Report contents

1. Overview, summary and challenges

1.0 Overview

This report describes how EDF Energy evaluated a new innovative, revolutionary LED retro fit light bulb and how the new technology was successfully delivered to selected customers.

The advanced technology in a Lemnis Pharox III retrofit LED light bulb means it can last for 25 years.

The bulb had not been carbon scored for CERT because the technology is new innovative and unproven.

EDF Energy used metering staff and 'London Warm Zone' surveyors to distribute the bulbs to customers and advise them as to the benefits of the new technology.

EDF Energy in carrying out a "demonstration action" has realised a 0.52 tc02 carbon score for the Lemnis Pharox III retrofit LED light bulb over less efficient bulb types.

Through the efforts of all involved we have identified that the bulb can make a direct impact on climate change.

In Great Britain, energy suppliers have a Carbon Emissions Reduction Target (CERT) to reduce carbon dioxide (C02) discharged by domestic households. Suppliers meet the CERT target by promoting low carbon energy solutions to domestic homes to reduce their carbon footprint.

EDF Energy as one of the CERT obligated energy suppliers has evaluated a new lighting technology under a "demonstration action."

A "demonstration action" is one of the mechanisms designed for CERT that enables energy suppliers to trial a new technology that is "reasonably expected" to save carbon emissions from energy consumption.

The trial described in this report was designed by EDF Energy and set out to establish whether Lemnis Pharox III retrofit LED light bulbs have potential for reducing carbon emissions.

The Energy Saving Trust estimates lighting accounts for 20% of billed domestic electricity consumption In Great Britain. Lighting market transformation will reduce lighting power consumption but most retailers do not actively promote LED bulbs. The Lighting industry forecasts that less efficient light bulb will gain an increased market share.

Some say LEDs are not ready for mass marketing but through the trial we tested the assumption and the results conclude that Lemnis LED retro fit bulbs are ready for domestic use. The measured customer interaction with the bulb demonstrate that the Lemnis LED retro fit bulb has great potential to save carbon over less efficient light bulbs.

In this report we describe how the "demonstration action" was delivered and draw conclusions based on the evidence collected.

This report summarises the main findings and details:

- The measured carbon saving per bulb
- Answers questions posed in the formal scheme submission
- Measures customer reaction and opinion
- Indicates where the bulbs are used and in which fittings
- Evaluates the average wattage saving per bulb
- Counts average hours of use
- Determines whether Lemnis LED retro fit bulbs are ready for mass acceptance

The independent evidence gathered validates whether customers:

- Like the bulbs
- Will use them instead of less efficient bulbs

The findings described in this document are based on the evidence collected and reported by the appointed independent research company 'Synovate'. We recommend 'Synovates' report is read conjunction with this report.

1.1 Summary of main conclusions

- The Lemnis Pharox III retrofit LED light bulb is an obvious choice for domestic customers who want to use a good retro fit energy efficient light bulb

- The new Lemnis LED retro fit bulbs are liked by the majority of customers

- The results demonstrate the innovative LED retrofit bulb has great potential for delivering carbon savings over less efficient light bulbs

- Overall measurement of the Lemnis LED retro fit bulb is very positive

- The results tend to indicate a very high purchase consideration

- Whether the Lemnis LED retro fit bulb can reach full potential in Great Britain is likely to depend on the products future retail price point

1.2 UK lighting market – Future challenges

The notes in this section aim to set in context the position for LED lighting products in Great Britain.

LED lighting is forecasted to be one of main contributors towards a low carbon strategy to reduce UK housing emissions by 80% by 2050.

The Energy Saving Trust (EST) estimate lighting accounts for 20% of billed domestic electricity consumption. Less efficient light bulbs have greater market than more efficient LED bulbs. Retailers selling light bulbs are not actively promoting LED bulbs over less efficient light bulbs.

The Lighting Association measured by a domestic household survey in 2007 that:

- 31% of customers actively avoid using compact fluorescent bulbs (CFLs)
- There are 300 million inefficient bulbs installed in UK homes for which there have been no CERT eligible bulbs delivered
- Dimmer switches are widely in use but dimmable CFLs have not been fully embraced by customers

The EU directive on EuP aims to phase out some categories of less efficient light bulbs by switching domestic European customers from using traditional light bulbs to more energy efficient light bulbs. Plans have not been finalised to phase out all categories of less efficient light bulbs. Government expects the phase out will make CFLs the default light bulb purchase in Great Britain.

The Lighting Industry is concerned that from April 2011 when CERT obligated energy suppliers no longer subsidise the retail cost of CFLs that sales of cheaper less efficient bulbs will increase. The industry forecasts that cheaper less efficient bulbs including halogen bulbs or cheap non ESR approved CFLs may become the default light bulb purchased.

The main issue holding back LED technology are predictions that the bulbs will get better, brighter and less directional by light output. Some experts say that LED bulbs are suitably bright enough for use as room side lights, but not for lighting whole rooms.

Ofgem requires for CERT that LED bulbs must be Energy Saving Recommended (ESR) approved. The EST operates the ESR scheme in Great Britain recommending best in class energy saving products that must meet certain technical performance requirements.

Lighting experts in Great Britain are beginning to encourage the installation of lighting controls to encourage energy efficiency.

The Department of Energy and Climate Change (DECC) in their impact assessment indicate they expect an LED's have a life time of 19.53 years. Ofgem considers that the life time is appropriate, if there is no other evidence to validate another life time.

This is just the beginning for LED products and they will continually improve via Manufacturer product development.

2. Outcomes and reporting requirements

2.0 Outcomes of the trial

- The Lemnis Pharox III LED retrofit light bulb has been tested
- Consumer reaction to the Lemnis LED retro fit bulb has been measured
- The bulbs carbon score has been measured

2.1 Reporting requirements

This document is provided to fulfil Ofgem's "demonstration action" reporting requirement and confirms:

1. The measured results of the trial
2. How the scheme was delivered
3. That the delivery method replicates the plan set out in the scheme submission

3. Actions and headline results

3.0 Summary of main delivery actions:

- 5,000 Lemnis LED retro fit bulbs were delivered free of charge to homes within the Greater London area
- One Lemnis LED retro fit bulb was provided per household
- Delivery started last quarter 2009 and ended first quarter 2010
- Distribution was split between two channels:
  - 3,000 – 'EDF Energy Metering Services' network field based metering employees
  - 2,000 – *'London Warm Zone' surveyors working on behalf of EDF Energy
- All the evidence was gathered independently
- All customers answered the same questions designed and approved for the trial
- The researchers conducted the interviews - last quarter 2009 to first quarter 2010
  - By accepting the bulb the recipient understood they might be selected for an interview about the bulb
  - The researchers were set a target to complete at least 500 interviews
  - 876 customers were interviewed about the bulb they received
  - All the customers selected for interviews were chosen by random selection
  - No monitoring was completed for the remainder customers i.e. (5,000 - 876 = 4,124)
  - The interview condition enabled a higher number customers to be monitored than expected
- +The market researchers:
  - Recorded the answers given by each customer
  - Analysed all the data collected
  - Documented their findings

+ Synovates report is available separately.

*EDF Energy has a partnership with independent not for profit London Warm Zone (owned by charity National Energy Action), which exists to help the fuel poor improve their energy efficiency.

3.1 Outcome of actions

The market researchers worked independently to gather and present the evidence. The information collected determines whether the demonstration action proves the bulbs as suitable for promotion to reduce carbon emissions.

The conclusions drawn in this report are based on the independent evidence. Synovate's independent research report is provided separately.

The main outcomes of evidence are:

- The bulbs carbon score
- Answers the questions set in the submission
- Customer reaction and opinion
- Identification of where the bulbs are installed
- Average wattage of bulb replaced for the trial
- Average hours of use
- Whether the bulbs are ready for mass acceptance

3.2 Summary of Headline Results

Headline results based on 876 interviews

The measured Lifetime carbon saving per retro fit LED bulb	0.52 tonnes
Average No. of hours per day the retro fit LED bulbs are used	Summer : 2.7 hours Winter : 4.8 hours
The main type of light bulb that the customer replaced	45% of the recipients replaced a traditional GLS light bulb
The average Wattage of the light bulb they replaced	52.7 W
% of customers that confirm they have installed the retro LED bulb in an existing light fitting	96%
Whether customers like or dislike the LED retro fit light bulb	93% of customers have a good opinion of the LED retro fit light bulb with 63% indicating its excellent or very good
Which fitting type(s) are being used	81% fitted the LED retro fit light bulb in a ceiling pendant
Whether customers are motivated to buy more of the same bulb(s)	The LED retro fit bulbs are liked by the majority of customers which tends to indicate a very high purchase consideration over price
What customers like about the retro fit light bulbs	96% think that the retro fit LED bulb is easy to fit and 90% like the colour of the light they provide
Main rooms where the retro fit LED bulbs are used	36% of the customers have installed the retro fit LED bulb in the lounge / living room

4. Project, participants and data

4.0 Project size and participants

- The bulbs were distributed to 5,000 customers in the Greater London area
- Only customers agreeing to participate in the trial were given a bulb
- Only one x Lemnis Pharox III LED retrofit light bulb was supplied per household
- Each participant was provided with information explaining the benefits of the bulb and how it should be installed

4.1 How customers were contacted

- Customers were contacted by telephone

4.2 How the data was gathered

- All interviews took place at least 7 days after the customer confirmed the bulb was installed
- 876 interviews were conducted by the researchers
- All customers were asked the same questions
- All the questions were scripted and approved in advance
- Each interview lasted 10 minutes
- The results provided the evidence to confirm usage, performance and other feedback

5. Research

5.0 Research timescale

All customer contacts were made last quarter 2009 to first quarter 2010.

5.1 Research Data quality

The participant response rate was greater than expected and this meant the researchers were able to conduct a greater number of interviews.

On a statistical basis we measure that for 876 interviews the maximum margin of error rate is 3.3% at a confidence level of 95%.

6. Demographics

6.0 Customer demographics

Customers were measured by their household income, social grade and class definition.

The group of customers defined as being ‘vulnerable’ within the research are measured by whether they are low income and / or receiving state benefits, elderly (70 years plus) or having young children (11 and under) in household.

The research compared ‘vulnerable customers’ vs. those ‘that are not’ and takes into account their income, benefits, age and dependents. Any differentiations between the delivery routes ‘EDF Energy Metering Services’ vs. ‘London Warm Zone’ are highlighted.

Any extremes where opinions differ that could impact usage or where significant differences exist between the groups or where demographic differences were found have been reported.

By and large the overall interaction exhibited by the customer groupings was positive and the only real area of negativity was around the price customers might expect to pay for the bulbs.

6.1 Vulnerable group

Share the same positive opinion of the bulbs with exception of they have no measured dislikes about the bulb.

Specific behaviour differences recorded

- More of the Vulnerable group (42% vs. 36%) fitted the bulb in the lounge / living room
- More of the Vulnerable group (46% vs. 54%) used the bulb for less hours in winter

6.2 London Warm Zone vs. Energy Field Services customers

- More L W Z (28% vs. 15%) than E F S replaced an energy saving light bulb

6.3 Household income

Income Less than £27,000	47%

6.4 Customer Social Grade / Class definitions

A	5%	ABC1	46%
B	12%		
C1	29%		
C2	15%	C2DE	47%
D	10%		
E	22%		

The research confirms that the Lemnis LED retro fit bulbs were distributed to a wide range of customers as defined by social and class definition.

7. Carbon, Savings and cost

7.0 Purchase and running cost

One negative aspect the research measured is that customers might be put off by the bulbs initial purchase cost. The Lemnis LED retro fit bulb running cost is lower than less efficient bulbs.

7.1 Carbon saving score

The research measures that the lifetime carbon score for the Lemnis Pharox III retrofit LED light bulb is 0.52 tonnes.

The calculation is based on the research evidence gathered with exception of lifetime years.

The advanced technology in the bulb means that it can last for 25 years but in DECC's impact assessment, 19.5 lifetime years is considered appropriate for LED measures under CERT. In the absence of evidence confirming another life time DECCs assessment forms part of the calculation.

Average Wattage of lamp replaced	52.7	W	As measured under CERT demonstration action
Lemnis replacement lamp wattage	5.6	W	Taken from independent CE testing report (12/11/08)
Average wattage saving	47.1	W	Wattage of lamp replaced - Lemnis lamp wattage
Average hours of use per year	1,305	hours	Average hours of use per day Summer/ Winter as measured under CERT demonstration action
Annual energy saving per Lemnis lamp installed	61.5	kWh	Average wattage saving * Annual average hours per use / 1000
Carbon co-efficient value per kWh	0.4308	kg	OFGEM standard figure
Annual carbon saving per lamp	26.48	kgCO2/a	Annual energy saving per Lemnis lamp * Carbon co-efficient value
Life time of Lemnis lamp	19.53125	years	Life time based on DECC's impact assesment
Lifetime carbon saving per lamp	**0.52**	**tonnes**	**(Annual saving per lamp * Life time) / 1000**
One lamp	1		Number of lamps
Lifetime carbon saving of trial	0.52	tonnes	Lifetime carbon saving per lamp * Number of lamps

7.2 Average hours of use

The calculation is based on British summer time ending 25 October 2009 and starting 28 March 2010. The winter period is measured 26 Oct 2009 to 27 March 2010 = 152 days. Number of days summer is (365 – 152 =) 213 days.

British summer time ends	25-Oct-09
British summer time starts	28-Mar-10
Winter No. of days 2009/10	152 days

	Hours
Winter	4.8
Summer	2.7
Total	

Days	Hours
152	730
213	575
365	1305

7.3 Wattage of the replaced bulb

The measured wattage per bulb replaced is based on 578 customers. 25 customers were defined under the category "another wattage" and 202 customers were unable to confirm the wattage of the bulb they replaced.

7.4 Replaced bulb compared by light provided (Lumen)

The Lemnis LED retro fit bulb is designed to replace a traditional 60W GLS bulb or an equivalent 11W CFL but not all customers replaced an equivalent light bulb.

Wattage	%	Bulb replaced
5 -11W	8%	*Dimmer / Equivalent
12 -19W	3%	Brighter
20W	2%	Brighter
23-39W	1%	Brighter
40W	12%	Dimmer
60W	38%	Equivalent
100W	9%	Brighter
Other	3%	Unknown
Don't know	25%	Unknown

* 5-10 W Dimmer, 11W Equivalent

%	Bulb replaced
8%	*Dimmer / Equivalent
12%	Dimmer
15%	Brighter
38%	Equivalent
28%	Unknown

Conclusions

8.0 Conclusions

EU directive on EuP phases out certain inefficient light bulbs but that does not mean LEDs will become a customer first choice. With the lighting industry expecting that when Energy suppliers stop subsidising retail CFL prices more non efficient bulbs will be sold carbon emissions will also increase. Lemnis LED retro fit bulbs can provide carbon saving over the other bulb types that survive the EuP phase-out.

The trial set out to measure customer opinion and to quantify the bulbs carbon score. The research provided evidence to conclude that the Lemnis LED retro fit bulb can reduce UK carbon emissions. The lifetime carbon score for the Lemnis Pharox III retrofit LED light bulb is 0.52 tonnes.

The wider promotion of LEDs should be a priority for those working on reducing UK carbon emissions to ensure only the most efficient light bulbs are promoted. If solutions are not developed it risks non efficient light bulbs proliferating by wider usage.

93% of customers expressed a good opinion of the Lemnis LED retro fit bulb and the positive views add weight to the argument for speeding up the process to make the new technology available to a wider market. 36% of customers installed the Lemnis LED retro fit bulbs in their living rooms, landing or hallway. Overall 81% fitted the bulbs in a ceiling pendant.

Some experts say that LED bulbs are bright enough to use as side lights, but not for lighting whole rooms. The research concludes that 78% are happy to use the Lemnis LED retro fit bulb as their main room light and 77% think the bulb would be suitable in any home.

LED products seem to be being held back because they are predicted to get better, brighter and less directional in light output. The evidence gathered on the Lemnis LED retro fit bulb indicates that it's ready for customers to adopt now.

The research indicates that 8% of customers said that the Lemnis LED retro fit bulb is too dim. The Lemnis LED retro fit bulb is designed to replace a traditional 60W GLS bulb or an equivalent 11W CFL but not all customers replaced an equivalent light bulb. We also conclude that it is unrealistic to expect a 100% customer satisfaction rate.

At the design stage it was envisaged the "year" element of the carbon score calculation would be based on the bulbs actual life. The advanced technology in the bulb means that it can last for 25 years but the Lemnis LED retro fit bulb bulbs life has been fixed at 19.5 years which has influenced the bulbs carbon score.

The scheme was designed so that customers were asked to replace their existing bulb. In normal circumstances we expect most customers will use their existing bulbs until they fail. The bulbs replaced were measured by type and also by wattage. More customers were able to identify the type of bulb they replaced than the wattage. The average wattage of the bulb replaced is based on a 75% sample size.

The research confirms that the Lemnis LED retro fit bulbs were distributed to a wide range of customers as defined by social and class definition. The proven principle of demographic research is that people with similar 'groupings' generally exhibit similar lifestyle and spending tendencies. We conclude if the bulbs are retailed on a larger scale then similar results will be achieved.

Lighting experts are encouraging installation of lighting controls but installation is expensive Affordability will challenges domestic take up especially during a period of economic uncertainty. Long life LED retro fit bulbs provide an alternative economic solution.

The manufacturer may make further product improvements but the Lemnis LED retro fit bulb in its current form is measured as being acceptable.

The Lemnis LED retro fit bulbs are an obvious choice for domestic customers when choosing lighting. The overall measurement of the Lemnis LED retro fit bulb was very positive and the results tend to indicate a very high purchase consideration. Whether the bulb can now reach its full potential in Great Britain is most likely to depend on the products future retail price point.

9. Recommendations

9.0 Recommendations

LEDs have an important future role in terms of achieving lighting efficiencies and carbon savings. To encourage this new market, it will help if the carbon score is sufficient to allow the products to compete on the open market. The scores should reflect the performance that can be achieved by the best products. To this end LED manufactures might consider sourcing evidence about customer habits e.g. fashion, trends, moving home habits etc that will influence how long products should be designed to last and to determine the carbon saving.

The results for the Lemnis LED retro fit bulb indicate there is potential for repeatability through the sale and promotion of bulbs on a larger scale to reduce carbon emissions. CERT has the potential to focus interest on LED technology and enable more rapid commercialisation of the measures which in turn will speed up an earlier reduction in carbon emissions than if the measures are not promoted.

The Lighting Association survey in 2007 measured that dimmer switches remain widely in use and that dimmable CFLs are not being embraced by domestic customers because they are expensive. The Lemnis LED retro fit bulb is fully dimmable and offers an alternative choice.