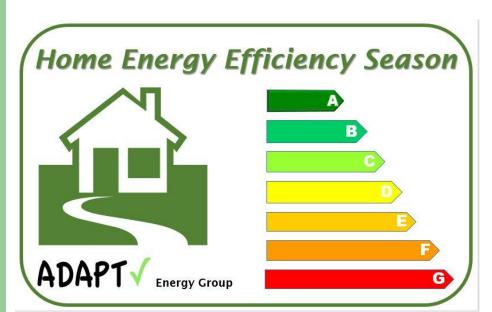


Event 2 – Appliances and LED lighting

- Appliances Chris Knibbs
- LED lighting Andy Hannah
- Tea and biscuits after!





Chris Knibbs ADAPT Energy Group

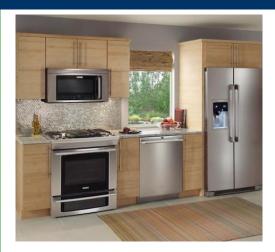
Electrical Appliances

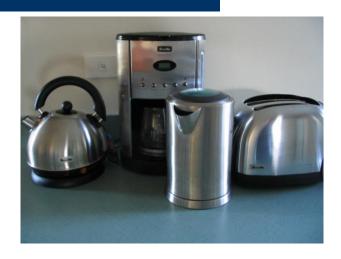
Focus

- Waste Less
- Use Less (Use them less often, use them more efficiently, Choose more efficient appliances
- Have a better impact on the environment



How many appliances ??



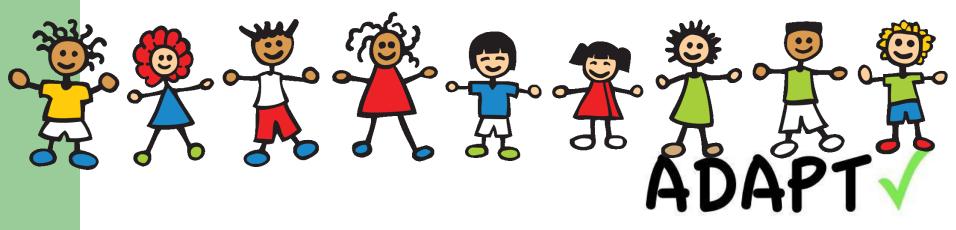




How many appliances ??

- 50 in the average UK home
- More if there are





Which Appliances Top 15 byPowerElectric shower8

Electric shower	8500-10,500W
Immersion heater	3000W
Kettle	2200-3000W
Electric fire	2000-3000W
Tumble dryer	2000-3000W
Oven	2000-2200W
Washing machine	1200-3000W
Oil-filled radiator	1500-2500W
Grill/hob	1000-2000W
Iron	1000-1800W
Dishwasher	1050-1500W
Toaster	750-1500W
Deep fryer	1200W
Microwave	600-1500W
Electric mower	500-1500W

Which Appliances Top 15 byEnergy UsedFridge-freezer24

Fridge-freezer	200-400W
Oil-filled radiator	1500-2500W
Electric fire	2000-3000W
Freezer	150W
Immersion heater	3000W
Central Heating Pump	5-450W
Plasma TV	280-450W
Tumble dryer	2000-3000W
Washing machine	1200-3000W
Fridge	40-120W
Grill/hob	1000-2000W
Kettle	2200-3000W
Dishwasher	1050-1500W
LCD TV	125-200W
Electric shower	8500-10,500W

Kitchen Appliances



• Save £40 a year-just by careful use



ADAPT

Kitchen Helpful Tips

• Heating Water



Only Heat what you need (lids)





Kitchen Helpful Tips

Is Fridge or Freezer set too cold



5 Degrees C

-18 Degrees C

- Check at top
- Don't Overload
- Let food cool
- Check seals
- Can air circulate at the back?



Kitchen Helpful Tips

• Washing Machines



- Full Loads Only (Dishwashers Dryers)
- Reduce settings to 30 Deg C can save 40%

Other Appliances















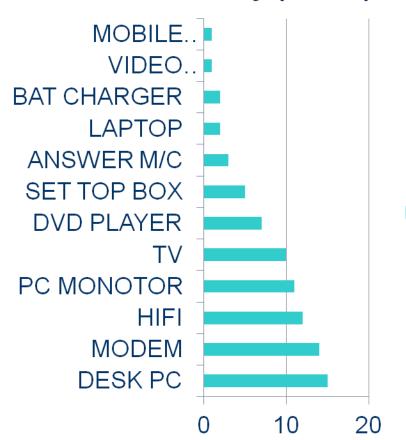


Standby Tips

- Save up to £76 per year
- What this means
- 300kg of CO2 saved
- = 10% of Electricity used
- = pollution from 870mile car journey



Standby Tips



Standby (Watts)

Standby (Watts)



Standby Tips

- Energy Saving Plugs –pcs, tvs
- Energy Monitors
- Use them to reduce energy consumption







Shower Tips

Time Spent in Shower







Shower Tips

_	2 minutes	SHOWER = 27 25 minutes
-	Zininates	
	260.0.	00
	0 000	
	°0 K 10	Il stains
DAPT	Wash and rinse the body.	flection and deep thoughts about
	Wash and rinse the body.	flection and deep thoughts about e origin of life and the universe.



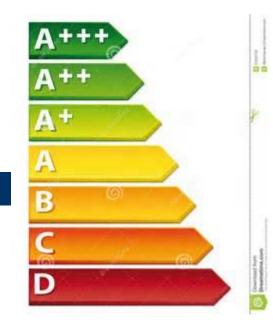
Shower Tips

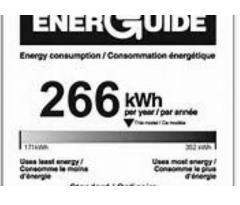




Appliances

- Efficiency Rating
- Also compare annual energy use figure
- Smaller units will usually use less.
- Buy the size you need with the most efficient rating.









Computers



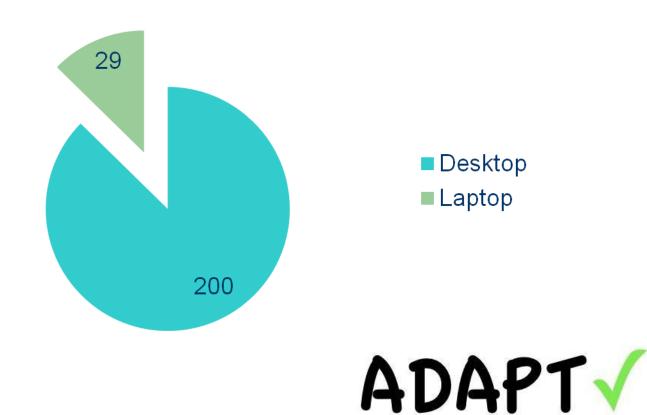






Computers

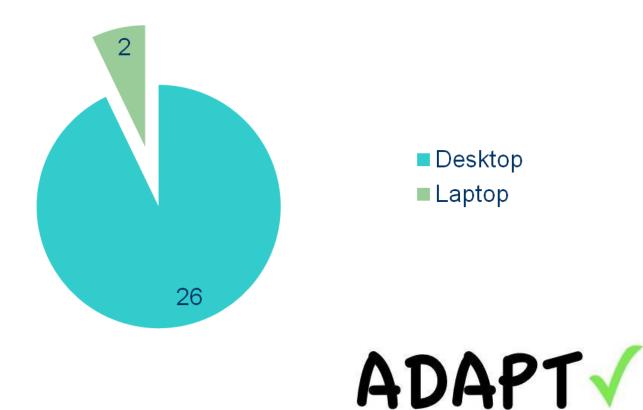






Computers







Kettles



VS



- If you have gas, it is cheaper to boil water on a gas hob
- Turn Gas off straight away.
- Use woodburner to preheat water

Electric Kettles

- Use same energy- Regardless
- Boil only what you need, mark 1 cup, 2 cups level on kettle
- DEFRA calculates we waste 1.3 Billion KWh of Electricity a year through overfilling kettles.
- See through, insulated & built in thermometer.
 ADAPT



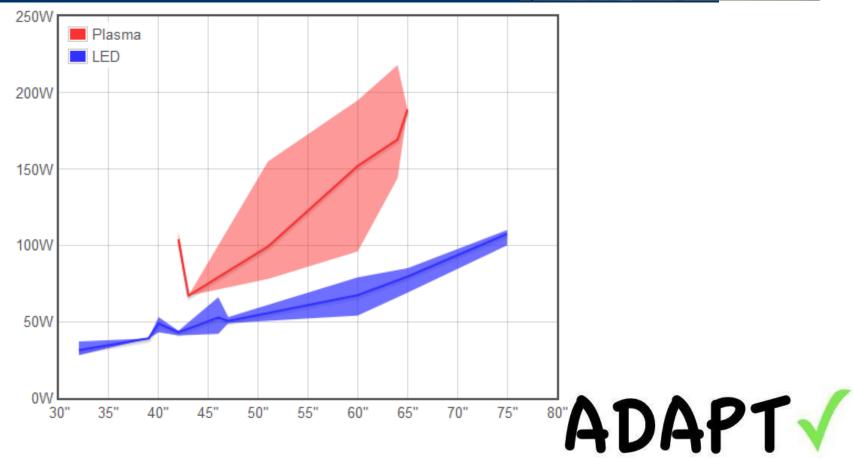


Electric Kettles

- Hard water, wasting energy heating through limescale
- Leave dilute vinegar on element overnight
- Buy kettle with low minimum fill
- & short over boil time- Energy Saver



TVs





Cooking Appliances

- Cheapest way to cook
- Microwave Oven
- Slow Cooker
- Pressure Cooker
- Induction Hob

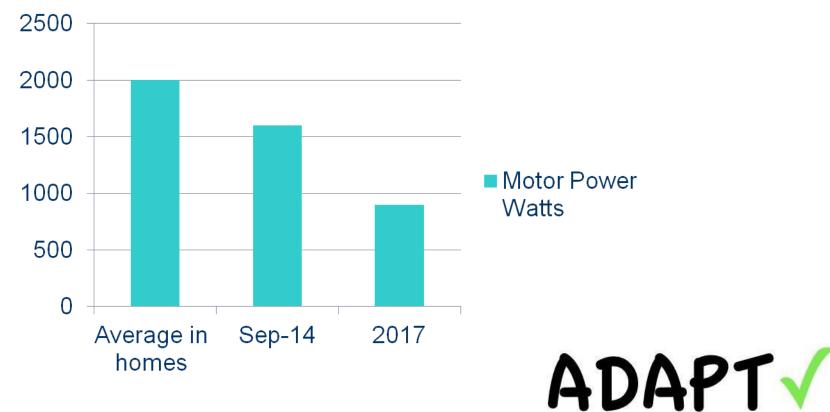
- Expensive way to cook
- Convection Oven

- Electric Hob
- Gas Hob
- Gas Oven



Vacuum Cleaners

Motor Power Watts



Summary

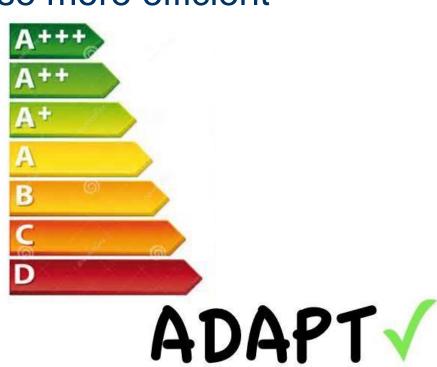
• Waste Less



Summary

 Use Less (Use them less often, use them more efficiently, Choose more efficient appliances





Summary

• Have a better impact on the environment







Chris Knibbs ADAPT Energy Group

Electrical Appliances

LED Lighting

Energy Efficient Lighting for your home

Andy Hannah ADAPT Energy Group



Why LED lighting?

- The most popular and cost effective energy efficiency measure available today.
- Greenhouse gas reduction as well as cost savings



Bulbs and lamps

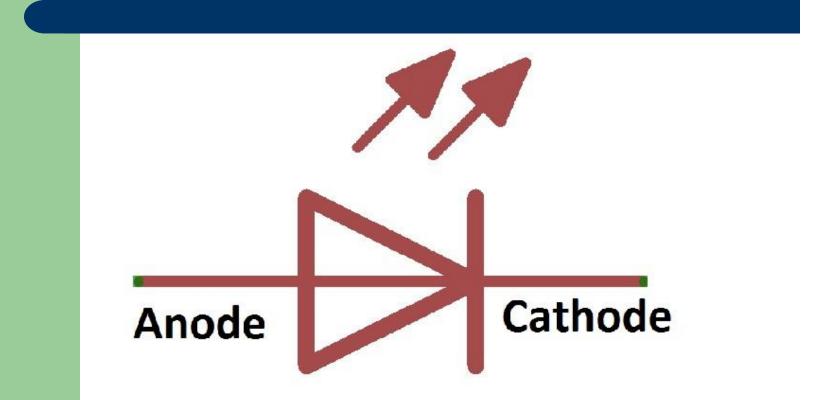


What is an LED?

• Light Emitting Diode



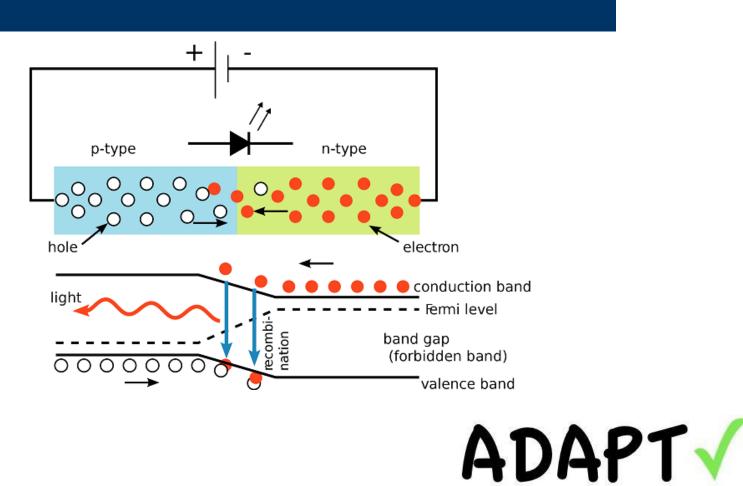
So what's a diode, then?



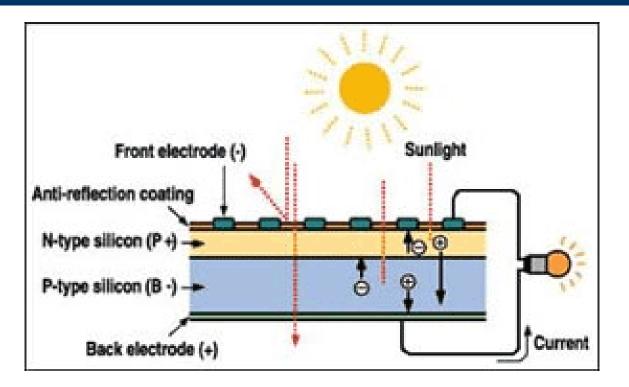
An electronic check valve



How do these diodes emit light?



Photovoltaic cell





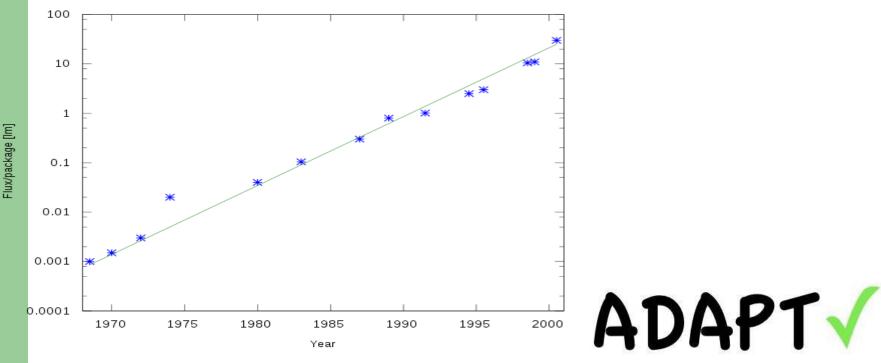
Early Development

- Early 1960's Red & Infra-red LEDs
- 1970's Commercialisation in 7 segment displays (e.g. digital watches)
- Evolved with other colours of LED using different materials
- Recent advances in white LED power and efficiency



Haitz Law

Light output rises exponentially with time – doubles every 36 months



So where are we now?

- Breakthrough in domestic lighting LEDs
- Like for like 'plug and play' replacements
- An energy efficiency technology you can often implement yourself!

- Much improved affordability
- Big reductions in energy use (and bills!)
- Short payback periods
- Warmth of colour and colour rendering improved

Comparison of lamp life

- Average rated lamp life:
 - LED 25,000 hours
 - Halogen incandescent- 2,000 hours
 - Tungsten incandescent 1,000 hours
 - Compact fluorescent 10,000 hours
- 3 hours per day = about 1000 hours per year.

ADAPT

• Expected life of an LED lamp = 20-25 years

Practical Examples of LED application 1. Replacement of halogen lamps - GU10s

- Application recessed lighting.
- Often installed in large arrays
- Halogen Incandescent 50W
- LED equivalent 5 W





Practical Examples of LED application 1. Replacement of halogen lamps - GU10s

GU10 repla	acement			Unit rate=	£0.1155	per kWh
	Lumens	Rating (W)	Hours/yr	kWh/year	£/year	
Halogen	330	50	1000	50	£5.78	
LED	345	5.2	1000	5.2	£0.60	
				Saving	£5.17	
Cost (ea	ch-based	l on purchas	se of mult	ipack of 5)	£2.40	
				Payback	0.46	years
				Payback	5.6	months

Practical Examples of LED application 1. Replacement of halogen lamps - GU10s

- Case study at Brookside
- Kitchen / Diner / Living area
- 15 Halogen GU10s
- 1200 hours per year
- Annual saving £101
- Cost @ Feb 2015 £60 (would be £36 today!)
- Payback 7.2 months
- Plus much longer life, so savings in replacement costs.
- MR16 lamps available at similar price to GU10s



Practical Examples of LED application 2. Replacement of GLS incandescent

- GLS= 'General Lighting Service'
- Classic light 'bulb'
- 60W GLS lamp replacements widely available
- Price has more than halved in a year
- 100W equivalents now available at competitive price
- Many 40W equivalents available
- Dimmable versions are available for suitable switches





Practical Examples of LED application 2. Replacement of GLS incandescent

GLS Non-dimmable - 60W equivalent							
				Electricity price / kWh	£0.1155		
	Lumens	Watts	Hours	kWh per year A	nnual cost		
LED	810	9	1000	9	£1.04		
Incandescent	810	60	1000	60	£6.93		
				Annual Saving	£5.89		
				Cost	£2.29		
				Payback	0.39 years		
					4.7 month	าร	

Payback was over 1 year this time last year!

Practical Examples of LED application 2. Replacement of 100W GLS incandescent

				Electricity price / kWh	£0.1155
	Lumens	Watts	Hours	kWh per year Ai	nnual cost
.ED	1521	13	1000	13	£1.50
ncandescent	1600	100	1000	100	£11.55
				Annual Saving	£10.05
				Cost	£4.00
				Payback	0.40 years

Not readily available 12 months ago!

Practical Examples of LED application 3. Replacement of Candle incandescent

40W equivalent illustrated



Practical Examples of LED application 3. Replacement of Candle incandescent

				Electricity price / kWh	£0.1155
	Lumens	Watts	Hours	kWh per year Ar	nual cost
LED	470	5.9	1000	5.9	£0.68
Incandescent	450	40	1000	40	£4.62
				Annual Saving	£3.94
				Cost	£2.99
				Payback	0.8 years



What if I've already converted to Compact Fluorescent Lamps (CFLs)?

- You've probably made most of the savings already.
- Still about 30% saving to be made by converting
- Payback will be longer for making the switch
- Paybacks for less than 5 years now achievable
- But if replacing to improve light levels, go for LED
 ADAPT

CFL to LED conversion

CFL to LED					
				Electricity price / kWh	£0.1155
	Lumens	Watts	Hours	kWh per year Ar	nnual cost
LED	810	9	1000	9	£1.04
CFL	810	14	1000	14	£1.62
				Annual Saving	£0.58
				Cost	£2.29
				Payback	4 years

Payback was 13 years this time last year! ADAPT

Power consumption comparison

Fitting	Light output	Electrical power consumption				
type	Lumens	Watts				
		Incandescent	CFL	LED		
Recessed	340	50 (GU10)	n/a	5		
Pendant	450	40	9-11	5-6		
Pendant	800	60	13-15	8-10		
Pendant	1600	100	24-28	13-15		

What about other fittings?

- LEDs now available for most fittings
- Some are more expensive
- Assess on case by case basis
- If too expensive for a particular fitting, keep monitoring periodically to see if the price drops.

Linear Fluorescent Tubes (LFL)

- Direct replacement LED tubes are available for some fittings
- But some 'replacement' LED tubes will require rewiring of fitting
- Different ways of dealing with fluorescent lamp ballast means that a qualified electrician should assess and recommend
- Direct replacements are less efficient than those involving rewiring
- Savings depend on efficiency of existing, which can be judged by tube diameter

- Be careful that lumen output is comparable
- To assess properly you need to understand the total consumption of the whole fitting, not just the tube

Linear Fluorescent Tubes

- If you have 38mm diameter tubes (T12), and use them, change to:
 - more efficient slimmer 26mm T8s (direct replacement)
 - or 16mm T5(requires an adaptor)
 - or LED (consult electrician)

Direct replacement with T8s is certainly easiest and probably most cost effective

• If you already have T8 or T5, and are not overlit, payback on LEDs may not be attractive

Assessing whether to go for LEDs

- Consider the annual hours of operation
 - Illustrations based on 1000 hours, or 2.7 hours every day.
 - For seldom used areas consider whether it's worth the investment
- Assess whether you want the equivalent light level, and if so pick equivalent lumen level lamp
- Subtract the new power output from the old to get the hourly saving
- Multiply that by the annual hours, and convert to kWh
- Apply the tariff rate (without standing charges) to get annual saving
- Compare the cost with the annual saving.
- Remember the contribution to greenhouse gas reduction as well as the cost saving.



Of course...don't light unnecessarily

- Switch off lights when not needed
- Unnecessary lamps in a circuit? just remove them!
- Consider lighting sensors to control

- 5 important factors to consider
 - Light output equivalency
 - 'Warmth' of colour
 - Dimming ability
 - Beam angle on recessed lamps
 - Compare products and suppliers

Light output equivalency

- Buy according to lumen rating
- Not what the seller says is equivalent
- Lots of 600 lumen lamps have claimed to be equivalent to 60W incandescent, and they're not!
- Be particularly careful with GLS/Candle replacements. Lots of low output lamps on the market which look the same as the proper equivalents.

• 'Warmth' of colour

- Generally LEDs are classed as 'warm' or 'cool'.
- Warm is what you would expect of an incandescent lamp

- Cool is a more stark, bluer light
- Warmth is measured in degrees Kelvin (K)
- Look for these values:
 - Warm 2,700-3,000K
 - Cool 3,600K plus.
 - Some are rated at 6,000K (very cool)
- Warm more suitable for living areas
- Cool may be fine for bathrooms / utility areas
- Colour rendering can vary too

• Dimming ability





• Dimming ability

- LEDs can be dimmable or non-dimmable
- Dimmable LEDs will work in a non-dimmable circuit
- Don't use non-dimmable in a dimmable circuit
- Dimmable LEDs aren't suitable for all dimmer switches
- Low voltage (MR16) circuits can cause dimming problems
- Options for dealing with dimmer circuits:
 - Fit an LED compatible dimmer switch (electrician required)
 - Convert to a non-dimmable switch (electrician required)
 - Change low voltage MR16 circuits to 240V GU10 circuits and use dimmable GU10 LED equivalents (electrician required)
 - Use all the same lamps in a circuit

- Beam angle on recessed lamps
 - Check that the beam angle is equivalent to your existing
 - If you have a choice pick the wider angle, to avoid risk of dark spots



• Compare products and suppliers

- Prices have been dropping, and may continue to do so, particularly for some fittings
- Wide disparity in prices and specifications in the market
- Prices quoted based on 'over the counter' purchases locally
- Internet prices can be much much lower, especially for quantity
- Multipacks often much cheaper (especially GU10s) ΔΠΔΡΤ

...and then there's torches!

- Highly effective, and now cheap!
- Why buy batteries for old incandescent lamps?
- Cycle lamps too.



Conclusions

- Replace lighting with LED if.....
 - it is currently incandescent (including halogen)
 - and the lamps are used for enough hours annually to justify the investment
 - Dimming compatibility has been considered
- Assess on a case by case basis based on run hours
- Be careful to consider the 5 points highlighted (especially dimmer switches)
- Buy multipacks
- For LED conversion of linear fluorescent fittings, a qualified electrician should assess and advise

- Remember that efficiency savings:
 - reduce greenhouse gas emissions
 - reduce the depletion of finite resources

LED Lighting

Energy Efficient Lighting for your home

Questions??



