Technology Strategy Board
Driving Innovation

Innovation **results**

AN R&D CASE STUDY #044

Silent, lightweight and portable power generation

This project has successfully combined hydrogen fuel-cell and light-emitting diode (LED) technologies to provide high-quality lighting for applications where noise, vibration and fumes are undesirable or dangerous.

The need

The Government aims to reduce the UK's greenhouse gas emissions by 80% by 2050 compared with 1990 levels. Fuel cells are an important low carbon technology and developing applications where they can replace fossil fuelled electricity generation will make a significant contribution to meeting these challenging targets. Traditionally, lighting for use at outdoor events or in remote locations has been provided by incandescent lamps powered by noisy and inefficient diesel generators. However, recent developments in fuel-cell and high-efficiency LED technologies provide a basis for a silent and cleaner solution.

The results

This project, led by Arcola Theatre Production Company Ltd, designed, built and tested a compact plug-and-play lighting unit that combines a 150 W fuel cell system with high efficiency LED technology. The unit, HyLight 150, is enclosed in a compact, wheeled flight-case, which also contains a back-up battery, power management system and two gas cylinders that contain the hydrogen fuel.

The cylinders were developed by project partner BOC. They are made from a lightweight composite so they can be carried and manipulated by one person, and have a simple regulator that does not need technical knowledge to operate.

The project successfully overcame significant barriers to usability by integrating a computer that handles switching to the back-up battery in the event of the hydrogen running out, user error or equipment failure, with a user interface to display system status and log performance.

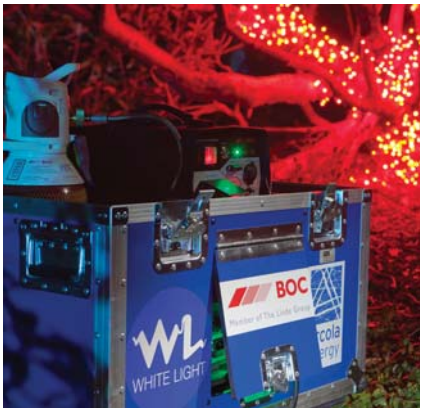
In use, HyLight 150 produces no noise and there are no harmful emissions – only a small amount of water is produced. It provides a choice of low energy LED lighting systems suitable for architectural, live event or safety applications.

Ten prototype units were built and have been successfully demonstrated nationwide by project partner White Light. Usage data and feedback from the demonstrations provide the basis for continued development. Arcola hopes to sell 12 production units in 2011, 100 in 2012 and 1,000 in 2013.

Market potential

The UK portable generator market is worth £100 million and the global stationary battery market is worth £1.5 billion. It is estimated that the global portable fuel cell market will be worth USD2.3 billion by 2016. There is significant potential for fuel cell systems in these applications and Arcola is targeting the UK and overseas markets.

HyLight could be adapted for underground track repair work where noise and emissions from diesel generators are dangerous. HyLight could also be used by the military, on construction sites and in temporary offices where grid connections are not available. A range of lighting options will be offered to cater for these new applications and it is planned to add a system-customisation facility to appeal to a broader market.



Hylight 150 in use for the National Trust at Belsay Hall

Cost considerations

The current capital costs of HyLight systems are considerably higher than traditional portable power units (eg diesel generators). However, volume production is expected to reduce the unit price. In addition, hydrogen fuel is about 20 times more expensive than diesel for comparable electrical output. Nevertheless, due to the very poor efficiency of conventional lighting and of diesel generators in supplying loads at the 100s of watts scale, HyLight offers considerable total cost-of-ownership savings.

‘We are delighted to be leading the way in this area, and look forward to putting HyLight to use on many more projects in the future.’

RICHARD WILSON, WHITE LIGHT

Next steps

To reach additional markets, a modular, customisable range of HyLight products with higher power output and additional features such as solar photovoltaic input and remote monitoring is being developed. A new company, Arcola Energy, has been created to take forward these developments.

A second-generation, even-lighter weight cylinder is about to be launched that will allow a wider target market to take advantage of the product’s environmental benefits.

New Hymera fuel cell and lightweight hydrogen cylinder from BOC at the heart of HyLight150

Front cover image shows a performance by The Dulce Tones illuminated by Hylight 150.

Project no. 100779

Project partners
Arcola Theatre Production Company (spun out to Arcola Energy), BOC Group plc, White Light Ltd

Technology Strategy Board investment
£27,600

Total project investment
£61,000

Project contact details
Dr Ben Todd
Arcola Energy
24 Ashwin St
London E8 3DJ

T 0207 503 1386
E ben@arcolaenergy.com

T11/011 March 2011