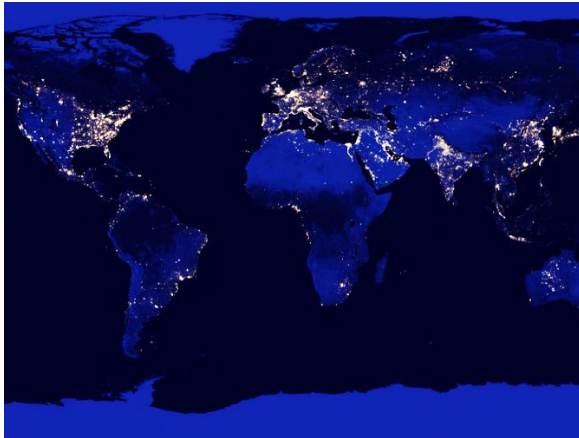




Rexel
foundation 
FOR A BETTER ENERGY FUTURE
under the aegis
of the Fondation de France



LED lighting: a solution to fight fuel poverty in developed countries?

Paris, March 2015

Table of content

- Foreword 4
- Executive summary 5
- Acronyms and abbreviations 5
- 1. Fuel poverty and residential lighting: links and issues 6
 - 1.1. Fuel poverty issues in the developed countries: facts & figures 6
 - 1.2. Lighting industry: a role to play in an energy efficiency program? 8
- 2. To what extent could LED lighting solutions be an answer for fuel poors?..... 10
 - 2.1. Benefits of LEDs for fuel poors and low-income households..... 10
 - 2.2. Barriers to overcome 11
- 3. What innovative customer value propositions and offers to deploy LED solutions to low-income consumers? 14
 - 3.1. Carry on suppliers and retailers efforts to better market LED's strengths 14
 - 3.2. Raise awareness on LED's performances 15
- Conclusion 19
- Bibliography 20

Foreword

The Rexel Foundation's mission is to promote access to energy efficiency for all based on three main programs: community-based public interest projects, grants and knowledge. This third one aims to raise awareness of energy efficiency in order to improve understanding of the issues and the possible solutions through studies, conferences and workshops, as well as through the support and advice of expert committee members.

The lighting industry is currently undergoing a fast pace of innovation, with the development of new technologies and a change in regulation in the mature markets that enhance energy efficient solutions.

However, even though fuel poverty issues in developed countries are benefiting from large coverage by studies and analyses, hardly any experts or studies have tried to identify and assess the link with residential lighting energy consumption.

Given these statements, the Rexel Foundation has mandated Greenflex to conduct a study aiming at:

- ▶ Clarifying the links between fuel poverty in developed countries and lighting
- ▶ Assessing the potentials, obstacles and benefits of LED technologies as an answer to fuel poverty.
- ▶ Identifying the right solutions to deploy LED technologies amongst the low-income consumers

A focus is given to three European countries: France, England and Germany. The study conducted by Greenflex was based on studies and **interviews with experts, companies and institutions including lighting solution suppliers, utilities, retailers, professional associations, social businesses and associations, housing associations and international energy institutions**. Greenflex and the Rexel Foundation would like to thank Osram and all the interviewees for their valuable contribution to this study.



Greenflex acts in response to environmental and social issues and makes it its duty to create value for companies and all stakeholders by attributing solutions to such large scale issues. Greenflex connects ecological challenges to the economic reality of today's societies through operational solutions in order to facilitate corporations' transition towards sustainable development. Based in Paris, Greenflex provides services in sustainability consulting, sustainable marketing, energy management, and asset management. <http://www.greenflex.com/>

Executive summary

Osram and the Rexel Foundation wished through this study to explore the potential role of efficient lighting solutions in the fight against energy poverty in developed countries. Based on interviews in three countries (France, England and Germany), here are the main conclusions of the study.

- ▶ **Fuel poverty is expected to rise in the coming years.** The most effective way to reduce energy bills is by reducing a building's energy demand.
- ▶ Lighting represents a small share of electricity consumption. However changes in lighting technologies represent an easy change to implement with a low barrier to investment compared with other energy efficiency actions. **Lighting has the potential to be a gateway to larger energy efficient initiatives for low income households on other equipments (e.g. heating system, windows, insulation). It represents an efficient way to communicate and raise awareness about energy efficiency.**
- ▶ **LED is the technology that provides the best energy efficiency on a very long service life** (between 10 and 20 years). From a technological point of view LEDs represent an option to save energy for households with high energy bills. It also has several additional benefits (e.g. long service life, no replacement needed, light quality approaching halogen technology, several control options).
- ▶ Today LEDs are premium products, yet accessible unevenly across countries and still too expensive compared to other technologies for low income consumers. **LEDs are becoming increasingly more energy efficient and provide an increasing lighting comfort but these criteria are seen as secondary for low income consumers.**
- ▶ Several paths of development could accelerate the deployment of LED among low-income consumers:
 - ▶ Overcome upfront cost barrier by developing **collaborative BtoC lighting services on a leasing model** (e.g. by utilities)
 - ▶ Better understand energy bills by implementing **energy consumption metering tools** that would highlight LED value
 - ▶ **Advise and empower households** on energy savings through trusted third parties
 - ▶ Reduce LED purchase price by **grouping purchases, through collaborative economy**
- ▶ **The market is moving toward a large diffusion of LED. The technology will represent the major part of lighting systems in the residential sector in a few years. But inaction has a cost and this transition needs to be speeded up.**

Acronyms and abbreviations

LED	<i>Light-Emitting Diode</i>
CFLi	<i>Compact Fluorescent Lamp integrated</i>
BtoC	<i>Business to Consumer</i>

1. Fuel poverty and residential lighting: links and issues

1.1. Fuel poverty issues in the developed countries: facts & figures

1.1.1. Definition

Fuel poverty may result of the combination of several factors. It can affect very various profiles of population, making it a particularly complicated issue to tackle. Despite current decrease in energy prices (fossil fuel price), fuel poverty is expected to rise in the long term. Only actions on reducing the building energy demand will allow low income households no to suffer this increase.

A person is to be regarded as living “in fuel poverty” if he has particular difficulties in buying the necessary energy to satisfy basic needs (heating, cooking, hot water, and lighting). This may lead to serious health problems (from cardiovascular and respiratory problems to depression), lack of comfort or decrease in housing values.

Statistically this used to be defined **when a household would need to spend more than 10% of its income to pay its energy bills**. This objective indicator proposed by the UK government is often completed with a subjective indicator: the percentage **of households unable to keep their home adequately warm**.

1.1.2. Fuel poverty factors

Fuel poverty results of a combination of 4 factors:

- ▶ Low housing **energy efficiency**
- ▶ Wrong **household behavior** or low-efficiency of domestic appliances
- ▶ High **energy prices**
- ▶ Low household **income**

Constraints are often cumulative: important energy bills due to no or poor housing insulation, less efficient lighting and heating systems and longer time spent at home because of unemployment.

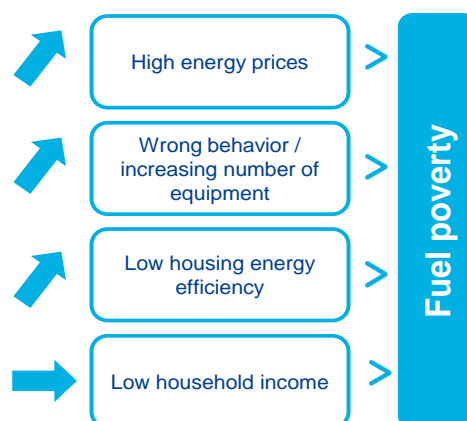


Figure 1 : Fuel poverty factors

Fuel poverty is most common among those who live in private rented accommodation (in the UK, 20% of households in private rented accommodation were in fuel poverty). Lone parents with dependent children and households in rural areas are also more likely to be in fuel poverty (20% of households in rural area compared with 15% in urban area)¹.

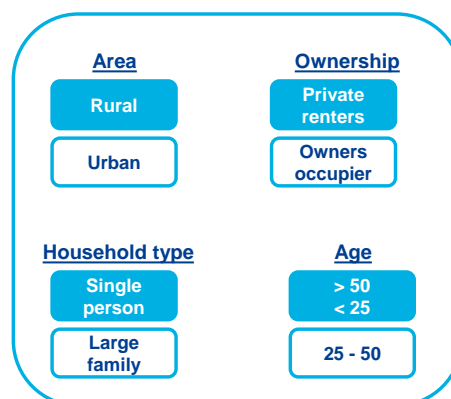


Figure 2 : Profiles of consumers in fuel poverty

¹ <http://www.poverty.org.uk>

1.1.3. Facts and figures

Fuel poverty is a major problem for Europe. Despite the fact that there is no common European definition, the European Parliament estimates that **between 50 and 125 million people² (out of 500 million) are unable to afford a proper indoor thermal comfort.** In 2011, 9.5%³ of households were unable to keep their home adequately warm.

In 2013, households in fuel poverty represented about 4.5 million households in the UK⁴, 5.1 million in France⁵ and 6.9 million in Germany⁶.

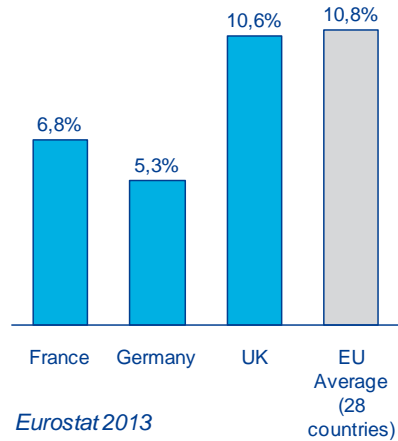
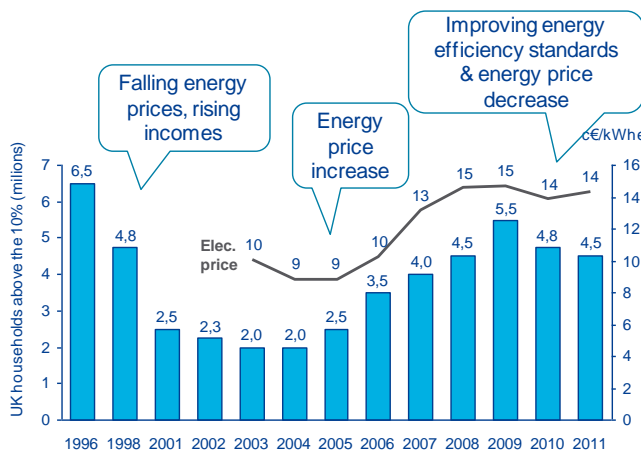


Figure 3 : Share of population unable to keep home adequately warm in Europe



UK Government – Fuel Poverty Report 2013 & Eurostat 2014

Figure 4 : Fuel poverty historical evolution in the UK

Despite a current decrease of fossil fuel prices, electricity prices are expected to rise in the long term. Household's budgets stay undermined by the economic crisis and **fuel poverty is expected to rise in the coming years.**

Only actions on energy efficiency will enable sustainable gains from both economic and environmental points of view and will allow low-income households not to suffer from electricity price increases (+ 30% forecast in France between 2013 and 2017⁷).

It is widely recognized that the most effective and sustainable way for consumers to reduce their energy bills is through reducing the energy demand of the building by implementing energy saving measures. However, **energy efficiency solutions and information related are not tailored for low-income households.** Usually households in fuel poverty cannot afford the initial investment for high-efficiency domestic appliances or insulation.

Between 50 and 125 million people are unable to afford a proper indoor thermal comfort in Europe

² BPIE – Alleviating fuel poverty in the EU - 2014

³ Eurostat 2011

⁴ Uk government fuel poverty report - 2013

⁵ ONPE

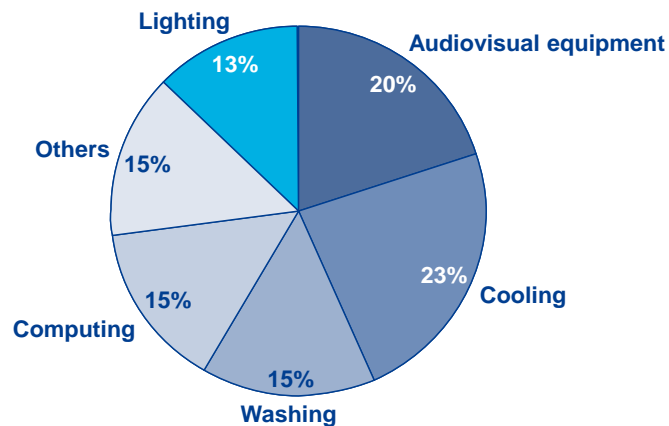
⁶ Spiegel, <http://www.spiegel.de/wirtschaft/service/gruenen-anfrage-energiearmut-in-deutschland-nimmt-drastisch-zu-a-954688.html>

⁷ CRE – Fonctionnement des marchés de détail français de l'électricité et du gaz naturel - 2013

1.2. Lighting industry: a role to play in an energy efficiency program?

Even if lighting represents a small share of energy consumption, efficient lighting technologies have a true role to play in the initiation of larger energy efficiency program : they are one of the most easy and attractive solution to implement, with lower investment costs than any other energy efficiency solutions.

Lighting technologies are not often put forward in programs aiming at reducing fuel poverty. Indeed lighting represents a relatively small share of electricity consumption (about 13%⁸ excluding hot water and heating, 1 to 3%⁹ if included) which would represent about 80-160 €/year per household¹⁰.



Source : ADEME – Réduire sa facture d'électricité – Juillet 2014
Electricity consumption excluding hot water and heating

Figure 5 : Breakdown by use of average electricity consumption in France

However, it could represent the equivalent of 15% (for halogen) to 80% (for CFLi) of the energy bill.

Furthermore, changes in lighting technologies represent an easy change to implement with a low barrier to investment compared with other energy efficiency actions like insulation or heating system replacement. **In a context where comprehensive energy efficiency improvement at home is a long and still unattractive process for households¹¹, quick**

⁸ French energy agency - réduire sa facture d'électricité – Juillet 2014

⁹ Enerdata – Odysée 2008

¹⁰ Hypothesis: average energy consumption per household: 4700 Kwh/yr, subscription: 85€/yr

¹¹ Le défi de la rénovation énergétique, La Fabrique Ecologique - 2014

and visible energy savings through lighting could therefore represent a gateway to larger energy efficient initiatives.

The lighting industry is thus a perfect example of a quick eco-efficient innovation pace, but that does not reach the low-income households, while this market segment is the one who need them the most.

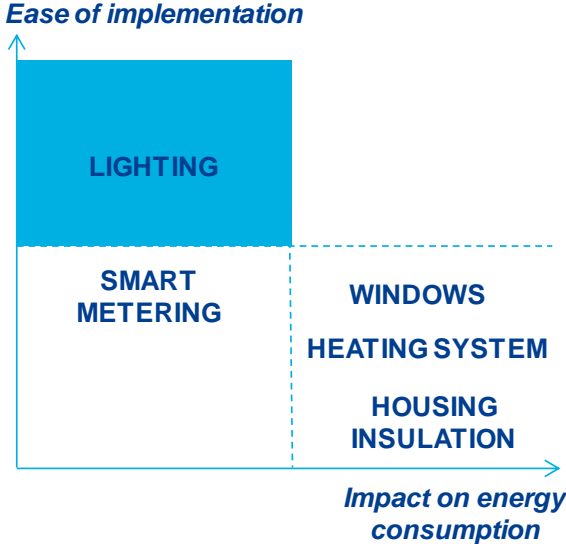


Figure 6 : Lighting as a “quick wins” technology

This study aims at analyzing to what extent new energy efficient lighting technologies as LED might be a solution for households in a state of fuel poverty but also, with a wider perspective, for all low-income households.

2. To what extent could LED lighting solutions be an answer for fuel poors?

LEDs are becoming increasingly more energy efficient and provide an increasing lighting comfort but the purchase price remains the main criterion for low-income households. Today LEDs are premium products, yet accessible unevenly across countries and still too expensive compared to other technologies for the low income segment.

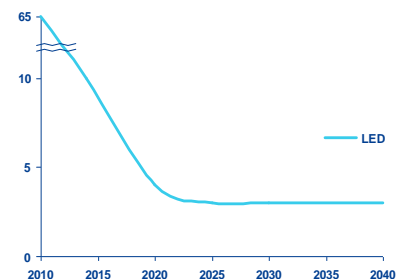
2.1. Benefits of LEDs for fuel poors and low-income households

2.1.1. LED's economical and environmental performances

LEDs provide the best energy efficiency on a long service life (about 40 000 hours versus 8000 hours for CFLi technology¹²). This means less replacement and less waste on an environmental point of view.

Moreover, the high investment price compared to other technologies (Incandescent¹³, Halogen and Compact Fluorescent Lamp (CFLi)) is largely amortized over a period of 10 years and conversion to LED has a relatively short payback. This tends to be even more interesting as **LED's prices fall by 20% each year.**¹⁴

Lower prices will be enhanced by the relocation of LED production to other Asian countries (initially China, Japan and Korea) where the cost of labor is lower. **In some countries, the price of LED lamps is expected to become competitive with CFLis** as soon as by 2015, which will further speed up the transition from CFLis to LEDs. At the present time, converting an halogen system to a LED system saves around 80 € per bulb over 10 years, with a payback reached from the second year.



Source: US Energy Information Administration, Annual Energy outlook 2014

Figure 7 : Average cost per bulb projection

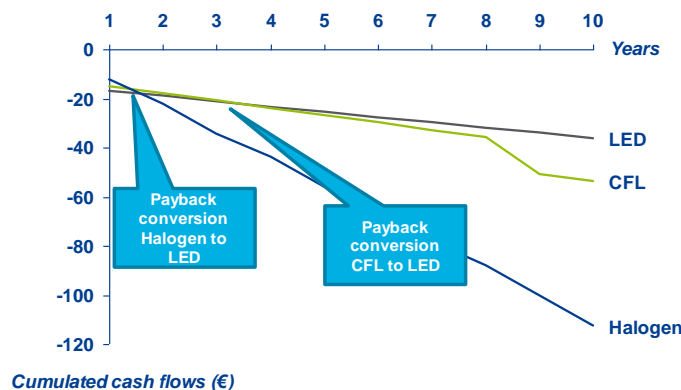


Figure 8 : Payback time when converting to lighting to LED

¹² MIROVA : 2014-2020 : ère de l'éclairage LED ? , 2014

¹³ Incandescent are currently under the process of being phased out by regulation

¹⁴ <http://www.notre-planete.info/actualites/4108-lampes-LED-avantages-inconvenients>

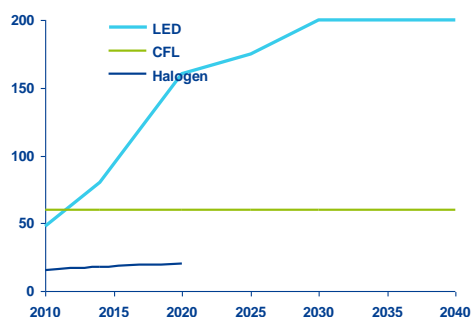
2.1.2. LED's technical performances

LED technology continues to grow: **LED performance doubles every 2 years.**

LEDs provide more flexibility than halogens in terms of lighting intensity and lighting color. If 1st generation of LED may have not provided the same lighting comfort than halogen, 2nd generation of LEDs provides now a quasi similar quality. Besides, LEDs allow new lighting experiences: color changes, remote control with a smartphone, rapid start.

However, light quality, replacement comfort and technological innovation are often not relevant purchase criteria for low income households.

(light output per unit of energy consumed (lumen/watt))



Source: US Energy Information Administration, Annual Energy outlook 2014

Figure 9 : Average lighting efficiency projection

2.2. Barriers to overcome

2.2.1. A premium product, still too expensive for low income consumers

Purchase price remains the predominant criterion. Low income households must make budget decisions daily and reason with little long-term vision. Thus, despite a significant gain of LEDs over 10 years and a relatively short payback when converting to this technology, **LEDs are often not chosen because individuals do not consider lighting as a long term investment.** LED energy savings performances are unfortunately scarcely taken into account in the purchasing process.

However, main manufacturers are changing strategy. Currently, LED is a premium product: technological and aesthetic capabilities of the product are put forward. But several **manufacturer's strategy is to make LED a product also affordable for middle and low income consumers in the following years.**

2.2.2. Economical and environmental strengths are not well communicated to consumers

LEDs are becoming increasingly more energy efficient. However, according to social business and associations, this is rarely a criterion for low income consumers who almost never calculate the potential energy savings coming from changing light bulbs.

Labeling on this topic is tricky because energy savings are dependent on applications and individual situations. The total cost of ownership is rarely calculated for bulb purchase. Awareness of potential savings for customers could therefore probably be improved. For instance, **lifetime energy consumption labeling could be tested** to raise consumer awareness on this point.

Furthermore, labeling on light quality is unclear and this criterion is still poorly highlighted on the shelves. New lighting technologies (e.g. LED) could benefit from clearer communication regarding their recent improvements of light quality.

These purchasing criteria are not exhaustive, and **it is important to remember that most purchases are not made rationally by consumers** (whereas building technical choices in workplace are made more rationally).

2.2.3. A product still unevenly available on the market

Consumers usually buy bulbs in the closest shop from their home, no matter which type of bulb is sold in the shop. People will only move further or to another shop if the bulb is given for free or delivered (e.g. Amazon).

LEDs are currently sold in different retail channels: general retail chains, electronic shops, do-it-yourself, furniture's shops, discounters.

According to an international energy expert, the situation varies widely across countries. In Germany and in the UK, **LEDs benefit of a very large market availability in all distribution channels, in contrast with France where LEDs are still unevenly distributed**. An important share of small supermarkets is positioned on very affordable products and rarely distributes LEDs. In France, the technology is still not enough understood by consumers.

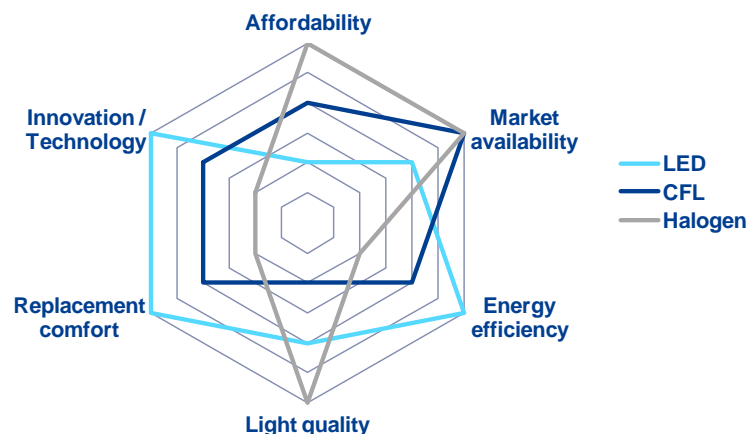


Figure 10 : LED co-benefits compared to other technologies

Qualitative analysis: Center = low performance ; Periphery = high performance

LED's Strengths

- > Long expected life time
- > Energy savings
- > Better light quality compared to CFL
- > Technological control options

LED's Weaknesses

- > Higher upfront cost
- > Heterogeneous market availability
- > Lower light quality compared to halogens

Opportunities for fuel poor market

- > Price decrease and emergence of "first price" LED products
- > Energy saving labeling to better market LED performances
- > Retailers engagement in accelerating the phasing out of less energy efficient bulbs

Threats for fuel poor market

- > Halogen competition during the transition
- > No improvement in labeling differentiation

Figure 11 : LEDs market position and perspectives

3. What innovative customer value propositions and offers to deploy LED solutions to low-income consumers?

Energy suppliers, manufacturers of light bulbs and social partners have a great role to play in the development of innovative business models, better knowledge of energy consumption and the availability of the product at affordable prices.

3.1. Carry on suppliers and retailers efforts to better market LED's strengths

3.1.1. A market moving toward a large diffusion of LED

In the residential sector, the LED market share was estimated at around 7% in 2011 and is expected to be almost 50% in 2016, rising to more than 70% in 2020. LED manufacturers that currently focus on the non residential and premium residential markets will soon extend their offer to mainstream lighting market. Some of them are already making the move (e.g. IKEA).

Accentuated regulation roadmaps to phase out inefficient light bulbs will surely accelerate the LED market share in residential applications even if the conversion is still predominantly done on halogens. For instance, in Europe, incandescent bulbs have been banned in 2012 and every low efficiency halogen bulbs (under category C) are planned to be banned by 2016 (according to some experts, this could be postponed to 2018).

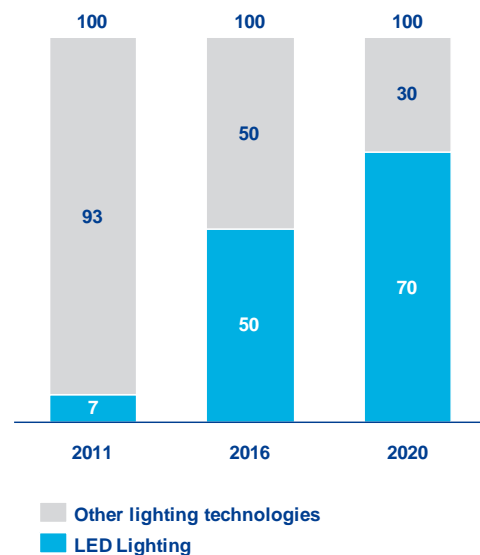


Figure 12 : Average lighting efficiency projection

Generally speaking, the market is moving towards a large diffusion of LED, with solutions more suited to low incomes, but this transition needs to be speeded up as inaction has a cost in terms of unnecessary energy consumption.

3.1.2. Overcome upfront cost barrier by developing collaborative BtoC lighting services on a leasing model (e.g. by utilities)

Facing the higher purchase price of LED lamps compared to conventional lamps, households in fuel poverty cannot afford efficient lighting technologies. A solution to overcome this limitation could be for energy suppliers to include the energy-saving bulb price and its installation in the energy bill.


Offering LED at an affordable price 

International

Description
 Since 2007, the specialized retail chain IKEA offers high-performance, stylish and affordable LED. The brand is also ambassador of this new technology as it explains in detail its strengths and qualities to its customers. Building on its success, the company is committed to selling only LED lighting technology from 2016.

Key figures and results

- > Offers LED from 3 to 13 €
- > These lights consume 85% less than traditional incandescence bulbs and have a 20 000 hours lifetime (20 years)

Batteries leasing in developing countries 

Lake Victoria, Kenya

Description
 In 2008, OSRAM launched a project for producing light independently from a grid-based power supply - "Off-Grid Lighting". Inhabitants can lease batteries for energy-saving lamps and other electrical devices for a small fee and at the same time recharge them at solar-powered energy hubs specifically built for this purpose. People then buy a lighting service and not a power on one side and an equipment on the other side. Renewable solar energy and rechargeable batteries enable modern LED lighting technology to be used even in rural and peri-urban areas in developing countries. This project was implemented by an actor who manages both energy production (through solar panels), energy supply (through batteries) and supply of the equipment using this energy (the LED lighting).

Key figures and results

- > Around 1€ for 4 days of lighting
- > Compared to kerosene lanterns and candles, battery operated lighting lower costs, avoid smoke and soot emissions and increase safety

This type of business model in the lighting sector has been tested in developing countries (as described below) but has never been extended to developed countries. This could be a smart example of “reverse innovation” from developing to developed countries.

3.2. Raise awareness on LED’s performances

3.2.1. Better understand energy bills by implementing energy consumption metering tools that would highlight LED value

Today, new energy counters display the total energy consumed at any time by a household. These counters generally raise a household’s awareness on energy waste. However, they do not allow a deep understanding of energy consumption and seldom engage their holders in energy saving investments.



Low-cost automatic sub metering solutions should be encouraged to allow rapid failure detection and better energy management

Customized energy audits for fuel poor exist in Germany, promoted by housing cooperatives or in France via the SOLENI service of Ullisse association (cf. case study).

These audits are done household per household and involve significant advising time from the auditor and training / listening time from the residents

It is then difficult to deploy these audits at a larger scale.

The emergence of non intrusive low-cost automatic sub-metering solutions should be encouraged to allow rapid failure detection and better energy consumption management. Ulisse Association via its SOLENI service has developed a partnership with Schneider Electric with the aim of developing this type of instrumentation dedicated to fuel poors.

<p>Household energy consumption monitoring and energy saving kits distribution</p> <p>Grenoble, France</p>  <p>Description</p> <p>Ulisse is a solidarity economy group. Through its service called SOLENI, it gives support to homes in precarious situation by :</p> <ul style="list-style-type: none"> > Offering a diagnostic of all energy consumption items (heating, lighting, etc.) by an enquiry on equipment power and average daily use time. > Giving a detailed vision on the invoice breakdown per use. > Supplying and installing a pack of energy saving items with LEDs. <p>Key figures and results</p> <ul style="list-style-type: none"> > More than 300 households supported for 3 years > Possibility to reduce the electricity bill by 20% for specific electricity consumption and by 10% for the gas. 	<p>Household energy consumption monitoring by a resident's cooperative</p> <p>Berlin, Germany ; Since 1996 - on going</p>  <p>Description</p> <p>A housing association, FriedrichsHeim eG cooperative, tries to improve the quality of living of its residents by structural measures in compliance with environmental and energy standards. It helps members to implement projects aiming at decreasing monthly charges. Charges billing are performed simultaneously in order to facilitate comparisons of consumption in a building and between all buildings. The social housing agency contact the households with high consumption to determine the cause and find solutions jointly.</p> <p>Key figures and results</p> <ul style="list-style-type: none"> > 1996 : foundation of the resident's cooperative > 2012 : 15 million euros invested in renovation > Today, their operating and heating costs represent less than the national average
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If the use of such sub-meters would speed up the audit phase, this would not relieve of an individual support. Energy suppliers could develop such products in order to provide services to explain the energy bill for consumers.

With smart meters, consumer data could be transmitted to the utility, which could then:

- ◆ Detect abnormal consumptions
- ◆ Send alerts to consumers
- ◆ Automatically send information sheets describing adapted solutions
- ◆ Provide advice during the annual technician visit

3.2.2. Advise and empower households on energy savings through trusted third parties

For a long time, housing associations have been willing to raise building caretaker's competences. Indeed, caretakers are available, live in the same place than residents who have the opportunity to communicate regularly with them. However, according to a social business organization, if caretakers are familiar with the inhabitants of the buildings, they can also be critical about the conditions of occupancy of the apartments (number of people, damage to the apartment) and their relationship with the social landlord may compromise confidence.


Caretaker energy saving training 

Bremen, Germany

Description
 The project established by Gewoba, one of the largest promoter of Bremen city, was to build a new residential area fully sustainable. Gewoba decided to train the caretakers to energy savings (including to LED technology), so that they may advise residents on good energy management practices. Caretaker's training is provided by a local energy agency.

Key figures and results

- > Gewoba manages about 42 000 apartments.
- > Up to 130 € / household / year are saved through the energy program
- > Only 600 households performing the energy saving check would save up to 78 000 € annually.

Joint purchasing strategy 

Cornwall, United Kingdom

Description
 A social housing consortium, ASW, implements a joint purchasing strategy systematically taking into account the price, the quality, the duration and durability for any product, service or activity. ASW recently set up groups work focused on new technologies and fuel poverty.

Energy saving kits distribution 

Frankfurt, Germany

Description
 The Cariteam energy saving service program offers to train long-term unemployed people to become energy-saving assistants. Cariteam supplies low-income households with a pack of energy-saving items (including LED) and gives them free advice on how to save electricity.

Key figures and results

- > Contributed to about 400 "energy saving" checks in 2007 and 2008
- > The project has now been extended to 60 other German towns and cities

Raising households awareness on energy savings 

Lanquedoc-Roussillon, France

Description
 Enercoop is a green electricity producer with a cooperative status. "Tupperwatt evenings" are opportunities for members of the cooperative Enercoop to:

- > talk about the need of energy model change
- > present and discuss the various energy saving solutions
- > discover Enercoop

The proposed animation lasts about two hours and may include the presence of several employees of the cooperative.

Key figures and results

- > Enercoop has currently 11 000 members, some 2 000 professionals and 30 communities
- > Tupperwatt evenings started in 2013, 8 years after Enercoop's creation
- > A Tupperwatt meeting may group till 150 households. 70% of these households are then involved in energy saving projects

The role of the caretaker must be clearly defined. For instance: energy saving solutions demonstration or, equipment installation assistance on request. In peri-urban or rural area, volunteer neighbors could become neighborhood ambassadors and take on this role.

These actions might be realized during evenings similarly to Tupperwatt evenings organized by Enercoop (cf. case study).

Some initiatives also provide energy saving kits including LEDs to households. Providing these kits can help motivate households to change their equipment. According to a social business organization, free distribution of energy saving kits including LED among low income consumers is not generally successful if this distribution is not accompanied by the installation of equipment and explanations on the energy bill. This is done to prevent kit resale on a secondary market.

Free distribution of energy saving kits including LED is not successful if not accompanied by the installation of equipment and explanations

3.2.3. Reduce LED purchase price by grouping purchases through collaborative economy

Energy providers or social landlords can make bulk purchases to get discounts on LED prices and become indirect retailers of LED technology.

3 % of French people aged 15 to 75 years practice grouped purchases. Collaborative consumption is more developed among people with a strong education and high income but some types of practices are also prevalent among employees¹⁵.

Grouped purchase of gas



France

Description

The consumer association UFC-Que Choisir launched the program "cheaper gas together." The principle : to gather as many consumers as possible in order to launch a tender for selecting an energy supplier able to compete with the regulated prices offered by GDF Suez.

¹⁵ French Energy Agency , Les Français et les pratiques collaboratives, 2013

Conclusion

Fuel poverty may result of the combination of several factors. It can affect very various profiles of population, making it a particularly complicated issue to tackle. Despite current decrease in fossil fuel prices, fuel poverty is expected to rise in the long term.

Even if lighting represents a small share of energy consumption, efficient lighting technologies have a true role to play in the initiation of larger energy efficiency program : they are one of the most easy and attractive solution to implement, with lower investment costs than any other energy efficiency solutions.

Today LEDs are premium products, yet accessible unevenly across countries and still too expensive compared to other technologies for the low income segment, as the purchase price remains the main criterion for low income. LEDs are becoming increasingly more energy efficient and provide an increasing lighting comfort but these qualities are not enough communicated to consumers and LED technologies are still unevenly distributed across countries.

It is therefore necessary to broadcast the LED as a sustainable and energy efficient solution available to all. Energy suppliers, manufacturers of light bulbs and social partners have a great role to play in the development of innovative business models, better knowledge of energy consumption and the availability of the product at affordable prices.

Synthesis / Conclusion	Pros	Cons
1. Overcome upfront cost barrier by developing collaborative BtoC lighting services on a leasing model (e.g. by utilities)	<ul style="list-style-type: none"> > No more upfront cost barrier for low income consumers 	<ul style="list-style-type: none"> > Complexity of energy bill
2. Better understand energy bills by implementing energy consumption metering tools that would highlight LED value	<ul style="list-style-type: none"> > Simplify potential energy consumption audit > Detect abnormal energy consumption 	<ul style="list-style-type: none"> > Metering tools do not replace expert advice at the audit phase
3. Advise and empower households on energy savings through trusted third party	<ul style="list-style-type: none"> > Quality information and assistance on energy saving solutions for residents 	<ul style="list-style-type: none"> > Investment in training > Investment in energy saving kits if provided
4. Reduce LED purchase price by grouping purchases through collaborative economy	<ul style="list-style-type: none"> > Decrease in LED purchase price > Secondary LED retail channel 	<ul style="list-style-type: none"> > Limited price decrease

Bibliography

On lighting :

International studies

- ▶ **McKinsey – *Lighting the way: Perspectives on the global lighting market*** – August 2012

National study

- ▶ **Mirova – *2014-2020 : ère de l'éclairage LED?*** – March 2014

On fuel poverty :

International studies

- ▶ **EPEE – *Lutter contre la précarité énergétique en Europe*** – September 2009
- ▶ **ageUK – *Reducing fuel poverty – a scourge for older*** - June 2014
- ▶ **BPIE – *Alleviating fuel poverty in the EU*** – May 2014
- ▶ **IEA / World Energy Outlook – *Energy for all. Financing access for the poor*** – October 2011
- ▶ **INSEAD – *Schneider Electric in Rural India: Integrating Social Responsibility with BOP Strategy*** – October 2012

National studies

- ▶ **ADEME – *Des ménages acteurs de la gestion de l'énergie dans leur logement*** – February 2014
- ▶ **ONPE – *Etude particulière relative aux actions des fournisseurs d'énergie dans la lutte contre la précarité énergétique*** – February 2014
- ▶ **ENEA Consulting - *Leviers, Enjeux et Perspectives de la lutte contre la précarité énergétique dans le logement*** – October 2013
- ▶ **CGDD – *La précarité énergétique des ménages dans le logement et les transports*** – April 2013
- ▶ **CREDO – *Consommation et modes de vie*** – March 2013
- ▶ **ANSA – *Pistes d'actions pour lutter contre la précarité énergétique*** – October 2012
- ▶ **FinSH - *Habitat à vocation sociale : sortir de la précarité énergétique*** – May 2010
- ▶ **CERTU – *Budget énergétique des ménages. Atlas des territoires vulnérables*** – November 2011