) - Leading global commercial real estate services firm overseeing facility operations and sustainability initiatives.
 Implementation Partners Space Solutions - Specialist workspace consultancy providing strategic design and implementation expertise for corporate environments.	 Lighting Technology EGG Lighting - Innovative remanufacturing specialists delivering sustainable lighting solutions with advanced DALI-2 technology integration.

Strategic Project Objectives

This study demonstrates the measurable benefits of lighting remanufacturing over traditional new equipment procurement in certain large-scale corporate environments. The Aberdeen project serves as a benchmark for facilities managers evaluating sustainable upgrade strategies.

Primary Deliverables:

- Marked operational cost reduction through energy efficiency gains
- Notable carbon footprint reduction via embodied and operational carbon savings
- Future-proof lighting infrastructure with advanced control capabilities
- Real-world performance validation through comprehensive monitoring and assessment

The project showcases how strategic remanufacturing approaches can deliver improved financial returns whilst advancing corporate sustainability goals, providing a replicable model for similar facilities across the energy sector.

Project Overview: Facility Lighting Upgrade

This section details the specific parameters of the project, outlining the comprehensive scope of the sustainable lighting remanufacturing project and its planned implementation timeline.

Facility Specifications & Operational Context

This project took place at a critical operational hub for the multinational energy provider's regional activities This multi-storey complex spans approximately **150,000 square feet** and operates with varied requirements across its diverse areas.



24/7 Operations

Specific control rooms and essential operational zones require continuous, reliable lighting



Diverse Work Environments

Open-plan offices, private meeting rooms, laboratories, and collaborative spaces each necessitate tailored lighting solutions



Health & Safety Compliance

Adherence to stringent industry standards for illumination levels and visual ergonomics



Energy Efficiency Imperative

Strategic focus on reducing energy consumption and associated carbon emissions aligned with the client's corporate sustainability goals

Data-Driven Operational Analysis

EGG Lighting conducted a detailed four-month analysis of real-world lighting usage across the facility. This monitoring allowed us to establish accurate daily operating hours, identify peak activity periods, and confirm significantly reduced occupancy during weekends.

These insights ensured that the proposed lighting design, control strategy, and energy-saving projections were based on verified operational behaviour rather than theoretical modelling, reinforcing the robustness and professionalism of our assessment and enabling more accurate ROI and carbon calculations.

Detailed Project Scope & Technology Integration

The project specifically targets the upgrade of **2,116 existing 600x600mm recessed panel fluorescent light fittings** throughout the facility. Rather than traditional replacement, EGG Lighting employed a sustainable remanufacturing approach, upgrading the original luminaires with cutting-edge components.

Fitting Distribution

- **70%** in open-plan office areas
- **20%** in meeting rooms and private offices
- **10%** in corridors, lobbies, and amenity spaces

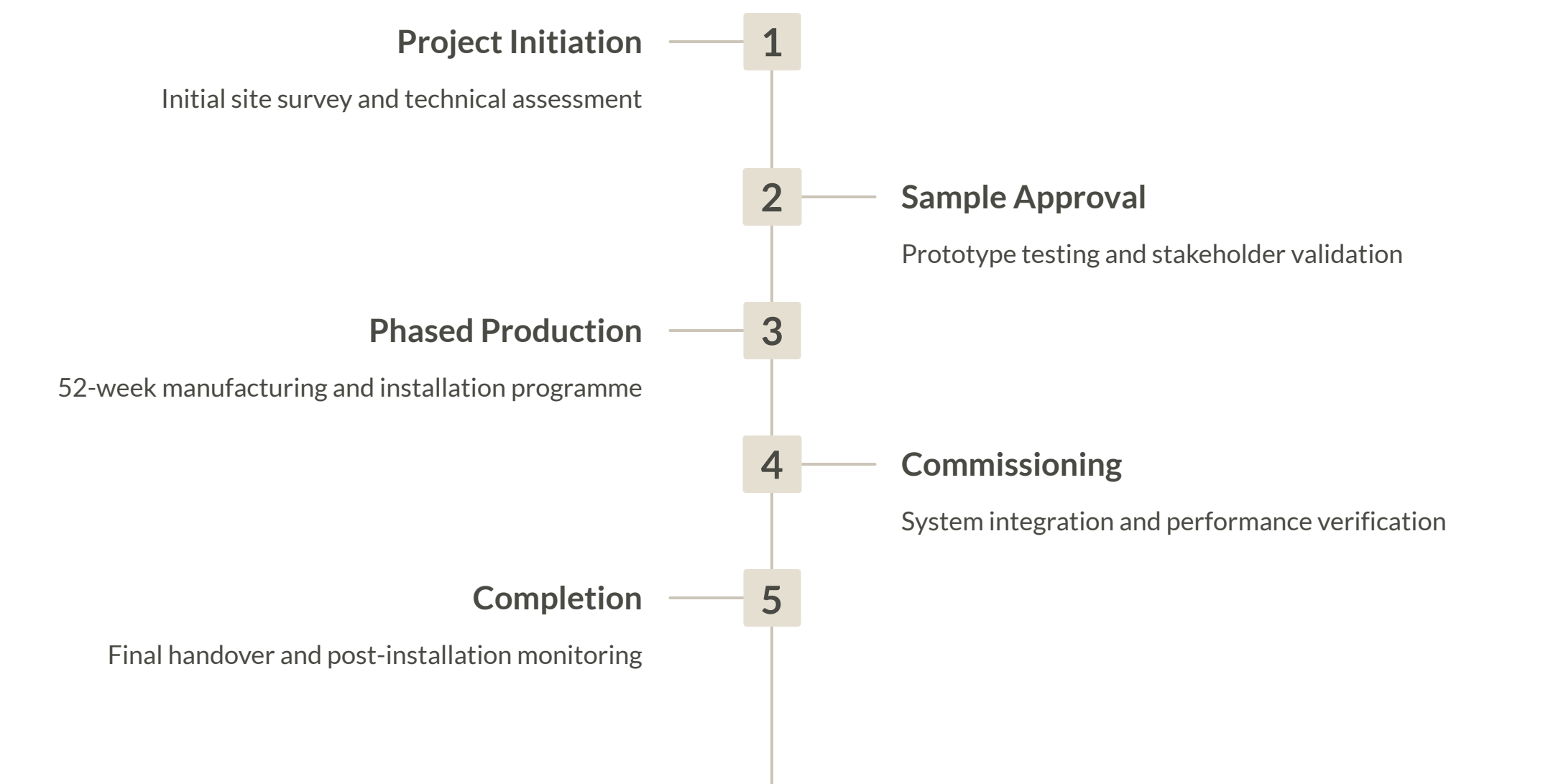
Phased workflow ensured client HQ was never interrupted.

Key Implementation Features

- Advanced DALI-2 integration enabling granular control and intelligent sensors
- Minimal disruption through carefully phased installation
- Component lifecycle extension reducing waste and embodied carbon

**Future-Proof Infrastructure:** The upgrade provides a scalable and flexible lighting infrastructure capable of adapting to future technological advancements and workspace reconfigurations.

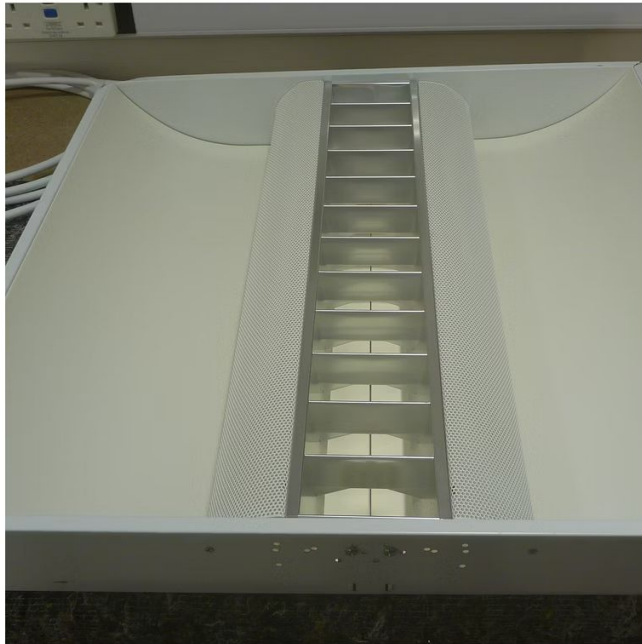
Implementation Timeline & Key Milestones



Same Housing. Entirely New Technology.

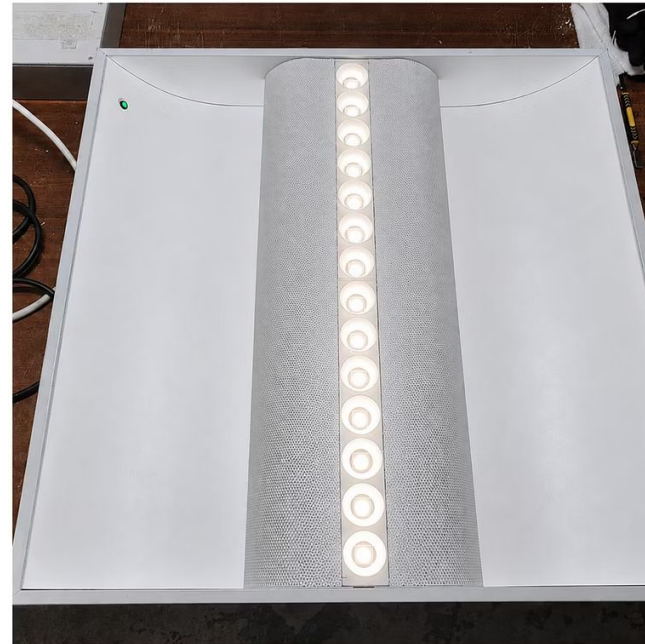
Before: Original Thorn IndiQuattro (Fluorescent)

The original Thorn IndiQuattro fluorescent fitting — 2,116 of these were collected, stripped, and remanufactured, avoiding disposal and preserving the value of the original housings.



After: Remanufactured by EGG Lighting (LED)

The same housing, reborn. New LED modules, Tridonic DALI-2 driver, and precision glare-control optics — installed across all 2,116 panels at the Aberdeen facility.



The housing didn't change. Everything inside it did.

Project Implementation & Delivery Management

With sample approval complete, we moved into scale and production. Our phased approach ensures quality control whilst minimising operational disruption across the facility. (50 fittings per week chosen to complement the working schedule at facility, requested by the host - there is scope to scale production at a higher level.)

01	02
Weeks 1-12	Weeks 13-26
Sample approval, final design validation, and production setup	Initial production run: 650 fittings manufactured and tested
03	04
Weeks 27-40	Weeks 41-52
Mid-phase production: 850 fittings with quality control checkpoints	Final phase production: 616 fittings and installation completion

50	52	2,116
Fittings per Week	Week Project Length	Total Fittings
Consistent production run rate	Full installation timeline	Complete facility coverage

Sustainable Packaging & Logistics

Our commitment to environmental responsibility extends beyond the product itself, influencing every stage from manufacturing delivery through to installation.

Eco-Friendly Materials Implementation of a reusable, returnable packaging system . Packaging was collected after delivery for reuse on subsequent deliveries, creating a circular system that eliminated single-use waste and reduced overall material requirements.	Optimised Transport Implementation of consolidated delivery schedules to minimise the number of transport movements required, directly reducing fuel consumption and associated transport emissions.	Carbon-Conscious Chain Selecting transport methods and partners prioritising carbon efficiency to ensure a low-impact logistics chain for all components and finished products.
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Live Site Project Management

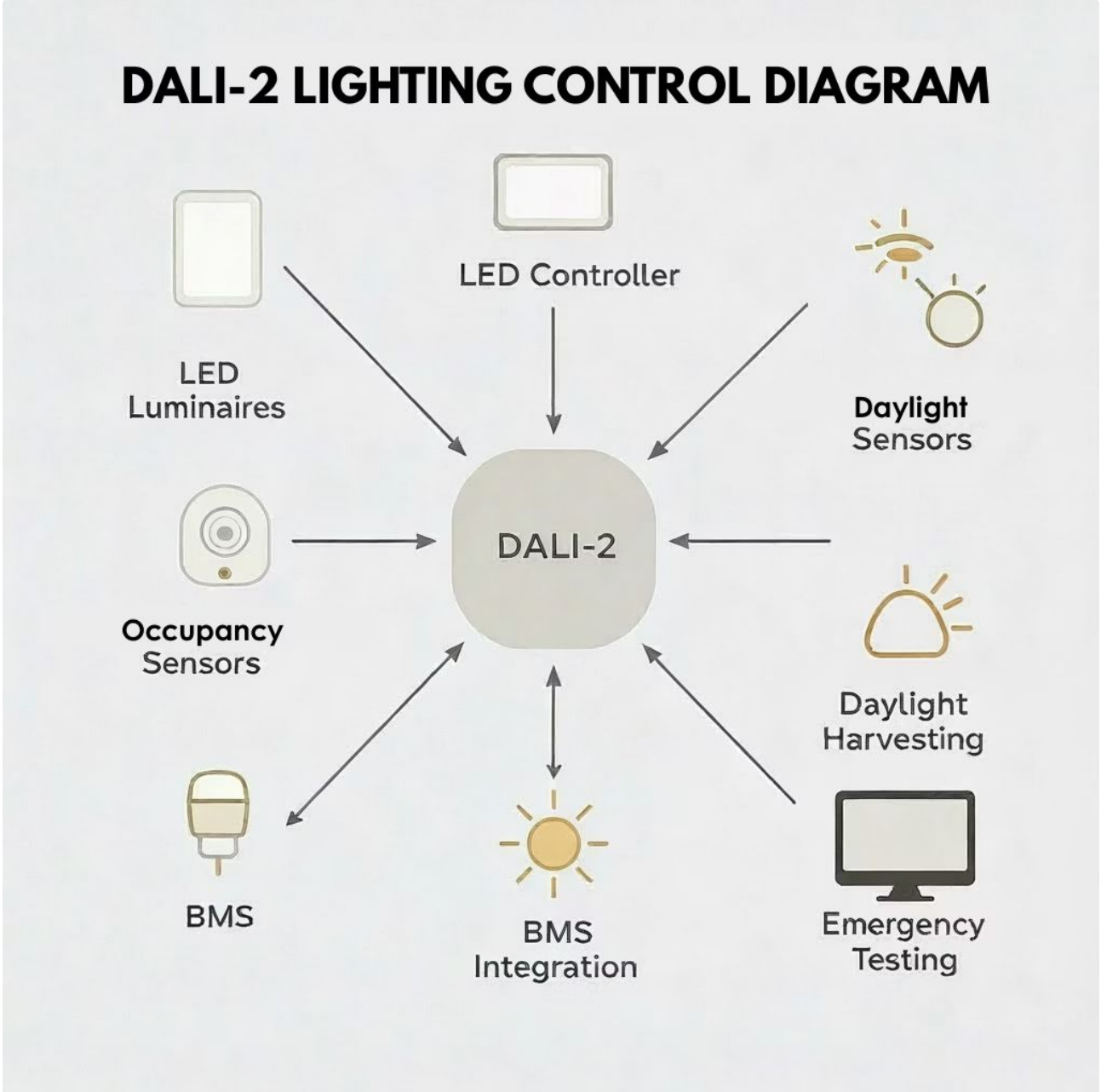
Managing a project of this scale within a fully operational 24/7 Aberdeen facility required stringent coordination, minimal disruption strategies, and adherence to highest safety protocols.

Phased Installation & Continuity Adopted a highly controlled phased installation approach aligned with operational schedules, ensuring business continuity and maintaining full service functionality throughout the 52-week timeline.	Operational Coordination Dedicated on-site project management team for daily coordination with the organisation's facility management and operational teams, minimising interference with critical energy sector activities.
Safety Protocols Strict adherence to live site safety protocols relevant to an active energy sector environment, including necessary certifications and continuous risk assessment to ensure zero incidents.	User Communication Strategy Established clear and proactive communication channels with facility users and stakeholders, providing timely updates on installation phases and potential minor access changes to manage expectations effectively.

Smart Controls Integration

As part of this project, the lighting system was upgraded to a new wireless Bluetooth automated emergency management (EM) system with proactive fault finding. Our smart controls solution leverages existing infrastructure—including cables and LCM systems—and integrates **DALI Bluetooth bridges** to enable sophisticated wireless automation without costly rewiring.

- **DALI Bluetooth bridges** enabling wireless system connectivity
- **DALI-2 compatibility** for seamless integration with building management systems
- **Automated fault diagnosis and reporting** down to individual component level
- **Enhanced system diagnostics** for proactive maintenance
- **Real-time monitoring** of power consumption, temperature, and luminaire status
- **Predictive maintenance alerts** based on operational hours and performance data
- **Automated emergency lighting functional and annual testing** reduces maintenance labour and supports compliance with emergency lighting regulations.
- **Daylight harvesting and occupancy sensing** for additional energy savings



 **Quality Assurance:** Each production batch undergoes rigorous testing against BS8887-221 and BS EN 60598 standards. Full traceability documentation maintained throughout the manufacturing and installation process.

Regulatory Compliance & Industry Standards

Adherence to stringent regulatory and industry standards is paramount for validating the performance, safety, and environmental claims of remanufactured lighting products. Our approach is designed to meet applicable regulatory and industry requirements.



BS8887-221: Remanufacturing Compliance

This standard governs the remanufacturing of luminaires, mandating 'as new' performance, safety, and warranty. The project demonstrates alignment with BS8887-221 requirements, demonstrating that remanufactured products meet or exceed original specifications, providing critical assurance for long-term reliability and operational continuity.



BS EN 60598: Luminaire Safety

BS EN 60598 outlines comprehensive electrical, mechanical, and thermal safety requirements for luminaires. Our remanufactured products undergo rigorous testing to this standard, ensuring that they consistently deliver safe and compliant operation within their application environments, mitigating project risks.



TM66: Circularity Assessment

TM66 provides a robust framework for evaluating the circularity of lighting products across their lifecycle. The project's remanufactured solutions demonstrate strong circularity performance under the TM66 framework, underscoring their environmental benefits and aligning with modern sustainable design principles for green buildings.



EPDs & TM65.2: Green Building Credits

TM65.2 calculations and EPDs can support project teams with embodied-carbon reporting and may contribute evidence for relevant green-building assessment credits, subject to the scheme, project scope, and assessor review.

Comprehensive Standards Framework

By rigorously adhering to these established standards, the project not only validates the technical viability and financial benefits of remanufactured lighting but also provides clear evidence of a responsible, future-proof solution for discerning A&E professionals.



Compliance with these rigorous standards demonstrates that remanufactured lighting solutions can meet the highest industry benchmarks for performance, safety, and environmental responsibility, providing specifiers with confidence in sustainable procurement decisions.

Remanufactured LED vs. New LED

Our remanufactured Thorn IndiQuattro solution delivers measurably superior performance across key metrics when compared with a representative current market alternative.

The data demonstrates clear advantages in efficiency, lifetime, and long-term value. Beyond the financial savings, the indirect backlight technology and 45° glare control shade deliver a noticeably cleaner, softer light quality than a standard backlit panel — improving the visual environment as well as the energy bill.

Comparison Basis

The energy and performance improvements reported throughout this case study are based on a direct comparison between the original installed Thorn IndiQuattro luminaires and the remanufactured Thorn IndiQuattro luminaires supplied as part of this project.

For reference, the "new alternative" shown on the next page represents the closest currently available market equivalent identified for benchmarking purposes. It is not the direct successor to, or a like-for-like replacement of, the original Thorn IndiQuattro luminaire. Comparisons involving the new alternative should therefore be considered indicative of current market offerings rather than a direct like-for-like comparison.

Remanufacturing delivers strong performance and value — even under conservative benchmarking assumptions.

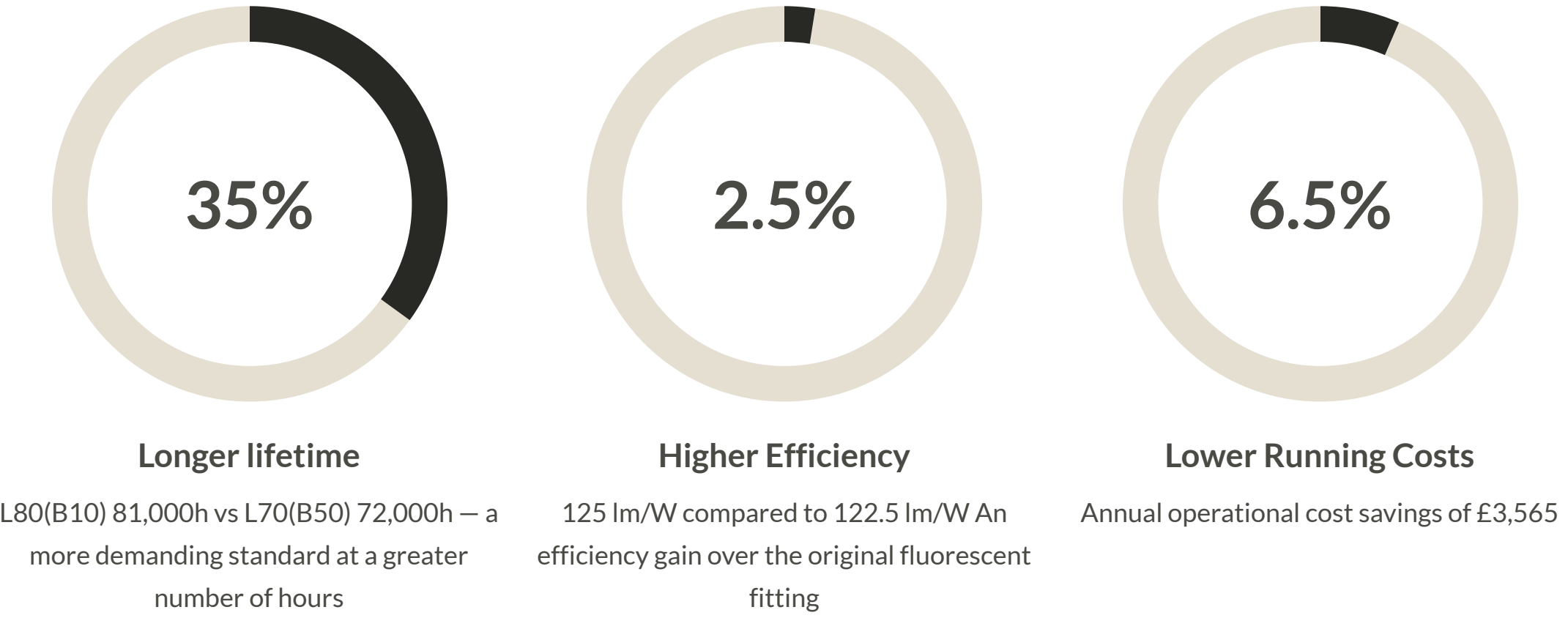
The Aberdeen project upgraded 2,116 fittings to a higher specification than the originals — adding Bluetooth wireless control and automated emergency lighting compliance reporting — and was then compared not against the true like-for-like replacement (a Thorn IndiQuattro) but against a cheaper, non-architectural alternative.

Despite those two factors working against the remanufacture case, the project still delivered 44% energy reduction, £207,423 in verified savings over seven years, and notable operational and embodied tCO₂e reductions. In a genuine like-for-like comparison, the saving would have been greater still.

Performance Comparison: Remanufactured vs. New

Indicative benchmark comparison against a current market alternative. The benchmark is intentionally conservative: the remanufactured solution is compared with a lower-cost current market panel rather than a true architectural like-for-like replacement

Specification	Remanufactured	New Alternative
Product	Thorn IndiQuattro 600x600 lay-in panel (direct+indirect, DALI-2)	Ansell Pace Backlit CCT Multi Wattage Panel OCTO
Expected Lifetime	L80(B10) 81,000h	L70(B50) 72,000h
Warranty	5 Years	5 Years
Annual Running Cost	£51,354*	£54,919
Unit Cost (Standard)	£128.33	£130.21
Unit Cost (Emergency)	£177.48	£183.32
Nominal (Catalogue) Power	26.4W*	20–30W (switch-selectable)
Luminous Efficacy	125 lm/W (consistent across operating range)	Up to 130 lm/W (at 4000K, 20W minimum setting only)
Upgradeability	LED & driver replaceable by professional	No information available
Control Protocol	DALI-2 (device querying, diagnostics and monitoring as standard)	Switch Dim / 1–10V / DALI (requires ADDIM/30/MC accessory driver)
Dimming Driver	Tridonic — included as standard	Accessory — additional cost (ADDIM/30/MC)
Component Replaceability	LED module replaceable by a professional	Not stated



Key Advantage: The remanufactured solution includes a Tridonic DALI-2 driver as standard — delivering advanced diagnostics, device-level monitoring, and dimming capability without additional cost or accessories. The Ansell Pace requires a separately purchased driver accessory to achieve equivalent dimming functionality, and offers standard DALI only. Additionally, the remanufactured fitting's LED module is replaceable by a professional, protecting the long-term investment without full system replacement — a feature not referenced in the Pace specification.

Beyond technical specs, the upgrade delivered dramatic improvements in workplace lighting quality—as the following lux readings demonstrate.

* Note: The £51,354 figure is based on the catalogue-rated connected load used in initial projections. The updated cost of £57,844 reflects the actual installed load (258,230 kWh/year) at £0.224/kWh. Catalogue rating shown; installed project specification utilised higher-output LED modules. See ROI: Initial Projections & Actual Results page for actual connected load.

Strategic Advantages of Remanufacturing

Our remanufactured fittings outperformed not only the original fluorescent units they replaced, but the nearest new market equivalent. This section quantifies those measurable advantages across three critical dimensions: financial rewards, environmental impact reduction, and technical performance – and demonstrates why remanufacturing consistently outperforms traditional replacement strategies.

5	125	149
Years to ROI	Lumens per Watt	tCO ₂ e Avoided Embodied Carbon (vs new equivalent)
Exceptional return on investment through reduced capital expenditure and enhanced operational efficiency	Best-in-class efficiency exceeding comparable new equipment specifications	Total embodied carbon avoided through strategic component reuse

Financial Rewards

The remanufacturing approach delivers a robust return on investment through reduced capital expenditure and enhanced operational efficiency. Unlike traditional replacement strategies, remanufactured solutions offer extended lifespan with significantly lower maintenance costs and future upgrade flexibility.

Key financial benefits include elimination of specification lock-in constraints commonly associated with modern LED product lines, enabling cost-effective component upgrades and technology evolution without complete system replacement. This strategic flexibility protects long-term infrastructure investment whilst maintaining cutting-edge performance capabilities.

Remanufacturing can deliver substantial embodied-carbon and material-retention benefits compared with new procurement, while still achieving operational performance equivalent to or better than current LED alternatives where the design and components support it.

Environmental Impact Reduction

Carbon Savings Methodology: Utilising CIBSE TM65 standards for embodied carbon assessment, the project achieves substantial environmental benefits through material conservation and operational efficiency improvements.

- Embodied Carbon Reduction:** Significant material waste elimination through strategic component reuse - 149 tCO₂e
- Operational Carbon Savings:** 7-year projected reduction through fluorescent-to-LED conversion - 300 tCO₂e
- Waste Minimisation:** Reduced manufacturing demand and disposal requirements



Performance Specifications & Modern Technology

The remanufactured fixtures exceed performance specifications of comparable new equipment through advanced component integration and precision engineering. Modern optics technology delivers enhanced energy efficiency and glare reduction through contemporary optical design, providing superior workplace illumination quality with refined aesthetic appeal.

Advanced DALI-2 Technology	Intelligent Automation	Comprehensive Monitoring
Enhanced compatibility eliminating vendor lock-in, with sophisticated control and real-time monitoring capabilities	Advanced sensor, switch, and input device support enabling comprehensive lighting automation and energy optimisation	Continuous data collection on power consumption, temperature, and luminaire operational status with predictive maintenance alerts

Real-Time Feedback: Detailed operational parameter reporting includes lamp failure detection, dimming levels, and operational hour tracking, enabling proactive maintenance strategies and maximising system uptime.

Remanufacturing Process: EGG Lighting's Sustainable Methodology

EGG Lighting's remanufacturing process is a meticulously engineered, multi-stage methodology designed to transform existing luminaires into high-performance, energy-efficient, and intelligent lighting systems. This approach not only significantly reduces environmental impact by extending product lifecycles but also integrates cutting-edge technology, ensuring superior performance and future-proof adaptability for clients.

01

Receiving & Initial Audit

Upon arrival at EGG Lighting's facility, each luminaire undergoes a comprehensive initial audit. This involves visual inspection, documentation of its original condition, verification of serial numbers, and a basic functional test to assess the integrity of the existing housing. This step is crucial for identifying any structural damage or anomalies before the remanufacturing process begins.

03

Advanced Component Integration

This is the core of the remanufacturing process. New, high-efficiency LED modules are precisely fitted into the prepared housing. Simultaneously, state-of-the-art DALI-2 compliant drivers are integrated, along with intelligent occupancy and daylight harvesting sensors. This step requires precision engineering to ensure optimal thermal management, electrical safety, and seamless technological compatibility with the new components.

05

Rigorous Quality Assurance & Testing

Every remanufactured luminaire undergoes a stringent multi-point quality control and testing regime. This includes photometric testing to verify light output (125 lm/w efficiency), colour rendering index (CRI), and distribution patterns. Electrical safety tests (e.g., insulation resistance, earth continuity) and functional testing of DALI-2 controls and sensors are performed to guarantee compliance with all relevant industry standards and client specifications.

02

Disassembly & Housing Preparation

The original luminaire is carefully disassembled, with all legacy components such as fluorescent tubes, ballasts, and outdated wiring removed. The luminaire housing is then thoroughly cleaned, degreased, and inspected for any imperfections. Necessary repairs or reinforcements are performed to ensure the housing is structurally sound and aesthetically suitable for re-use, adhering to original product specifications.

04

Reassembly & Wiring

Once new components are integrated, the luminaire is carefully reassembled. All internal wiring is meticulously connected and secured, adhering to the latest electrical safety standards and DALI-2 protocols. Special attention is paid to ensuring robust connections that minimise future maintenance needs and maximise operational longevity.

06

Packaging & Deployment

After passing all quality checks, the remanufactured luminaires are securely packaged for transport. Each unit is clearly labelled with its new specifications and ready for phased deployment back into the client's facility. EGG Lighting also provides detailed installation guides and support to ensure a smooth transition during the re-installation and commissioning phase.



Technical Specifications & Innovation

The remanufactured lighting solution incorporates cutting-edge technology components within existing fixture housings, delivering performance that exceeds new equipment specifications whilst maintaining cost-effectiveness and environmental responsibility.



LED Module Excellence

UK Manufacturing Standards - Industry-leading efficiency with professional-grade replaceability, ensuring long-term maintenance flexibility and performance optimisation.



Indirect Backlight Technology

Advanced optical design creates soft ambient illumination completely free from glare, enhancing workplace comfort and productivity.



Glare Control Technology

45° View Angle Cutoff - Sophisticated light management eliminating visual discomfort with 20+ colour and style options for seamless aesthetic integration.



LED Driver Technology

TRIDONIC Driver Integration - Industry-leading reliability with DALI-2 protocol support and DALI Bluetooth bridges ensuring seamless interoperability and comprehensive future-proofing capabilities for evolving control system requirements.



Precision Optics

High-Efficiency Light Control - Advanced optical systems offering 15 different beam configurations with both diffuse and clear options for optimal illumination customisation.



Design & Sustainability Features

Contemporary Aesthetics Clean, modern appearance that enhances workspace visual appeal whilst maintaining professional corporate environment standards. The refined design language complements existing architectural elements without requiring comprehensive interior modifications.	Premium Component Integration Quality branded components ensure reliable long-term performance with industry-standard warranties and support. Strategic component selection prioritises longevity and maintainability over short-term cost optimisation.	Modular System Architecture Flexible design framework enables efficient maintenance procedures and future technology upgrades without complete system replacement. This approach reduces lifecycle costs whilst maintaining cutting-edge performance capabilities.
Luminaires - Ready For Tomorrow Advanced control protocols and expandable system architecture ensure compatibility with emerging lighting control technologies and building automation systems. Investment protection through forward-thinking design philosophy.		

Implementation Impact: This project demonstrates how strategic remanufacturing approaches can deliver superior technical performance whilst achieving substantial cost savings and environmental benefits. This case study provides a proven methodology for similar large-scale facility upgrades across the corporate sector.

Technical Credibility & Component Quality

This remanufactured lighting solution has been engineered to deliver performance equivalent to, or exceeding, many newly manufactured luminaires through the integration of premium branded components, rigorous testing procedures, and compliance with recognised industry standards.

Key technical credentials include:

- High-efficiency LED modules delivering up to 125 lm/W efficacy.
- TRIDONIC DALI-2 drivers supplied as standard, enabling advanced diagnostics, monitoring, dimming, and long-term interoperability.
- L80(B10) 81,000-hour lifetime performance, providing extended service life and reduced maintenance requirements.
- Professionally replaceable LED modules and drivers, supporting circular economy principles and long-term asset value.
- Advanced optical design featuring indirect backlight technology and glare-control optics to improve visual comfort and workplace wellbeing.
- Comprehensive photometric, electrical safety, and functional testing on every remanufactured luminaire.
- Compliance with BS8887-221 remanufacturing requirements and BS EN 60598 luminaire safety standards.

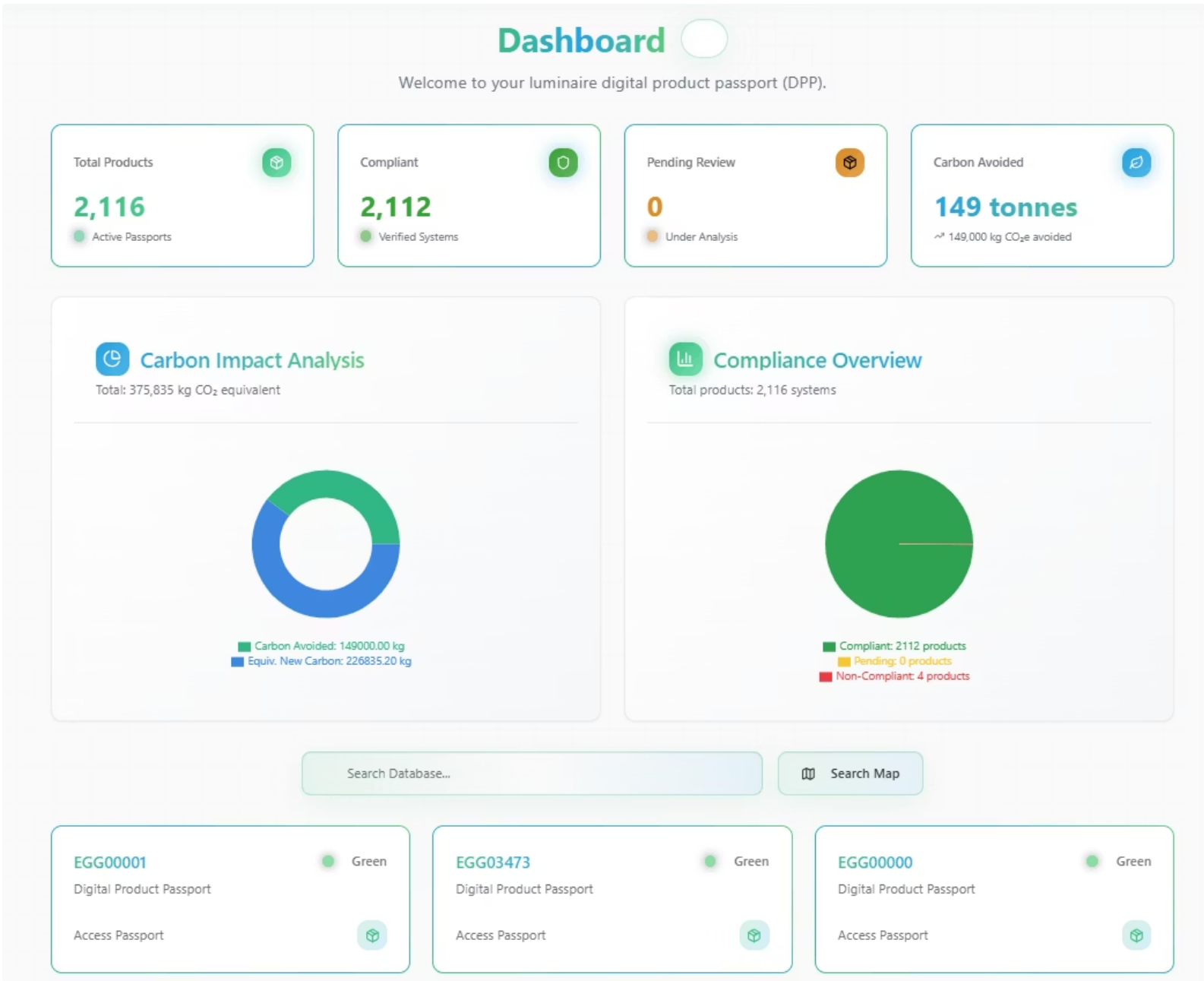
Unlike many modern LED luminaires that require complete replacement at end of life, the modular architecture of the remanufactured solution enables future upgrades, component replacement, and continued performance optimisation without discarding the entire fitting.

The result is a lighting asset that combines the sustainability benefits of remanufacturing with the technical performance, reliability, and maintainability expected from a premium commercial lighting system.

 **Quality Standard Reference:** Workplace lighting quality was reviewed with reference to relevant workplace lighting guidance, including HSE HSG38, and should be read alongside applicable lighting design standards and project-specific task requirements

Digital Product Passports: Complete Lifecycle Traceability

EGG Lighting's commitment to sustainability and transparency is exemplified through the implementation of Digital Product Passports (DPP). This innovative system provides unparalleled visibility into the entire lifecycle of every remanufactured luminaire, ensuring full traceability and accountability from production to end-of-life. By integrating a unique digital identity with each product, we empower clients with comprehensive data and insights, fostering a truly circular economy approach.



This methodical process embodies core circular economy principles, transforming what would typically be waste into renewed assets. By salvaging existing resources and integrating advanced technology, EGG Lighting delivers a sustainable solution that extends product utility, reduces material consumption, and minimises carbon footprints, aligning perfectly with modern corporate sustainability objectives.

Unique QR Code & Full Lifecycle Tracking

Every remanufactured light fitting receives a unique QR code label, providing full traceability through the dedicated DPP platform, from manufacturing through end-of-life.

Real-time Data Access

The DPP platform offers real-time access to critical information such as maintenance schedules, detailed performance data, and comprehensive sustainability metrics.

Enhanced Asset Management

Facility managers gain immediate insights into luminaire status, operational history, and predictive maintenance needs for optimised resource allocation.

Regulatory Compliance & Future Legislation

Our DPP system supports readiness for emerging product-data and traceability requirements, including future Digital Product Passport expectations where applicable.

Circular Economy & Carbon Footprint Transparency

The DPP platform provides unparalleled transparency in circular economy practices and facilitates accurate carbon footprint tracking for robust environmental reporting.

Embodied Carbon Assessment: Remanufactured vs New Equivalent

Comprehensive environmental impact analysis utilising **CIBSE TM65 methodology** demonstrates significant carbon reduction achievements through strategic remanufacturing approaches. This assessment provides quantifiable evidence supporting sustainable procurement decisions in large-scale facility upgrades.

Component Type	Remanufactured kgCO ₂ e/unit	New Equivalent kgCO ₂ e/unit	Carbon Savings kgCO ₂ e/unit	Quantity
Standard Panel	36.8	107.2	70.4	1,771
Emergency Panel	52.1	122.5	70.4	345

124,700 kg CO₂e
(124.7 tCO₂e)

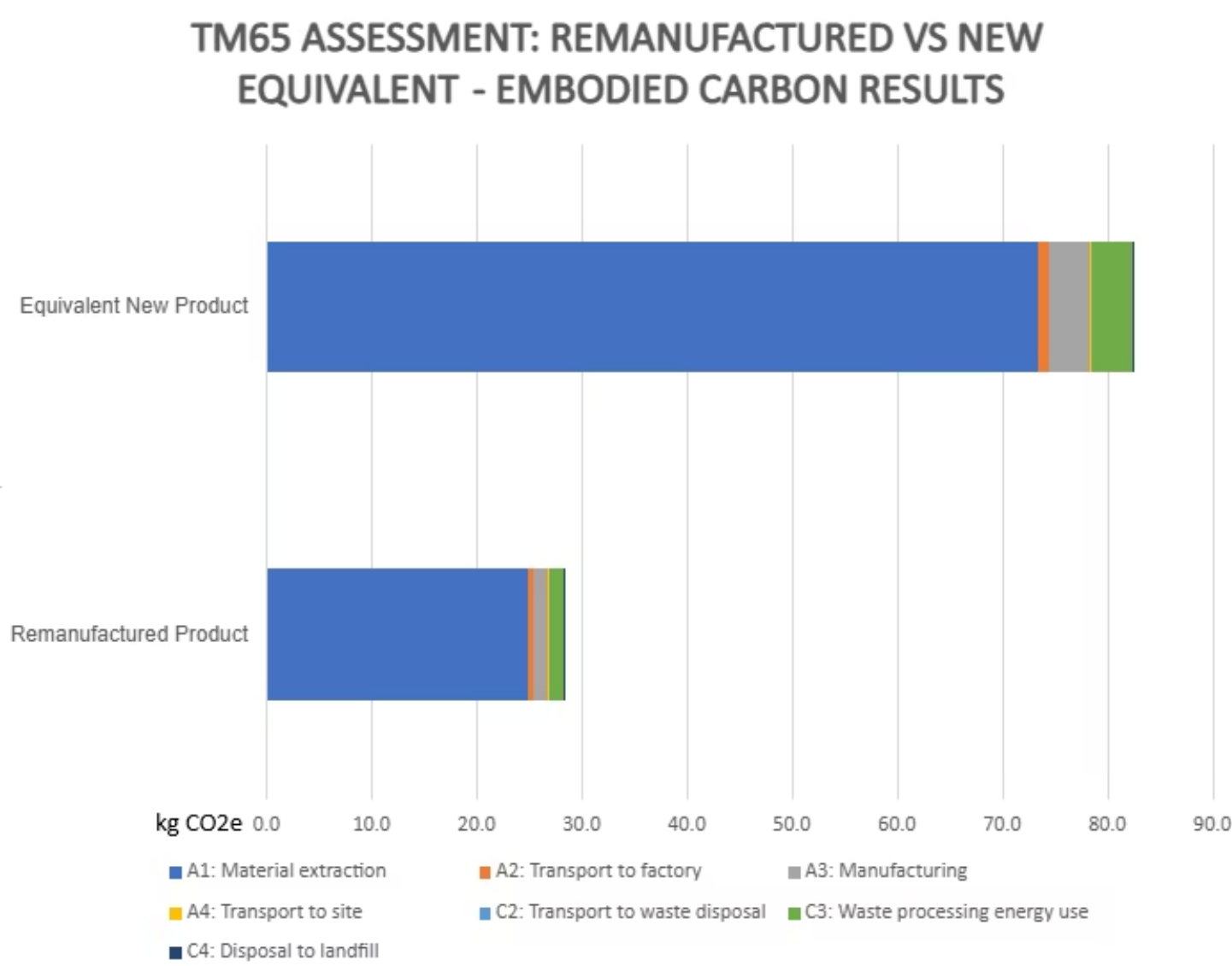
Total savings from standard panels

24,300 kg CO₂e
(24.3 tCO₂e)

Total savings from emergency panels

149,000 kg CO₂e
(149 tCO₂e)

Project total embodied carbon savings



Assessment Methodology: The comparison is between the remanufactured Thorn IndiQuattro solution and the defined new-equivalent luminaire baseline.

Assessment boundaries include luminaire housing refurbishment, replacement LED modules, drivers, controls, packaging, and transport.

Calculations were completed using the CIBSE TM65.2 methodology with stated assumptions and default uncertainty factors where primary data was unavailable.

Operational Carbon Impact Assessment

Operational carbon reduction has been estimated using a static electricity emissions factor of 0.212 kgCO₂e/kWh. Annual energy reduction is 202,538 kWh, producing an estimated 42.9 tCO₂e reduction per year and 300.6 tCO₂e over the seven-year assessment period. This figure excludes embodied carbon and does not model future grid decarbonisation.

300,000 kg CO₂e (300 tCO₂e)

Avoiding this level of CO₂e represents a major reduction in environmental impact, creating a significant sustainability win.

Carbon Payback

The remanufactured lighting solution achieves rapid carbon payback due to significantly lower upfront embodied carbon compared to full replacement.

Methodology note: Carbon payback is calculated by dividing estimated embodied carbon by annual operational carbon savings versus the previous fluorescent installation. Equivalent operational performance is assumed for both remanufactured and new-equivalent replacement scenarios; therefore, differences in payback reflect embodied carbon only.

Remanufactured Luminaires

- Embodied carbon: 83.1 tCO₂e
- Operational carbon saving: 42.9 tCO₂e/year

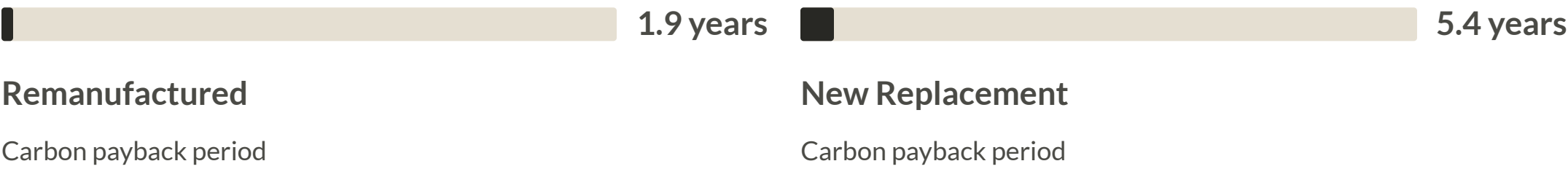
→ Carbon payback: ~1.9 years

New-Equivalent Replacement (Baseline)

- Embodied carbon: 232.1 tCO₂e
- Operational carbon saving: 42.9 tCO₂e/year

→ Carbon payback: ~5.4 years

Remanufacturing delivers approximately 65% faster carbon payback, significantly reducing whole-life carbon impact compared to installing new luminaires.



Environmental Impact Context

Beyond the immediate carbon savings, the remanufacturing strategy establishes a circular-economy model within the facilities management sector, reducing reliance on virgin material extraction and energy-intensive manufacturing processes. This methodology aligns with the organisation's wider sustainability commitments and offers a replicable framework for similar facilities across the energy industry.

Long-term Implications: These carbon savings represent only the direct benefits of material conservation. Additional environmental advantages include reduced transportation requirements, lower packaging waste, and avoidance of end-of-life disposal for existing fixture housings.

Carbon factor: 0.212 kgCO₂e/kWh, based on Greenhouse gas reporting: conversion factors 2025 (Department for Energy Security and Net Zero, June 2025). Static factor applied; excludes future grid decarbonisation.

For illustrative context only, the embodied and operational carbon savings are approximately equivalent to the annual emissions of ~100 and ~200 average UK passenger vehicles respectively, based on DfT fleet-average emissions (129.4 gCO₂/km), average annual mileage (7,100 miles/year), and an implied emission of ~1.48 tCO₂e per vehicle per year.

Source: Department for Transport fleet emissions data (2024) and UK Government/NimbleFins analysis of average mileage (2024–2026).

Lux Readings



Indicative Illuminance Improvements

Our lighting upgrade delivered substantial increases in illumination levels across the site, with average lux improvements of **87%**, **50%**, **68%**, and **68%** across the measured areas.

These enhanced light levels create a **safer, more comfortable, and more productive working environment**, improving visibility and reducing the risk of accidents.

Achieving these results **while simultaneously lowering energy consumption** demonstrates the effectiveness and efficiency of the new lighting system.

Representative spot illuminance readings were taken before and after installation to provide an indicative comparison of lighting conditions. These readings suggest that illuminance levels generally increased across the measured areas, particularly where baseline lighting levels were lower.

The upgraded lighting installation supports improved visibility, visual comfort, and safer task performance. These readings are indicative and were not collected as part of a formal lighting design compliance assessment.

Indicative Spot Illuminance Readings (Before/After)

Location	Initial Lux	Post-Installation Lux	Change
4L/1 – Point 1	165	360	+118%
3L/1 – Point 4	250	507	+103%
3L/3 – Point 1	230	393	+71%
3L/2 – Point 1	315	312	-1%
3L/3 – Point 4	525	429	-18%

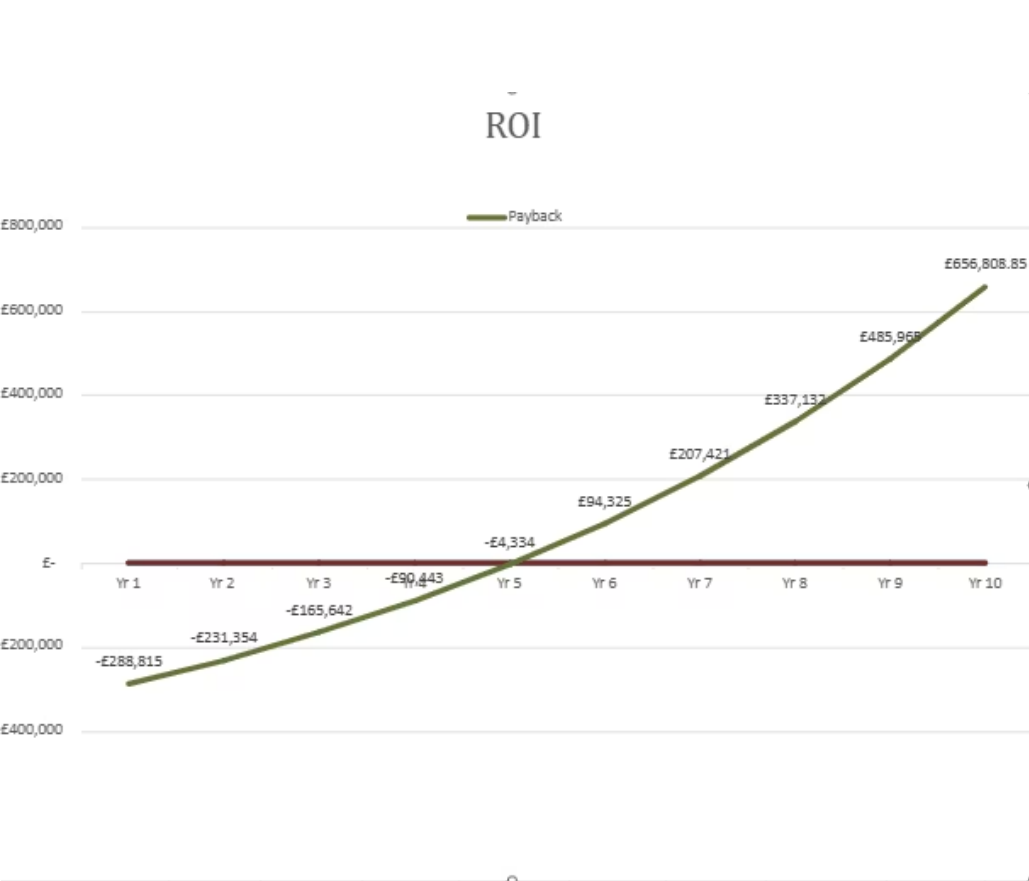
Spot illuminance measurements were taken at representative locations before and after installation using a calibrated lux meter. Values shown are initial measured illuminance levels. Detailed measurement records are available on request.

Financial Analysis & Return on Investment

The financial case for remanufacturing demonstrates exceptional return on investment through substantial energy savings, reduced operational costs, and extended asset lifecycles. This comprehensive 7-year analysis provides transparent modelling for facilities managers evaluating similar upgrade strategies.

Project Assumptions

Business Case Length 7 years standard evaluation period	Electricity Cost £0.224 per kWh baseline rate
Annual Maintenance £4,995 projected annual cost	Energy Cost Inflation 15.3% year-on-year increase
Labour Cost Inflation 5.0% year-on-year increase	Daily Operating Hours 11 hours average daily operation



Installation Summary

Metric	Existing	Remanufactured
Total Wattage	134,688W	75,484W
kWh/Annum	460,768	258,230
Energy Savings	—	44%
Capital Expenditure	—	£312,047
Installation + Disposal	—	£27,049

Energy Savings Impact: This 44% reduction was achieved by replacing fluorescent fittings with high-efficiency LED across all 2,116 panels — eliminating the inherent inefficiency of fluorescent technology at source. The resulting 59,204W connected load reduction delivers substantial operational cost reductions over the 7-year business case period, whilst significantly reducing the facility's carbon footprint.

ROI: Initial Projections & Actual Results

Initial projections were based on theoretical modeling. As operational data became available, including a reduction of 9 fittings from the initial assessment, we refined these figures to reflect actual usage patterns and performance requirements—delivering a more accurate and conservative business case.

All performance data was captured on-site by EGG Lighting electricians using calibrated clamp meters, recording actual energy consumption before and after installation. This direct measurement methodology — rather than theoretical modelling — is what gives the figures in this report their accuracy and credibility.

Luminaire Installation Summary	Before Upgrade	Initial Projection	Actual Result
Quantity of Lights	2,125	2,125	2,116
Total Wattage	134,668	57,203	75,484
Savings on Energy Consumption		58%	44%

Total Savings Over 7 Years	Actual Result
Energy Savings	£505,851
Maintenance Savings	£40,668
Total Investment (LED Supply & Fit)	£339,096
Net Benefit	£207,423

 Why actual results differ from initial projections:

Our data-driven approach delivered more accurate outcomes than theoretical modeling:

1.

Actual operating patterns: Initial projections assumed 11 hours daily operation across 365 days. Real-world monitoring revealed reduced weekend occupancy, yielding an effective 311-day operational year—a more precise reflection of the actual facility usage.
2.

Performance optimisation: Higher-specification LEDs were selected (35.2W standard, 38.1W emergency vs. initially projected 26W and 29.5W) to deliver brighter quality, as evidenced by lux readings showing 50-87% light level improvements across measured areas.

Result: More realistic energy modeling combined with enhanced workplace lighting quality, while still achieving substantial 44% energy reduction and 5-year ROI. The revised savings of £207,423 represent a more conservative and accurate forecast based on verified operational data rather than theoretical assumptions.

Lessons Learned & Best Practices

The successful implementation of the remanufactured lighting solution at this Aberdeen facility provides invaluable insights for future projects. Reflecting on project management, technical achievements, stakeholder collaboration, and implementation strategies helps us refine our approach and maximise outcomes for similar large-scale upgrades.

Project Management Agility Effective project management hinged on a flexible framework that allowed for iterative adjustments. Initial detailed planning, coupled with continuous monitoring and adaptive scheduling, was crucial. This approach minimised disruptions and allowed for rapid response to unforeseen site-specific conditions without compromising deadlines or budget constraints. Clear communication channels were established early, ensuring all team members and subcontractors were aligned with project goals and timelines.	Overcoming Technical Integration Integrating advanced LED technology into existing luminaire housings presented unique challenges. Success was achieved through rigorous pre-project technical assessments and prototyping, ensuring compatibility and optimal performance. Close collaboration with our engineering team and suppliers facilitated custom solutions for driver integration and optical configurations, proving that remanufacturing can surpass new equipment standards with the right technical expertise and innovation.	Proactive Stakeholder Engagement Engaging diverse stakeholders from the energy provider's facilities management, health & safety, and sustainability teams was paramount. Regular, transparent communication, including progress reports and demonstration sessions, built trust and managed expectations effectively. Addressing concerns early and involving key decision-makers in critical technical and design choices ensured broad acceptance and support throughout the project lifecycle, from planning to post-installation review.
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Implementation Standards

Efficient Execution

The implementation phase benefited from a modular deployment strategy, minimising operational downtime. Pre-assembled kits and a highly skilled installation team ensured rapid fitment and reduced on-site labour hours.

Strict quality control protocols at each stage of the remanufacturing and installation process guaranteed consistency and adherence to performance specifications, leading to a smooth and efficient rollout across all targeted areas.

Recommendations for Replication

For future projects, we recommend an even greater emphasis on upfront data analysis of existing infrastructure to refine predictive modelling for energy savings and carbon reduction. Establishing dedicated cross-functional teams with clear roles and responsibilities from project inception significantly enhances coordination.

Finally, leveraging digital twins or BIM for comprehensive project visualisation and asset management will further optimise long-term facility operation and maintenance.

- Early engagement with all stakeholders ensures alignment and reduces project risks
- Rigorous pre-project technical assessment and prototyping validates feasibility
- Modular deployment strategies minimise operational disruption during installation
- Comprehensive quality control at every stage guarantees consistent performance
- Digital tools and BIM integration enhance long-term asset management capabilities

A Sustainable Future: Project Learnings & Forward Path

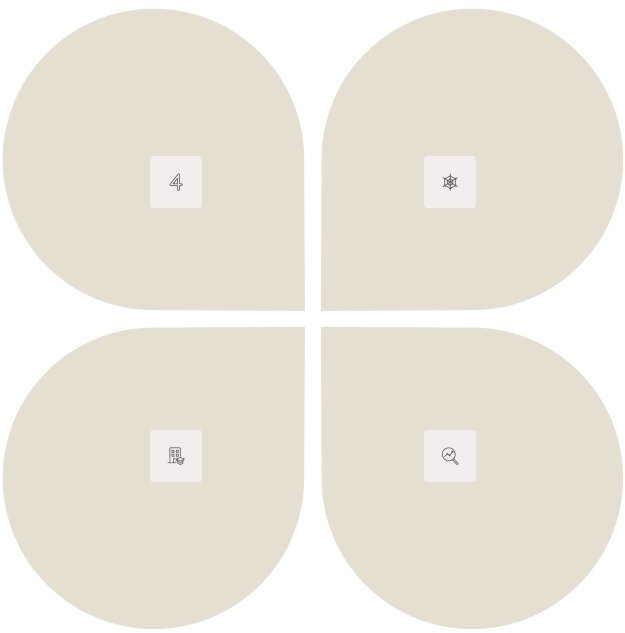
The successful remanufactured lighting project serves as a strong demonstration of the viability, environmental responsibility, and economic benefits of circular economy principles within the commercial lighting sector. This concluding segment synthesises the project's achievements, highlights its broader implications, and outlines actionable recommendations for fostering a more sustainable built environment.

Proven Success & Performance

The project demonstrated that remanufactured lighting products can meet and often exceed the performance, safety, and aesthetic standards of new luminaires.

Future Opportunities

Remanufacturing presents vast untapped potential, expanding into other building systems like HVAC components, integrated smart building technologies, and even furniture.



Broader Industry Implications

This project signals a transformative shift for the lighting industry, indicating that high-performance, compliant, and sustainable solutions are not mutually exclusive.

Scalability & Replication Potential

The methodology, technical solutions, and regulatory compliance achieved in the project are highly scalable and adaptable to a wide range of commercial facilities.

Strategic Recommendations for Industry Leaders

01	02	03
Prioritise Life Cycle Assessment (LCA)	Engage with Remanufacturing Specialists	Develop Internal Policies
Early in project planning to identify optimal remanufacturing candidates and quantify environmental benefits	Verify their adherence to relevant industry standards (e.g., BS8887-221, BS EN 60598, TM66)	Create procurement guidelines that favour circular products and services to drive market demand
04	05	
Educate Stakeholders	Integrate Digital Management	
Build awareness of the long-term economic, environmental, and performance benefits of remanufactured solutions	Connect remanufactured assets into digital building management systems for enhanced monitoring and predictive maintenance	

By embracing these recommendations and lessons learned, architects, engineers, and facility managers can confidently lead the transition towards a more resilient, resource-efficient, and sustainable built environment. This Aberdeen project provides a replicable model for success across diverse facilities and sectors.