

Developing Technologies

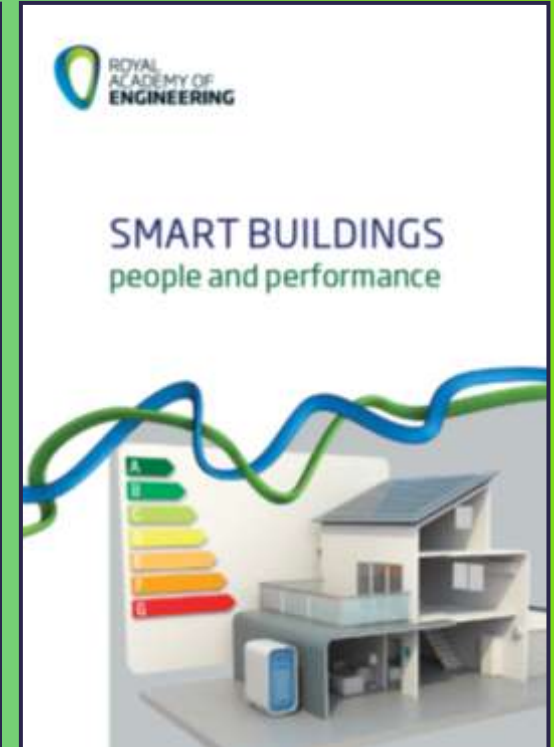
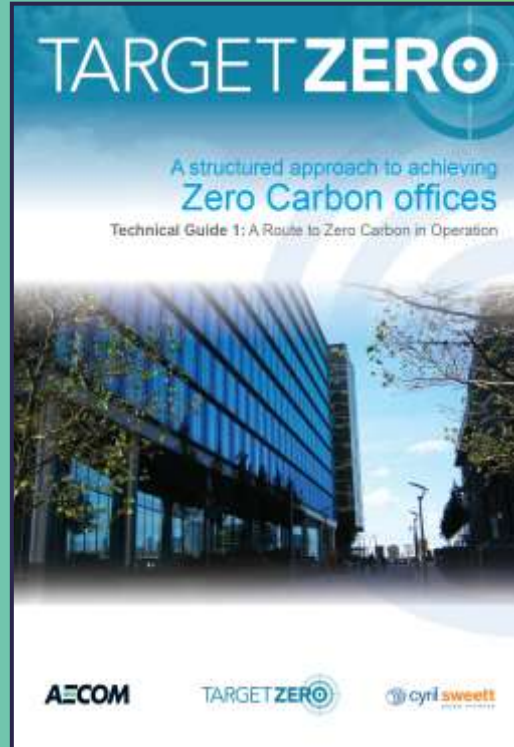
Reconciling a Wounded Planet



Ant Wilson

Director - AECOM Fellow

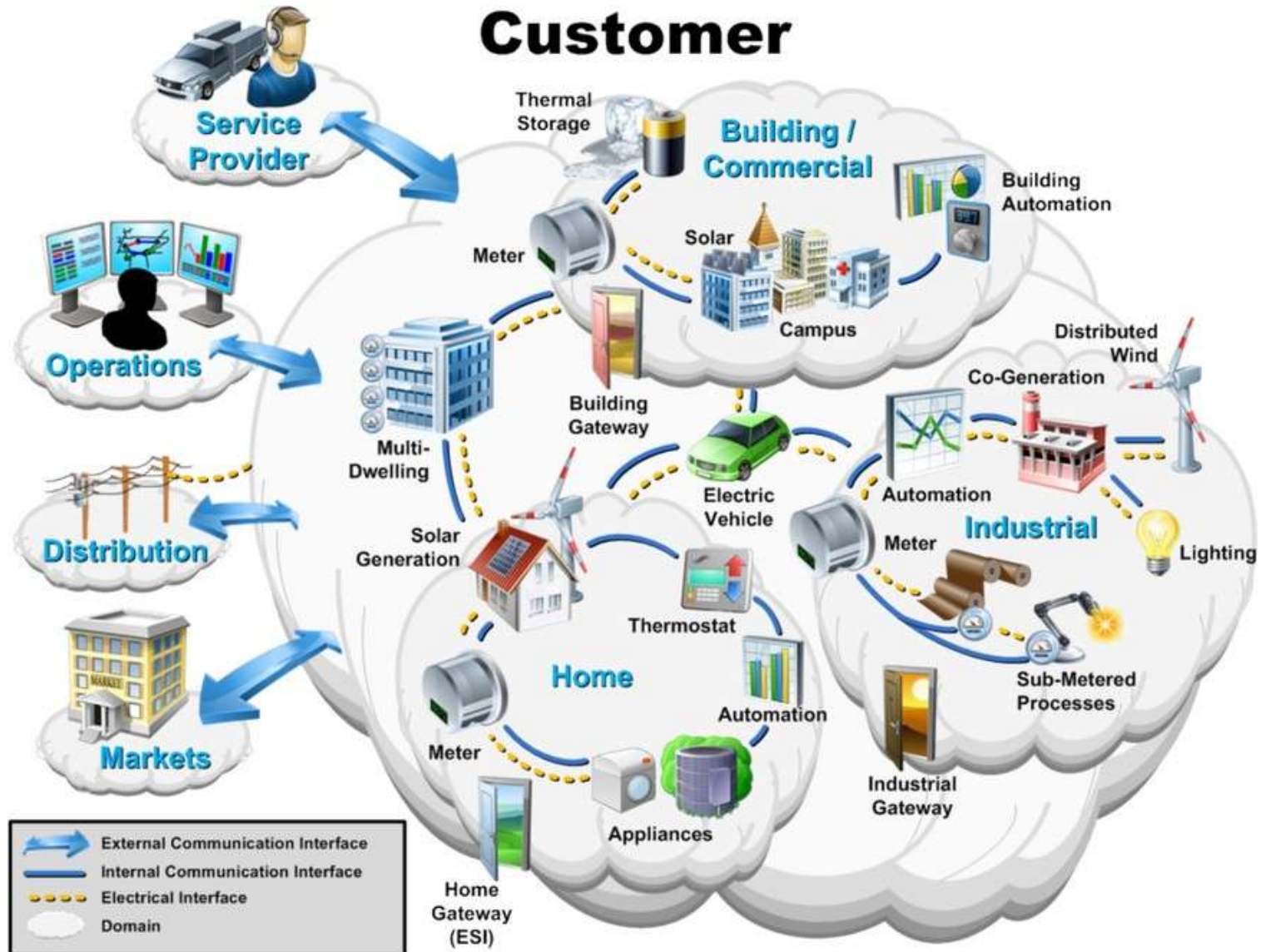
Building Engineering



18th September 2015

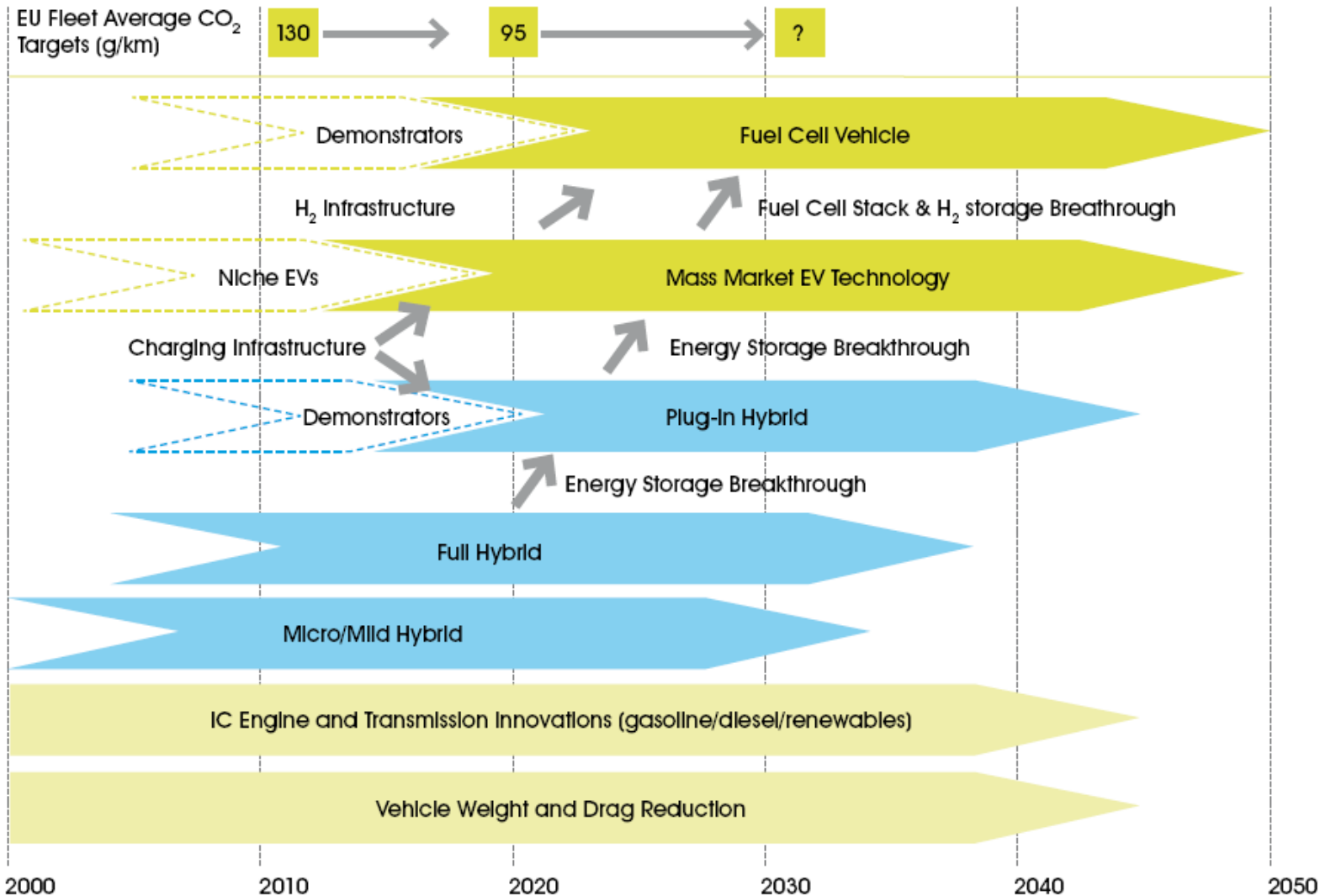


Smart Cities Need Smart Building, Smart Energy and Smart Grids



Transport Decarbonisation

Figure 3: A high level technology roadmap for the UK's de-carbonisation of road transport



Tesla Supercharger – The World’s Fastest Charging Station



Find

Supercharger stations are shown in Google Maps on the car's 17" touchscreen



Charge

Grab a cup of coffee or a bite to eat while your Model S charges



Drive On

Check the Model S app to see when your car is charged

Smart and Intelligent Buildings



A “Smart Device” is operated by a microprocessor and communicates with external systems via some form of data network.

True “Intelligence” implies the ability to automatically adjust operating parameters interactively between “Smart Items” to optimize building functionality or performance.



What is Smart Energy – Control & Delivery



The screenshot shows the SMARTGRID.GOV website interface. At the top left is the logo for SMARTGRID.GOV with the tagline "WHAT IS THE SMART GRID?". To the right are navigation links: About | Contact | Glossary | News | Site Map. Below the navigation is a search bar. The main header features the U.S. DEPARTMENT OF ENERGY logo and the text "OFFICE OF ELECTRICITY DELIVERY & ENERGY RELIABILITY". Below the header is a breadcrumb trail: Home > What is the Smart Grid? The main content area displays a grid of seven hexagonal icons representing different smart energy topics: The Smart Grid (map of the US), The Smart Home (house with solar panels), Renewable Energy (wind turbines and solar panels), Consumer Engagement (factory with gauge), Operation Centers (control room), Distribution Intelligence (power plant and houses), and Plug-In Electric Vehicles (car at charging station).

Smart Meters?



- ▶ For your home
- ▶ For your business
- ▶ About E.ON
- E.ON Group

🔒 [Login](#) or [Register](#)

- For your home
- Products and services
- Your account
- Saving energy
- Help and support

- ▼ Saving energy
- ▼ Smart meters
- ▶ How smart are smart meters
- ▶ How we're getting the UK smart
- ▶ Smart Energy Display
- ▶ Hints and tips
- ▶ FAQs

Smart meters: take charge of your energy bills - E.ON

Take control with a smart meter

With a separate smart display showing your latest energy usage and costs, a free smart meter puts you back in charge of your energy bills.

Take control

With a smart meter and smart energy display you can be back in control of your energy bills.

How smart are smart meters?

The smart meter sends your meter reading directly to us, so you don't have to. That means more accurate bills and one less thing to think about.



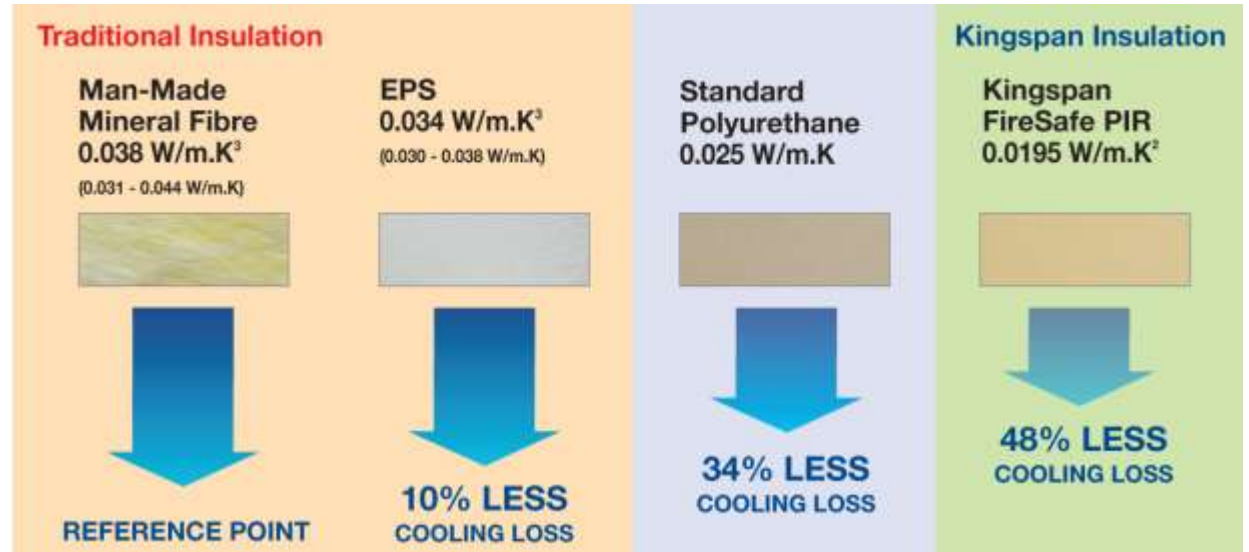
Not All Insulation Is The Same



OPTIM-R™ External Wall System

NEXT GENERATION INSULATION SOLUTION FOR EXTERNAL MASONRY WALLS

- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m.K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for constructions where a lack of construction depth or space is an issue
- Certified by DDA Agreement² and LABC Registered Details
- Vacuum insulation panels are over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-toxic/non-hazardous material



CoolDeck With Phase Change in Stevenage



Smart Components - Ten LED (60 Watt GLS Equivalent) Lamps

81



Osram 10W

While many lamps still have an industrial and chunky look about them, Osram's lamp is the closest thing in appearance to an incandescent lamp. The 10W (60W GLS equivalent) non-dimmable version we tested was robust enough to strike up again after we deliberately dropped it on the floor, and delivered a pleasing warm white light (2,700K). Its output is 810 lm and comes with a three-year guarantee. With a lifetime of 15,000 hours, it has a colour rendering index of 80Ra. The 10W will be available in Osram retailers across the UK from September 2013.

TECHNICAL SPECIFICATIONS

Light output 810 lm (lm) **Light distribution** Unavailable **Colour temperature** 2,700K **Edison or bayonet** Both **Price** £15 **Shockproof** Yes

60



Aurora 12W

Aurora's 12W dimmable lamp uses Bridgelux LEDs. The lamp has a colour temperature of 3,000K and an output of 720 lm. It has a lumen maintenance of 40,000 hours at L70. The lamp has a light distribution of 150 degrees and comes with a three-year warranty. It is described as dimmable on most common household dimmers.

TECHNICAL SPECIFICATIONS

Light output 720 lm (dimmable) **Light distribution** 150 degrees **Colour temperature** 3,000K **Edison or bayonet** Both **Price** Unavailable

96



Megaman 11W

Megaman's 11W LED classic A65 lamp offered a warm white light with 2,800K colour temperature and an impressive lumen output of 1055 lm. For the non-dimmable version. The 11W dimmable lamp offers 810

TECHNICAL SPECIFICATIONS

Light output 1055 lm (lm) **Light distribution** 330 deg

68



GE Lighting 12W

GE Lighting has a 2,700K extra warm white lamp that gives a 270-degree light distribution. The company says this makes it a better choice for general lighting applications such as table lamps. The product is available

TECHNICAL SPECIFICATIONS

Light output 810 lm (non-dimmable) **Light distribution** 270 degrees

Crompton Lamps 10W

With an output of 900 lm, Crompton Lamps has produced a 10W LED lamp equivalent to the 60W incandescent. Providing a warm white light, the lamp has a life of 25,000 hours. The new lamps have an opal finish and offer a colour appearance of either daylight (6,000K) or warm white (3,000K). Crompton's LED GLS range is available in 8W, 10W and 12W versions that are 40W, 60W or 75W equivalent.

TECHNICAL SPECIFICATIONS

Light output 900 lm (non-dimmable) **Light distribution** 330 degrees **Colour temperatures** 3,000K/6,000K **Edison or bayonet** Both **Price** £19.20

100



Nosaic 8W

Nosaic says it sells an LED GLS lamp every two hours to the UK market. We didn't manage to see a version of its LED retrofit lamp but found out it is available in 8W and 6W versions, which are equivalent to 60W and 40W GLS incandescents. They also come in dimmable versions. The company's LED GLS lamps have a lifetime of 30,000 hours and are available in three colour temperatures: 3000K, 4000K, and 6500K.

TECHNICAL SPECIFICATIONS

Light output 806 lm (lm) **Light distribution** Unavail **Colour temperature** 3,000K/6,500K **Edison or bayonet** Both **Price** £11.20

63



Philips 9.5W

Philips' retrofit LED lamp provides a warm white light at 2,700K and a high colour rendering index of 80Ra. Special plastic material provides protection for the lamp. Philips says the lamp makes it a better choice for energy savings of up to 90 per cent. The manufacturer has said it has significantly reduced the product's weight by using lighter components.

TECHNICAL SPECIFICATIONS

Light output 600 lm (non-dimmable) **Light distribution** 150 degrees **Colour temperature** 2,700K **Edison or bayonet** Both **Price** £19.99

78



Vertolin 10.5W

Vertolin offers a 10W 3,000K warm white lamp at 820 lm with a colour rendering index of 80Ra. The company has also produced a dimmable LED lamp at 10.5W, which is available in a warm white, with a 2,700K colour temperature at 806 lm. Like many of the lamps, there is a fit-like casing surrounding the bottom half of it. Having fitted the 10.5W version and operated it using a dimmer switch in the home, it dimmed smoothly

TECHNICAL SPECIFICATIONS

Light output 820 lm (lm) **Light distribution** 130 deg **Colour temperature** 3,000K **Edison or bayonet** Both **Price** £19.99

67



Ledon 12W

Ledon has produced a 12W (900 lm) lamp that is the equivalent of the 60W incandescent. The manufacturer says it is unique in the market because it has a higher colour rendering index of 90Ra. The 12W offers energy savings of up to 85 per cent compared with conventional light sources and a service life of 25,000 hours. Ledon has also produced a 10W LED (800 lm) that is a 60W incandescent equivalent. The 10W was named "Best Buy" product in the May issue of Which? magazine.

TECHNICAL SPECIFICATIONS

Light output 900 lm (non-dimmable) **Light distribution** 164 degrees **Colour temperature** 2,700K **Edison or bayonet** Edison **Price** £32.99

New LED Lamp Technology – Continuous Development

 <p>Dial Edison Screw Cap (E27) 4W GLS LED Filament Light Bulb</p>	 <p>Dial ES(E27) Fluorescent Globe Light Bulb</p>	 <p>Osram Edison Screw Cap (E27) 10W GLS LED Light Bulb</p>
<p>£8</p>	<p>£5</p>	<p>£10</p>

Dial Edison Screw Cap (E27) 4W GLS LED Filament Light Bulb

Product code: 5397007180084

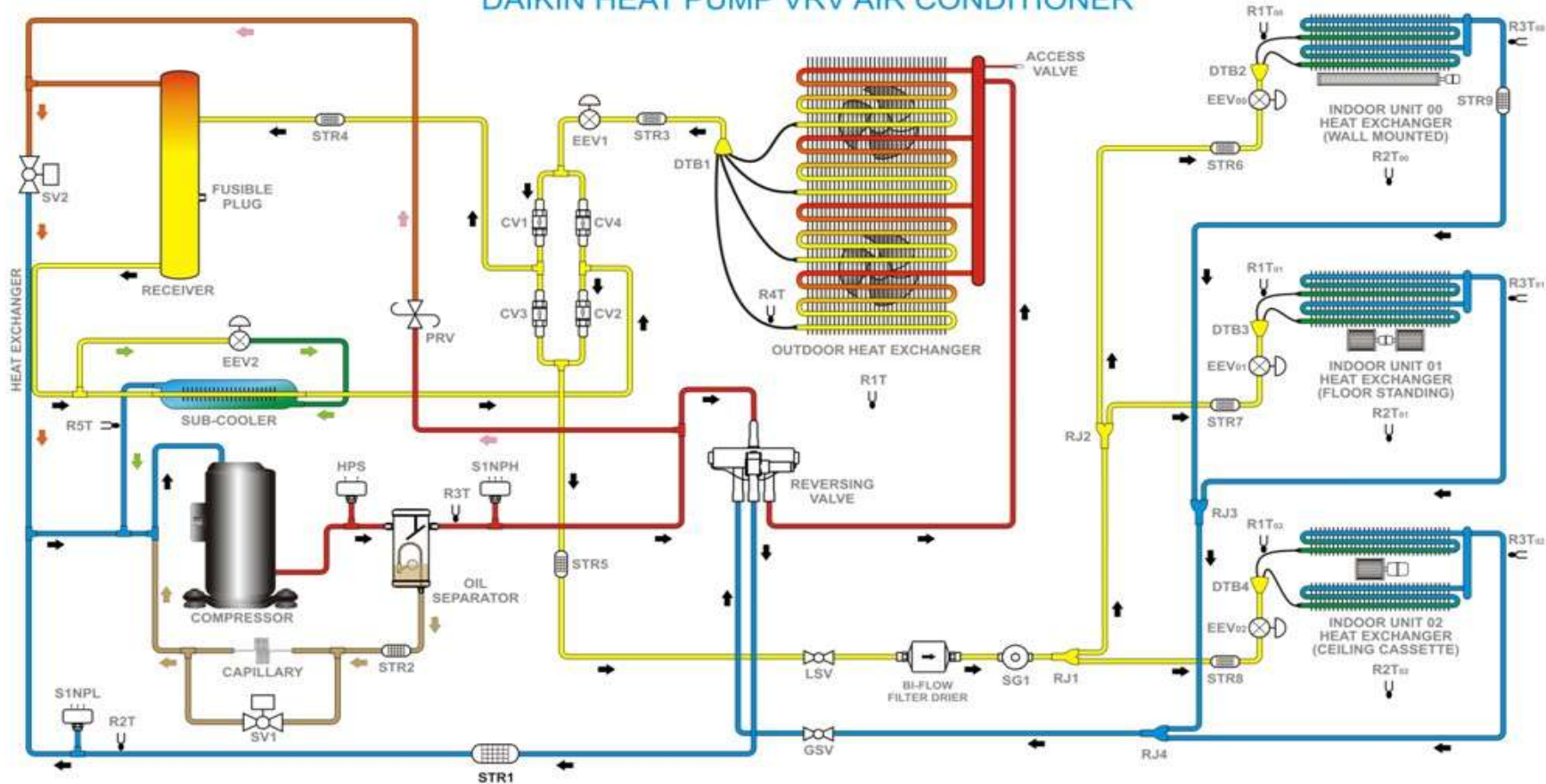
★★★★★ (Q)

This Edison Screw Cap (E27) GLS LED filament light bulb has an impressive low energy A++ rating. It has a 4W power consumption, which is equivalent to a 40W standard incandescent bulb and gives off a warm white light.

- 3 years Guarantee
- Lumens - 470lm

Heat Pump Systems

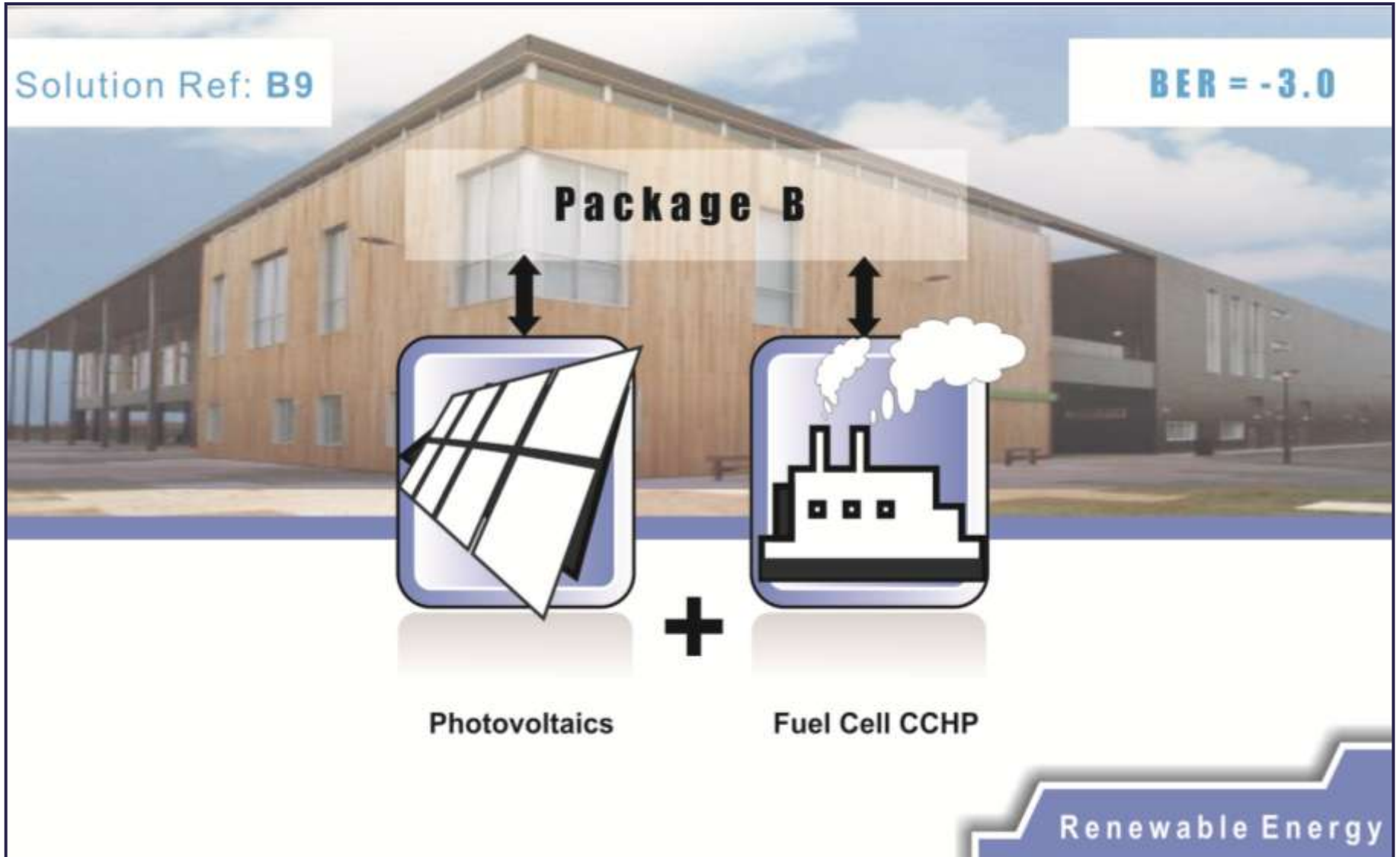
DAIKIN HEAT PUMP VRV AIR CONDITIONER



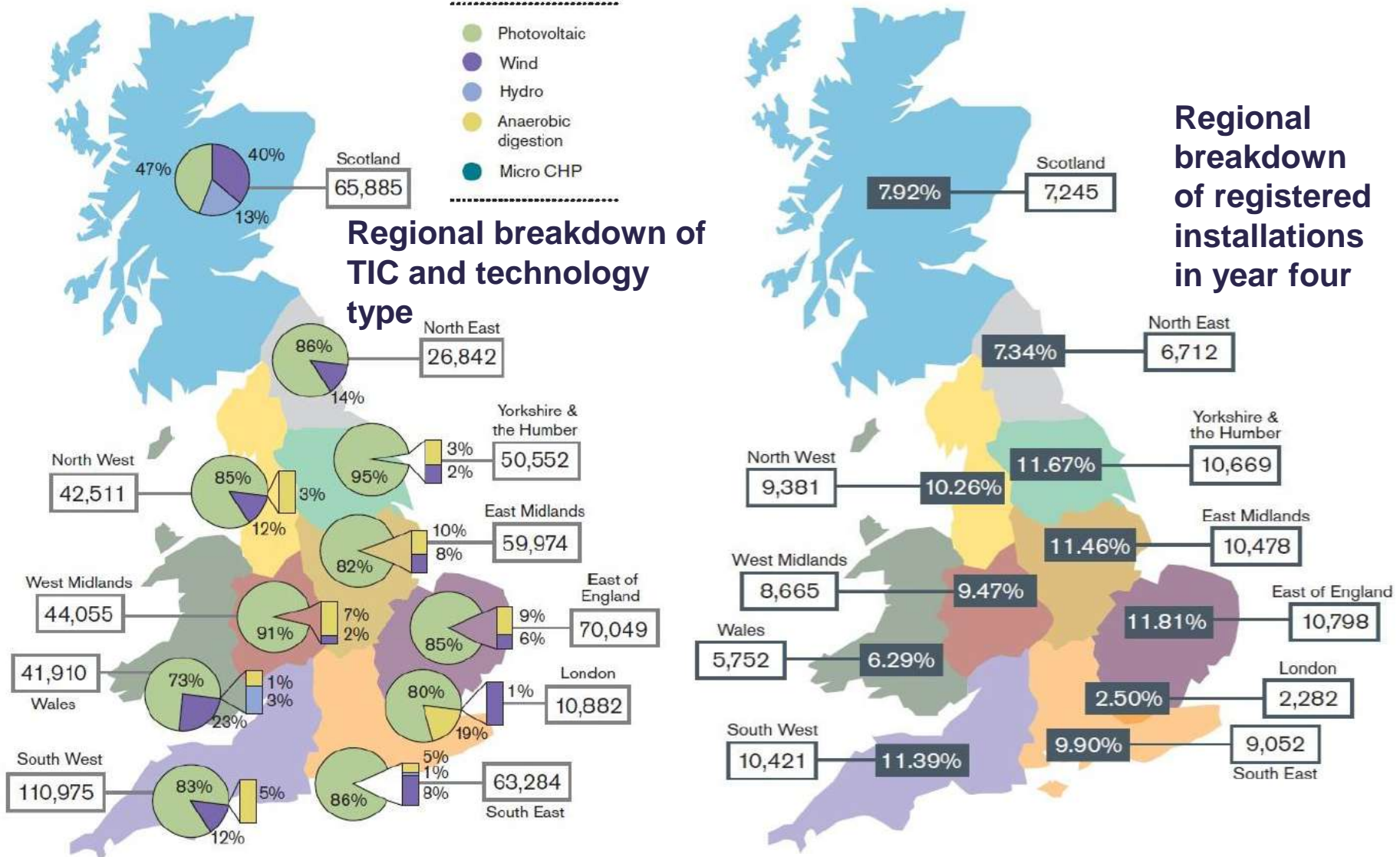
DESCRIPTION:

- | | | | | |
|---------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|
| MV : MANUAL VALVE | RJ : REFNET JOINT | EEV : ELECTRONIC EXPANSION VALVE | STR : STRAINER | — : LOW PRESSURE GAS |
| DTB : DISTRIBUTOR | CV : CHECK VALVE | S1NPL : LOW PRESSURE SENSOR | HPS : HIGH PRESSURE SWITCH | — : HIGH PRESSURE GAS |
| SG : SIGHT GLASS | SV : SOLENOID VALVE | S1NPH : HIGH PRESSURE SENSOR | GSV : GAS STOP VALVE | — : HIGH PRESSURE LIQUID |
| T/RT : TEMP. SENSOR | PG : PRESSURE GAUGE | PRV : PRESSURE REGULATING VALVE | LSV : LIQUID STOP VALVE | — : LOW PRESSURE LIQUID |
| → : MAIN REFRIGERATION LINE | → : SUB-COOLER INJECTION LINE | → : OIL RETURN LINE | → : FLASH GAS REMOVAL LINE | → : PRESSURE BALANCING LINE |

Complex Renewable Energy Options



Total and Year Four FIT Installations by Location and Technology



Tesla Powerwall and Power Pack

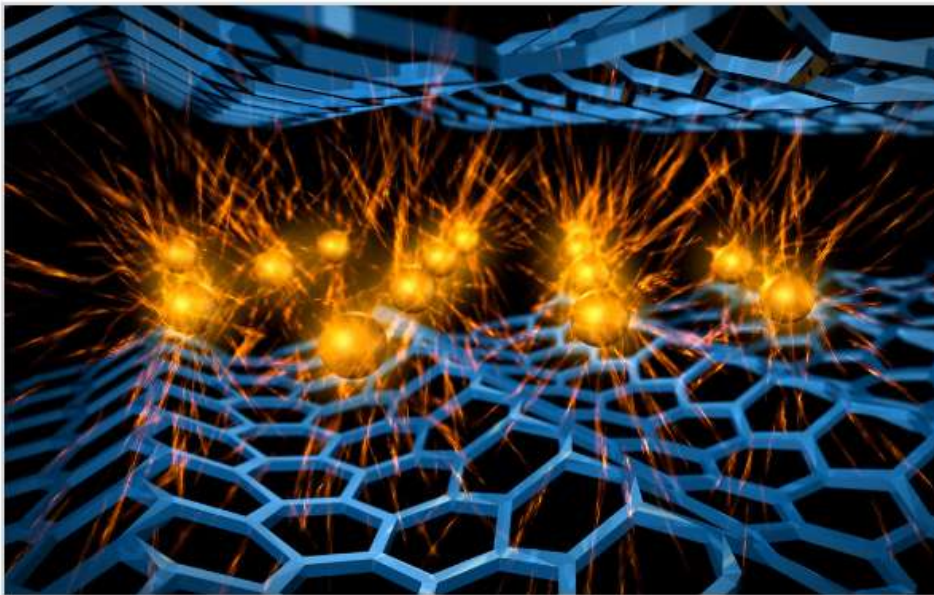


Graphene as a Super Conductor

Graphene superconducting property discovered

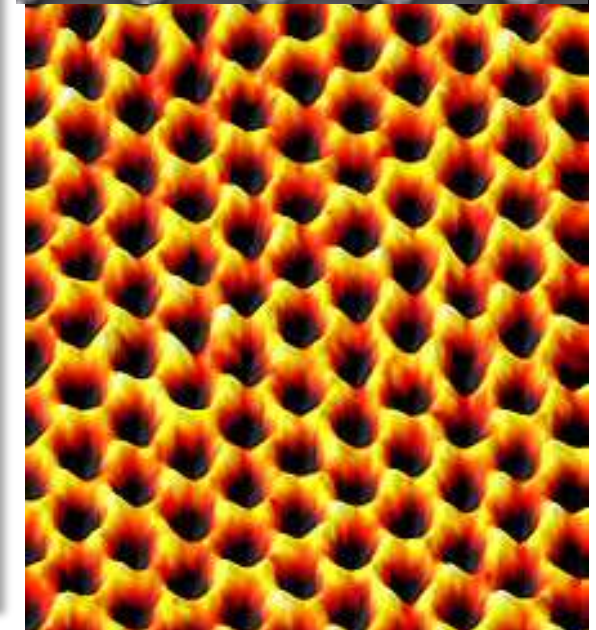
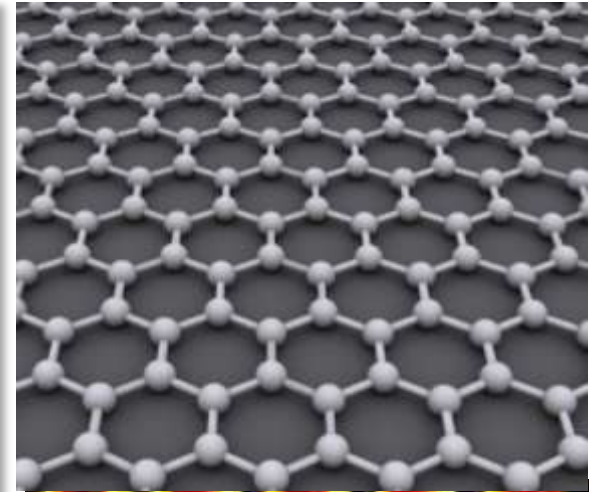
SLAC National Accelerator Laboratory see electrons dancing in superconducting material, setting a foundation for future explorations

March 21, 2014



Adding calcium atoms (orange spheres) between graphene planes (blue honeycomb) creates a superconducting material called CaC₆. Now a study at SLAC has shown for the first time that graphene is a key player in this superconductivity: electrons scatter back and forth between the graphene and calcium layers, interact with natural vibrations in the material's atomic structure, and pair up to conduct electricity without resistance. (Credit: Greg Stewart/SLAC)

Scientists at the Department of Energy's [SLAC National Accelerator Laboratory](#) and Stanford University have discovered how graphene — a single layer of carbon atoms with great promise for future electronics — is superconducting in a graphene-calcium compound, meaning that graphene would carry electricity with 100 percent efficiency.



Thanks for Listening

Thomas Edison said, 'I never perfected an invention without thinking in terms of how it would benefit others.' He didn't stop being an inventor so that he could help others. No, he used what he had already accomplished for himself to help others. Don't simply aspire to make a living, aspire to make a difference!

**In getting and gaining you become successful, but only in serving do you become significant.
So live for others!**

