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GREEN LIGHT LABORATORIES LIMITED

Fluorescence Microscopy: Light Source Running Costs

A study using real-world energy measurements to compare the projected running costs of a metal halide illumination system with two different CoolLED LED illumination systems

Save over £6,000 in bulb and electricity costs

Over 25,000 operating hours

Use up to 93% less energy compared to metal halide

When using CoolLED LED Illumination

Study Carried Out At:

Wolfson Bioimaging Facility, Biomedical Sciences Building
University of Bristol

Study Overseen By:

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Metal halide versus LED illumination: What does it actually cost to run?

Light microscopy facilities rely on stable, high-quality illumination every day. When it comes to widefield fluorescence, mercury and metal halide bulb-based light sources have long been familiar choices, but they also bring ongoing costs through electricity use, replacement bulbs and routine maintenance, not to mention the environmental risks associated with mercury.

This case study uses real-world energy measurements to project the running costs of the metal halide system tested and two CoolLED LED Illumination Systems over 25,000 hours: the pE-300^{lite} and pE-400^{max}.

This comparison shows that running a metal halide light source can cost thousands of pounds more over time than LED illumination. The data can also help support equipment replacement plans, sustainability discussions and funding applications, particularly where institutions offer grants or internal support for energy-efficient laboratory equipment.

Headline Findings

Save over £6k / €7k / $8k*

Over 25,000 operating hours, CoolLED LED illumination can reduce bulb and electricity costs from £6,100 for the metal halide system tested, to just £67.50 in total.

Use 93% less energy

Over 25,000 hours of use, the CoolLED pE-300^{lite} uses 300 kWh of electricity in total, compared with 4,000 kWh for the metal halide system tested.

Never change another bulb

Save approximately £5,200 on metal halide bulbs across 25,000 hours of use. No bulb changes are ever needed for CoolLED light sources.

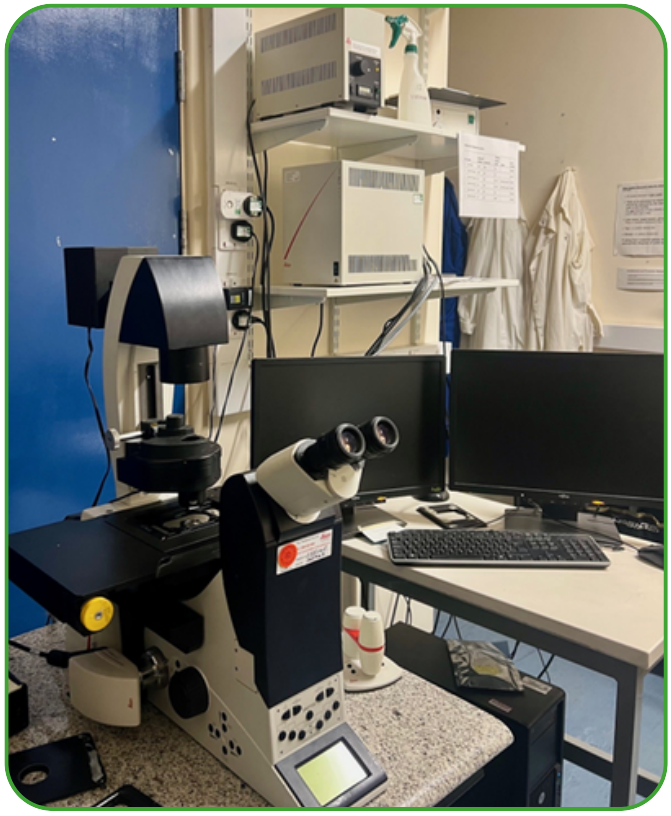
Spend less than 1p per hour

The pE-300^{lite} costs just 0.27p per operating hour and the pE-400^{max} costs just 0.61p per operating hour, compared with 24.4p for the metal halide system tested.

Systems Compared

System	Illumination Type	Configuration
Metal halide	120 W metal halide lamp	Single bulb, broadband light source
CoolLED pE-300^{lite}	LED Illumination	1-Channel system using 3 LEDs
CoolLED pE-400^{max}	LED Illumination	4-Channel system using 4 LEDs

* Potential saving based on exchange rate at time of publication, with each systems hypothetically tested over 25,000 hours. Actual savings will vary depending on the LED light source selected, usage pattern, energy tariff and fluctuating bulb replacement costs after the EU RoHS exemption for mercury in metal halide lamps expires on 24 February 2027.



- **Location:** Wolfson Bioimaging Facility, University of Bristol, UK.
- **Microscopy testing:** Dr Daniela Franchini
- **Existing light source:** 120 W metal halide
- **LED systems tested:** CoolLED pE-300^{lite} and pE-400^{max}
- **Imaging approach:** comparable fluorescence images captured on all three systems
- **Metal halide operation**: lamp run at full power
- **LED operation:** exposure and gain kept consistent, with channel power adjusted to match brightness
- **Energy monitoring:** Logicall Wireless Monitoring system
- **Monitor accuracy:** ±1%

Featured image (left): Fluorescence microscope system used in the study, with the metal halide light source located on the top shelf

25,000-Hour Running Cost Comparison

Comparison Period:	Electricity Rate Used:	Metal Halide Bulb Life:	Replacement Bulb Cost:	
25,000 hours	**£0.225/kWh**	**2,000 hours**	**£400**	approx. **£6,000** Higher projected running costs compared to the CoolLED light sources tested

Energy Consumption & Running Costs Results

Running Costs	Metal Halide HXP R 120 W Bulb	pE-300^{lite} 1 Channel On	pE-400^{max} 4 Channels On
Bulb Cost (25,000 hours) 13 bulbs, including 12 replacements	**£5,200.00**	**£0**	**£0**
Energy use per operating hour (kWh)	0.160	0.012	0.027
Energy Consumption (kWh for 25,000 hours)	**4000**	**300**	**675**
Electricity Cost (25,000 hrs)	£900	£67.50	£151.88
Operating Cost/Hour (Bulbs + Electricity)	**£0.2440**	**£0.0027**	**£0.0061**
Total bulb and electricity cost (25,000 hours)	£6,100	£67.50	£151.88

Conclusion

Use up to 93% less energy

The metal halide system uses 4,000 kWh over 25,000 hours of use.
The pE-300^{lite} uses 93% less energy (300 kWh)
The pE-400^{max} uses 83% less energy (675 kWh)

Save over £6,000 in running costs

Over 25,000 hours of use, projected bulb and electricity costs fell from £6,100 for metal halide to just:
£67.50 for the pE-300^{lite} or
£151.88 for the pE-400^{max}

£5,200 in bulb costs avoided

The metal halide calculation includes 13 bulbs in total, consisting of the starting bulb and 12 replacements. No bulb changes are ever needed for CoolLED LED light sources.

Comparable fluorescence images

Both LED systems produced fluorescence images comparable with those from the metal halide system, while using considerably less energy and incurring substantially lower projected running costs.

This study found that both CoolLED systems produced comparable fluorescence images while using considerably less energy than the metal halide system tested.

The pE-300^{lite} delivered the lowest measured energy use and projected running cost, while the pE-400^{max} also produced substantial savings.

For facilities moving away from lamp-based illumination, the results show a clear opportunity to reduce electricity use, remove replacement bulb costs and lower ongoing running costs.

Important Usage Note: Why 'Hours of Use' Are Not Always Equal

Metal halide lamps are commonly switched on for an imaging session and left running for extended periods. This helps avoid repeated warm-up cycles but means the bulb continues accumulating operating hours between image captures.

Some CoolLED LED systems, including the pE-400^{max}, can be synchronised with a camera so illumination is active only during image capture.

The pE-300^{lite} offers instant manual on/off control.

The comparison uses equal active operating hours, but those hours may accumulate very differently. An LED system that is switched off between uses may take considerably longer than a metal halide lamp to reach 25,000 operating hours.

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