Energy, Policy & Technology

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Building Engineering

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Newcastle

27th September 2016

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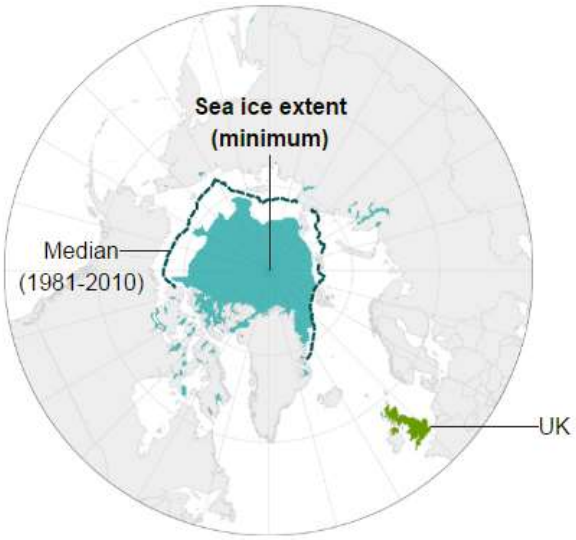
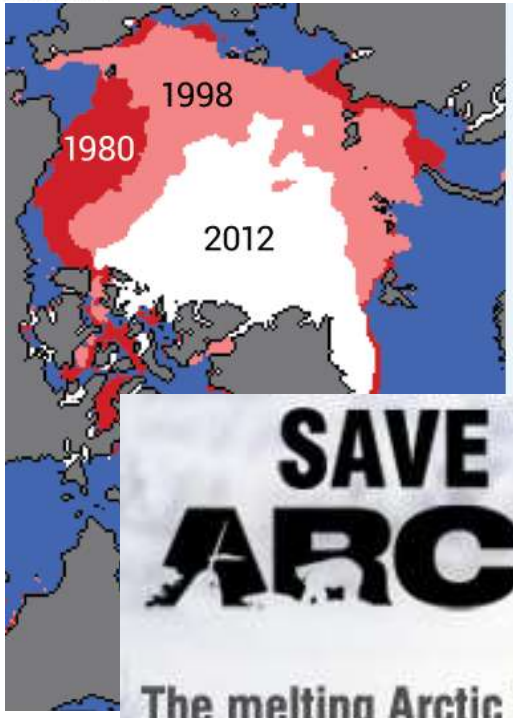
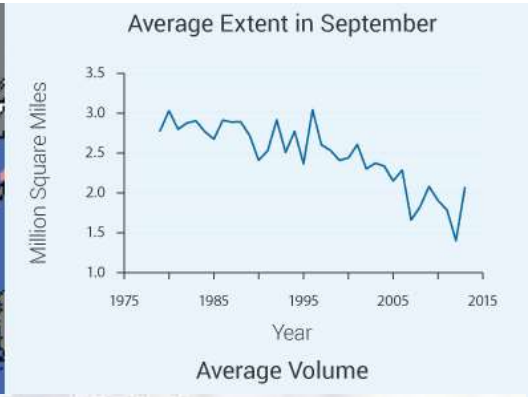
Loss of Artic Sea Ice From 1980

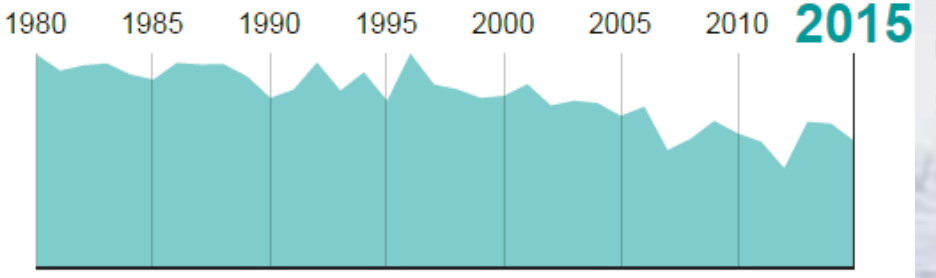
An area of sea ice roughly **10 times the size of the UK** has been lost when the current day is compared with average levels from the early 1980s.







Arctic sea ice min. extent: 1980, 7.8 million sq km. 2015, 4.6 million sq km



Source: National Snow and Ice Data Center

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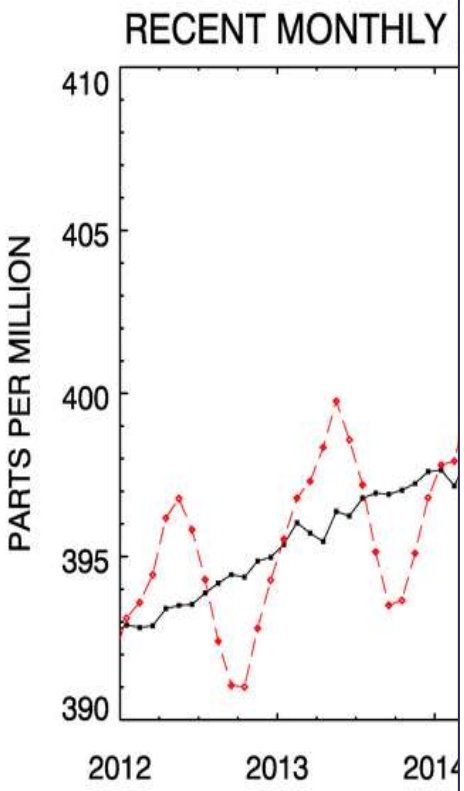
Atmospheric CO2 Levels From Mauna Loa , Hawaii

Recent Monthly Average Mauna Lo

June 2016:
June 2015:



STATUTORY INSTRUMENTS

2016 No. 785

CLIMATE CHANGE

The Carbon Budget Order 2016

Made - - - - 20th July 2016

Coming into force in accordance with article 1

A draft of this instrument was laid before and approved by a resolution of each House of Parliament, in accordance with sections 8(3) and 91(1) of the Climate Change Act 2008 ("the Act")(**a**).

Before the draft was so laid, the Secretary of State took into account—

(a) the advice of the Committee on Climate Change under section 34 of the Act, in accordance with section 9(1)(a) of the Act; and

(b) any representations made by the Scottish Ministers, the Welsh Ministers and the Department of the Environment in Northern Ireland, in accordance with section 9(1)(b) of the Act(**b**).

This Order is made in accordance with the duty to set carbon budgets for budgetary periods imposed by sections 4(1)(a) and 8(1) of the Act, and is made with a view to—

(a) meeting the target in section 1, and the requirements of section 5, of the Act(**c**); and

(b) complying with the European and international obligations of the United Kingdom.

The Secretary of State has taken into account the matters mentioned in section 10(2) of the Act.

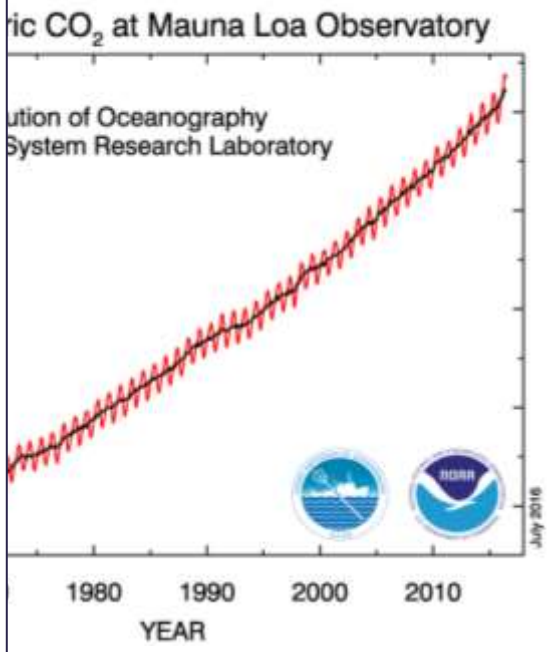
Accordingly the Secretary of State, in exercise of the powers conferred by section 8(1) of the Act, makes the following Order:

Citation and coming into force

1. This Order may be cited as the Carbon Budget Order 2016 and comes into force on the day after the day on which it is made.

Carbon budget

2. The carbon budget for the 2028–2032 budgetary period is 1,725,000,000 tonnes of carbon dioxide equivalent.



on July 10, 2016: 404.48 ppm
e from 1 year ago: 401.67 ppm
rom 10 years ago: 382.70 ppm
Last updated: July 19, 2016

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Government Departments with and Impact on Construction

Department for Business, Energy & Industrial Strategy

14 July 2016 — Press release
Statement from Greg Clark, Secretary of State for Business, Energy and Industrial Strategy

Find tools and guidance for business
Find business finance and grants
Save energy in your home or business
Get help with your energy bills
Climate change explained

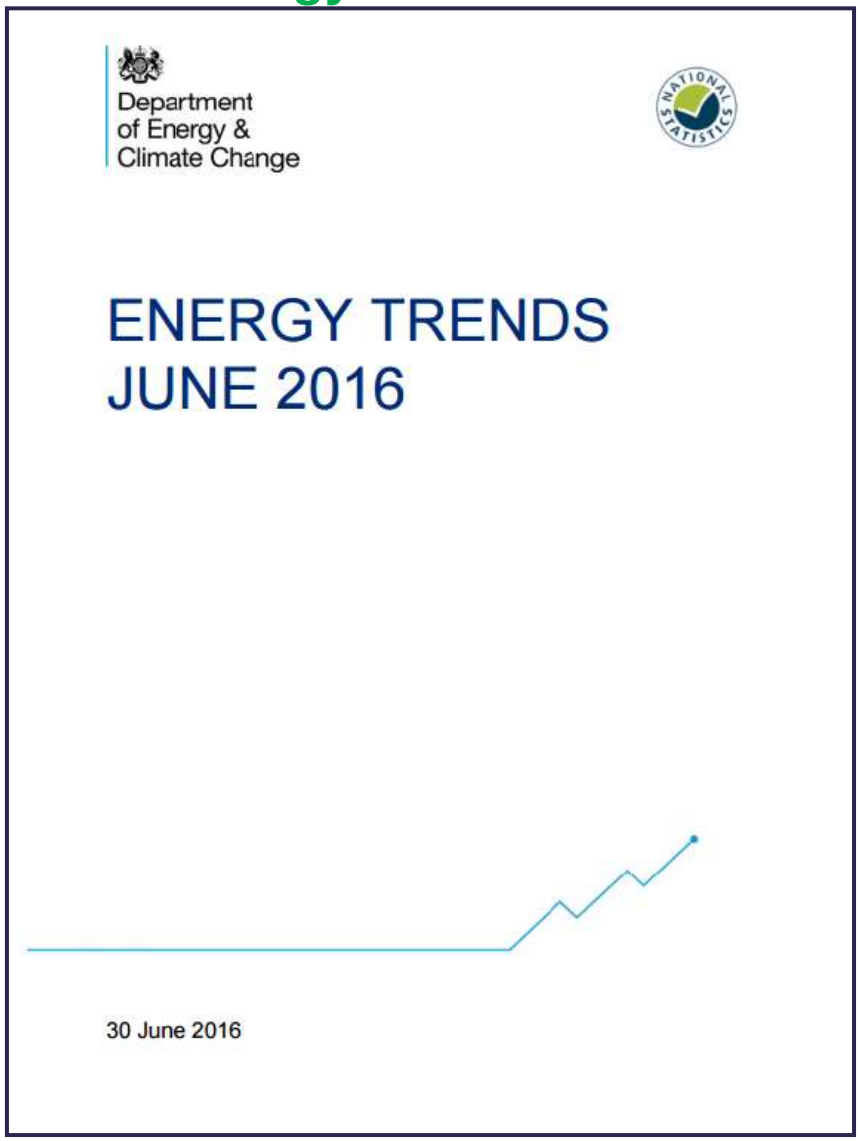
The department brings together responsibilities for business, industrial strategy, science, innovation, energy, and climate change.

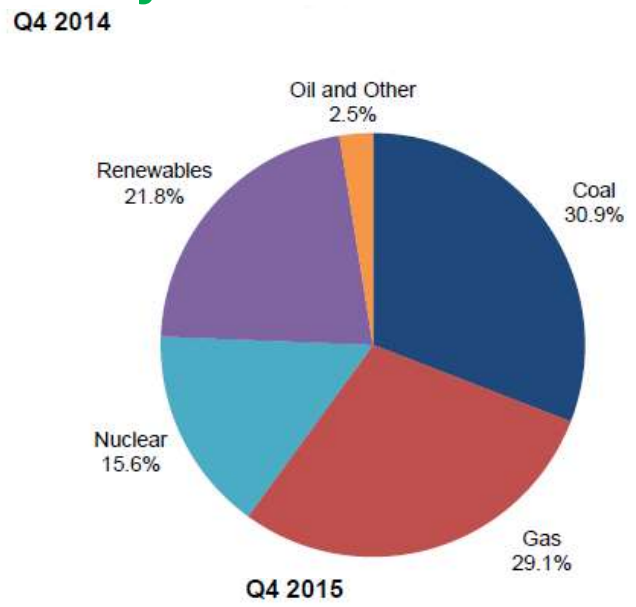
Department for Communities and Local Government

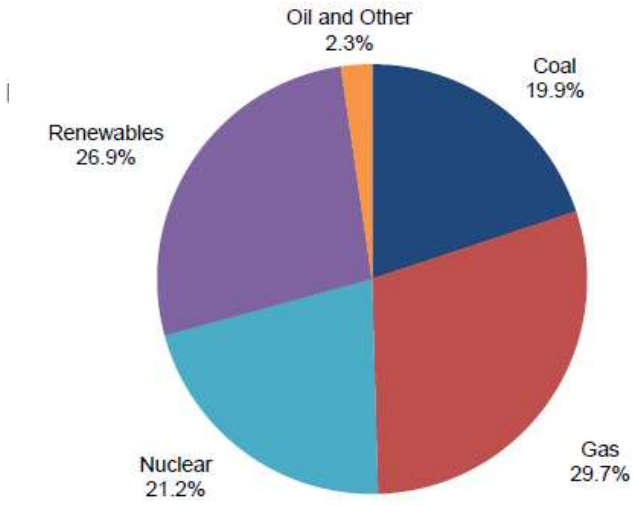
Architects Registration Board
Building Regulations Advisory Committee
Homes and Communities Agency
Planning Inspectorate

The Department for Communities and Local Government's job is to create great places to live and work, and to give more power to local people to shape what happens in their area

DECC Energy Trends – Share of Electricity Generation in UK







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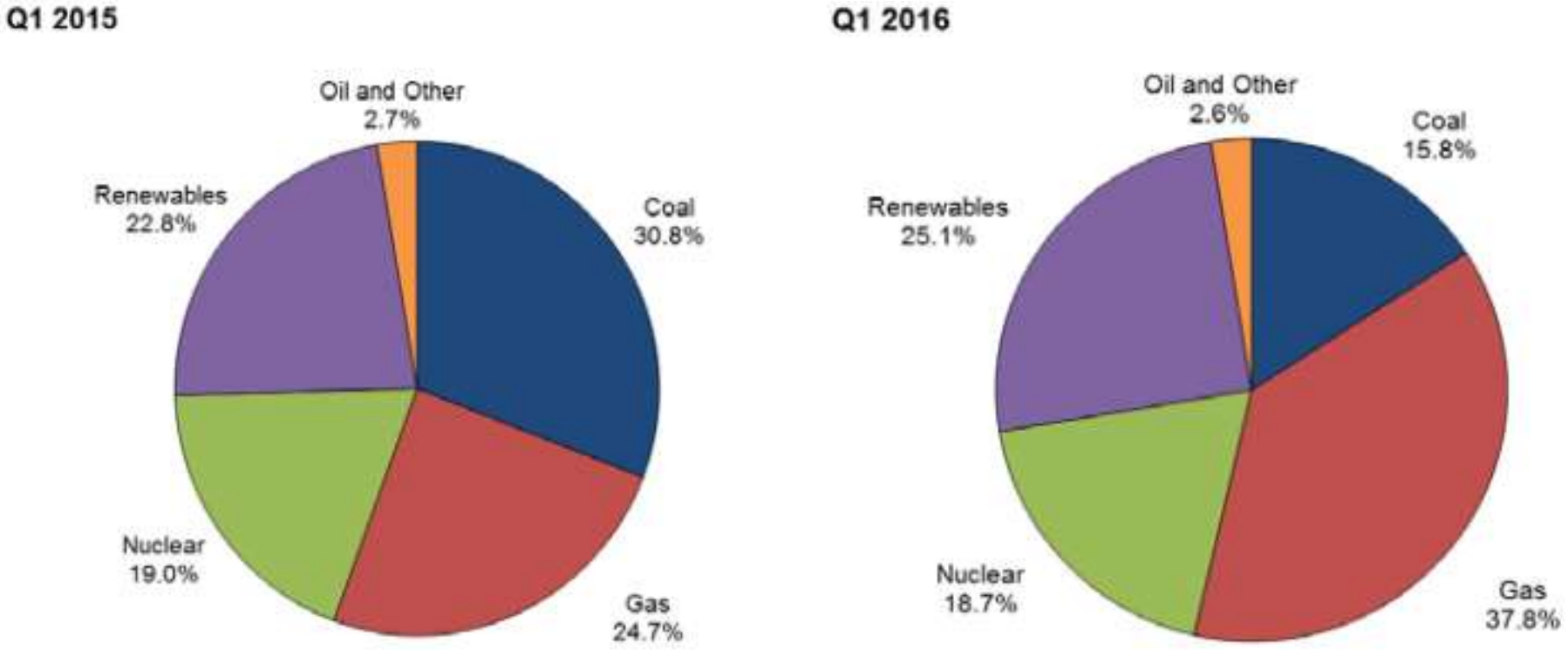
Energy Trends June 2016



The share of generation from coal decreased from 30.8 per cent in 2015 Q1 to a record low 15.8 per cent in 2016 Q1. Gas's share of generation increased from 24.7 per cent in 2015 Q1 to 37.8 per cent in 2016 Q1. Nuclear's share of generation fell from 19.0 per cent in 2015 Q1 to 18.7 per cent in 2016 Q1. The share of renewables (hydro, wind and other renewables) increased from 22.8 per cent in 2015 Q1 to 25.1 per cent in 2016 Q1.

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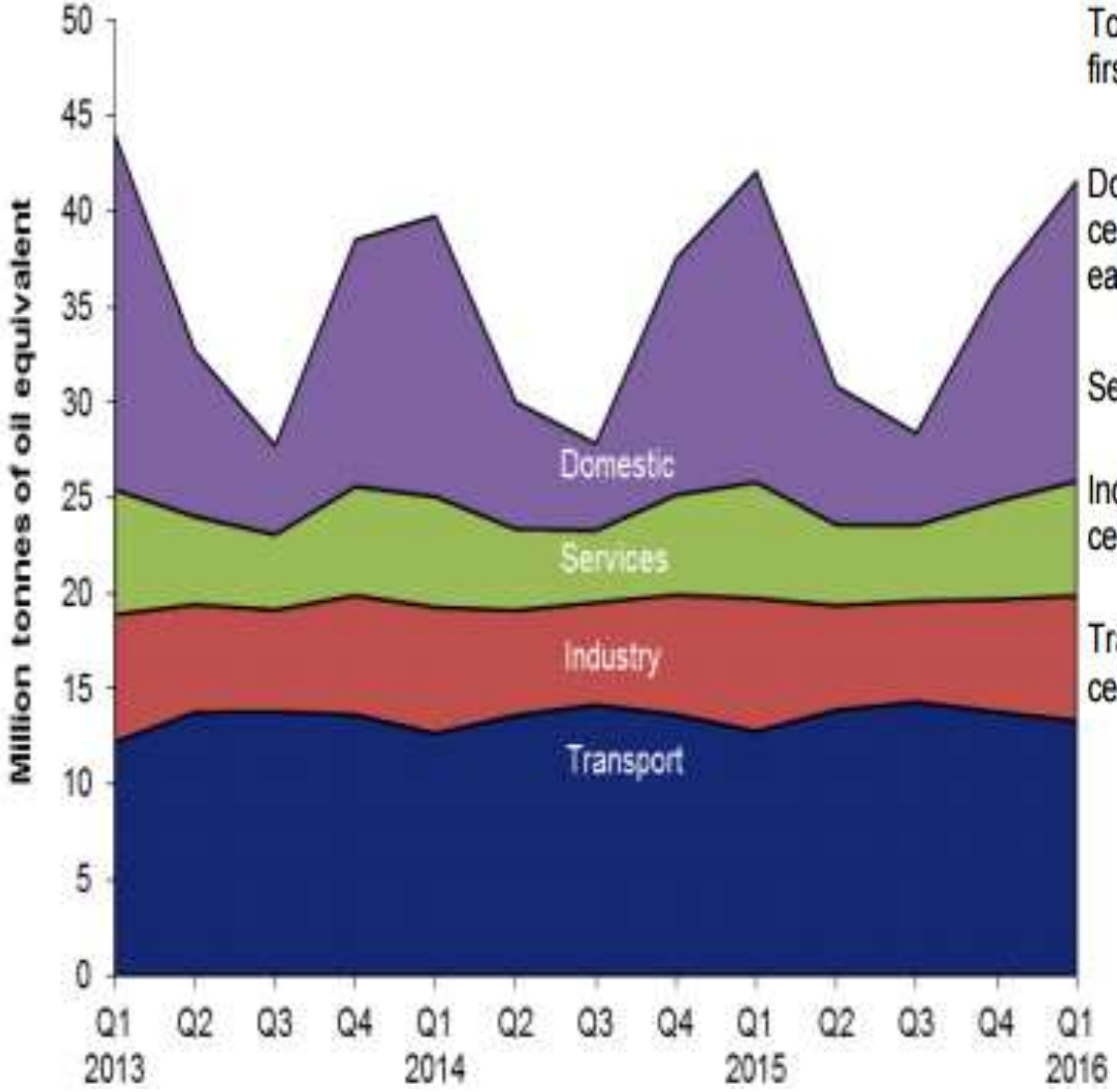
UK Final Energy Consumption by End Use



Total final consumption fell by 0.4 per cent between the first quarter of 2015 and the first quarter of 2016.

Domestic sector energy consumption fell by 3.4 per cent, reflecting the warmer weather compared to a year earlier.

Service sector energy consumption fell by 1.2 per cent.

Industrial sector energy consumption fell by 6.0 per cent.

Transport sector energy consumption rose by 4.3 per cent.

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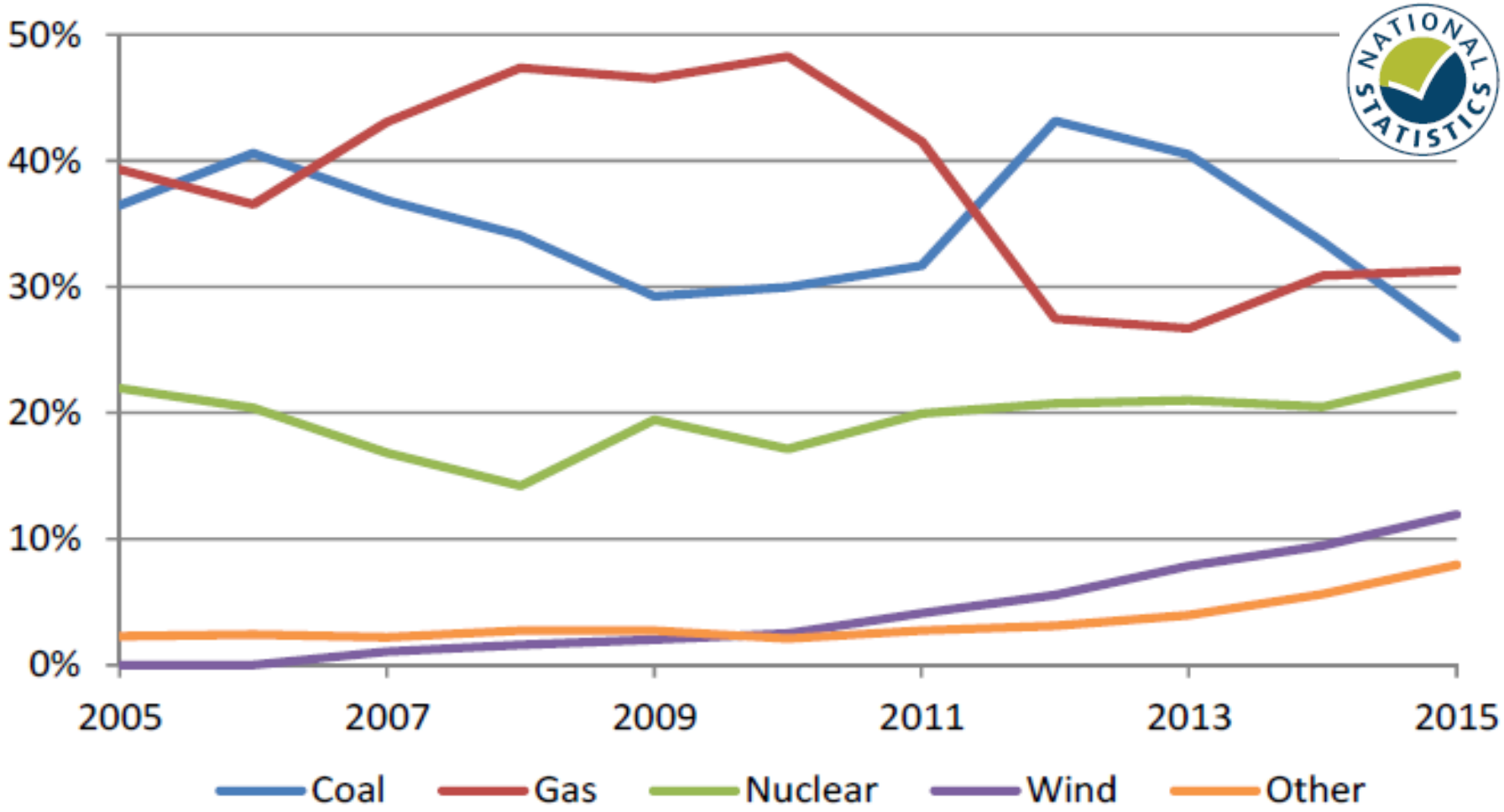
UK Electricity Generation 2005 - 2015



Low carbon generation accounted for 42.9 per cent of supply, up from 35.6 per cent in 2014, boosted by higher generation from nuclear and renewables (wind, hydro and bioenergy).

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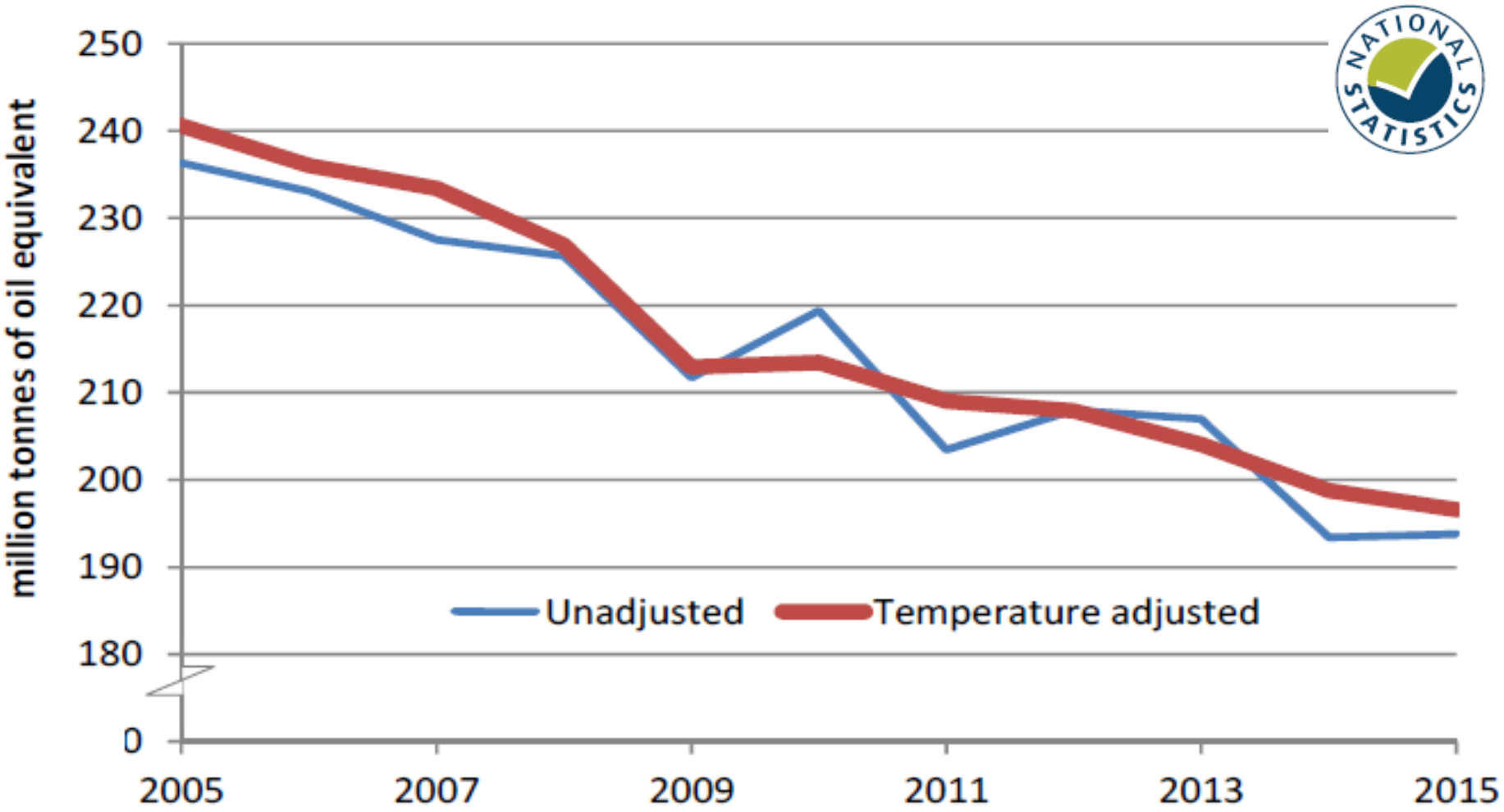
UK Primary Energy Consumption 2005 -2015



The majority of the fall in temperature adjusted primary consumption is likely due to changes in electricity generation

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Energy Institute – Energy Barometer 2016

energy Barometer 2016

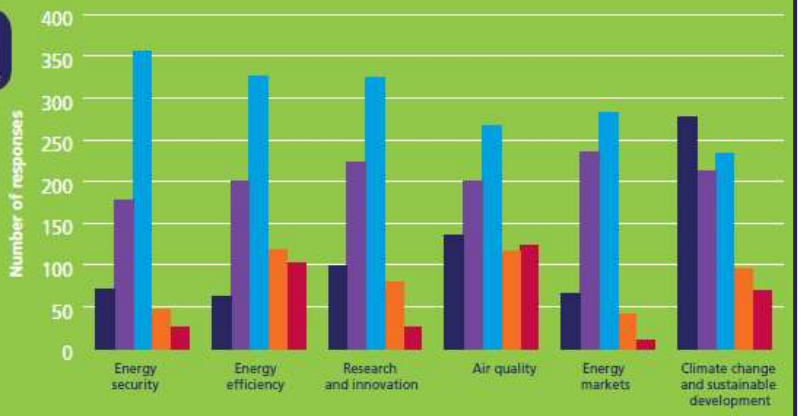
Views from UK energy professionals

energy institute

Level of policy decisions

At what level should policy decisions be made for the following areas? N = 438 Respondents were allowed to choose more than one response

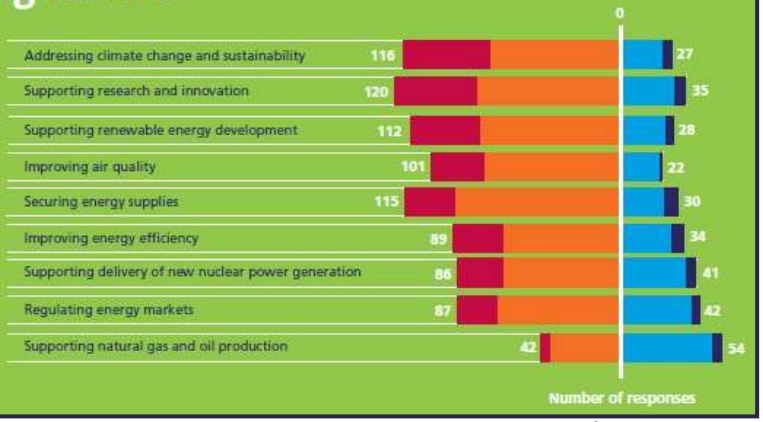
- United Nations
- European Union
- United Kingdom
- Devolved administrations
- Local councils



Effects of leaving the EU

If the UK were to leave the EU but remain in the EU single energy market, what effect would this have on the following areas of the UK energy system? N = 223: 'No effect' and 'Not sure' responses not shown on this chart

- Very positive effect
- Positive effect
- Negative effect
- Very negative effect



EU Strategy on Heating and Cooling

The European Commission has published its first ever plan to tackle the massive amount of energy used to heat and cool Europe's buildings, including households, offices, hospitals, schools, industry and food refrigeration throughout the supply chain.

Heating and cooling accounts for half of the EU's annual overall energy consumption and 68% of all its gas imports. Meanwhile, renewables only account for 18% of energy in the sector and a large amount of energy is wasted by industry. Taking action to curb energy use and boost renewables in the sector would reduce energy costs, help cut our dependence on imported fossil fuels and slash harmful carbon emissions.

The Heating and Cooling Strategy includes plans to make energy efficient renovations to buildings easier, to develop energy efficiency guidelines for public schools and hospitals and improve the reliability of energy performance certificates for buildings.

The Strategy also aims to better integrate the electricity system with district heating and cooling systems. District heating and cooling networks can use and store electricity powered by renewables and then distribute it to buildings and industrial sites, boosting the level of renewable heating and cooling.

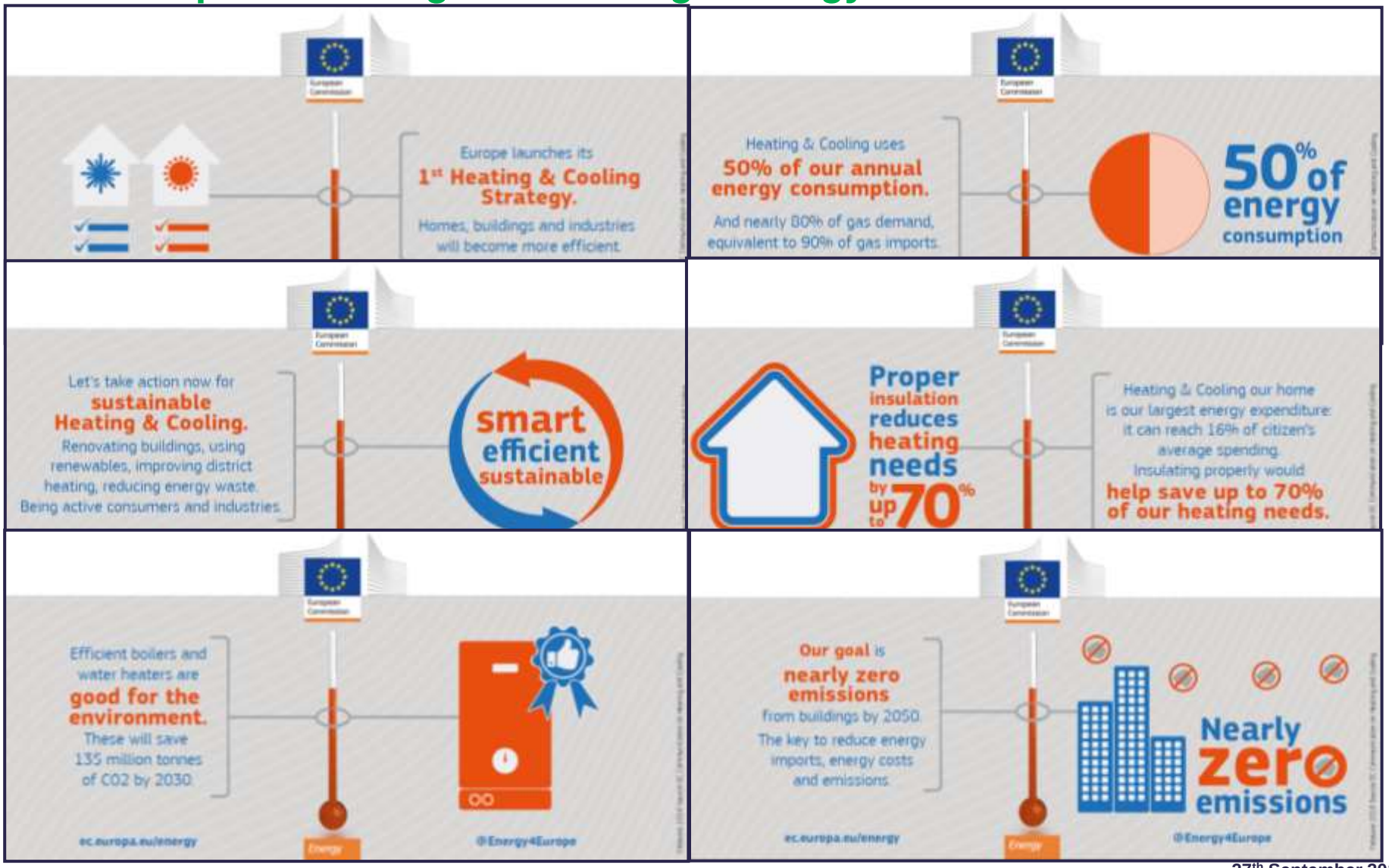
EUROPEAN COMMISSION

Brussels, 16.2.2016
COM(2016) 51 final

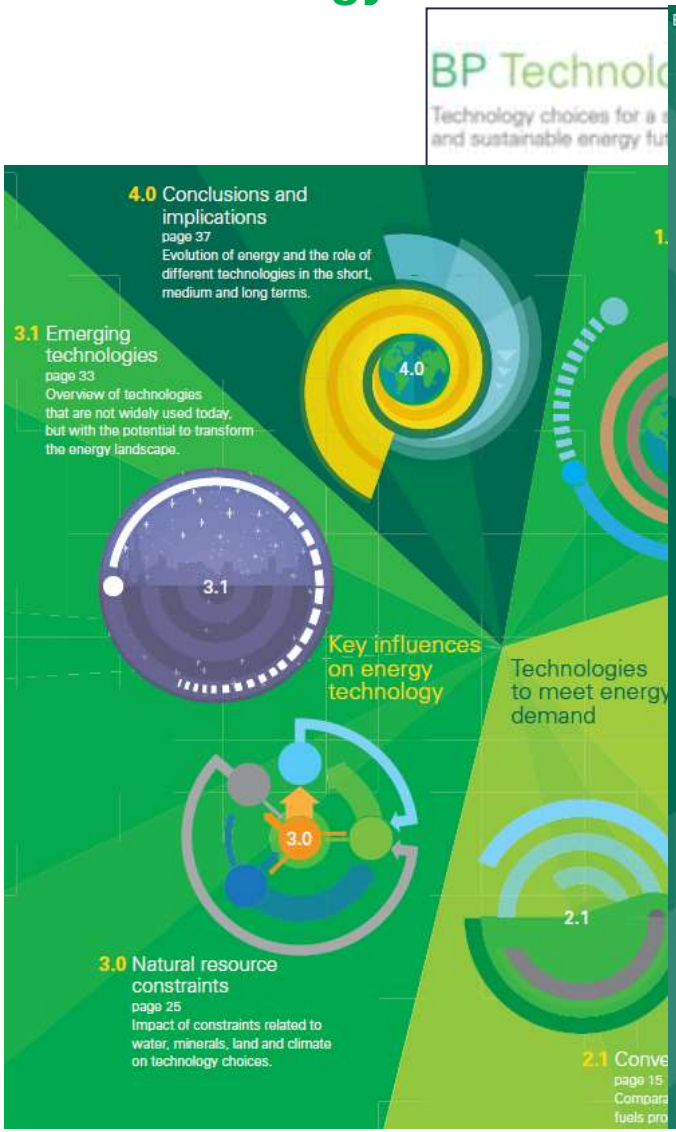
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

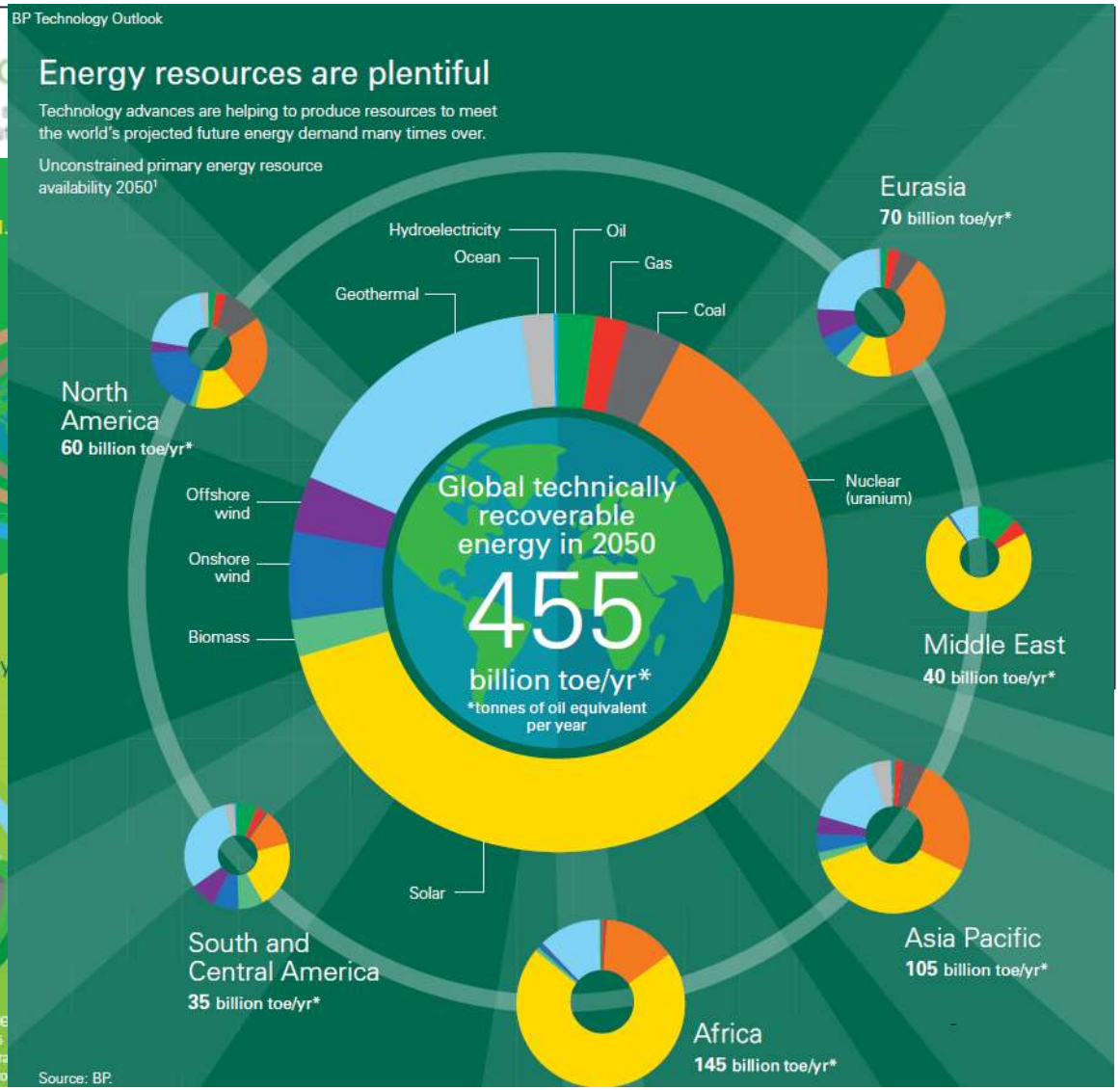
An EU Strategy on Heating and Cooling

First European Heating and Cooling Strategy - 2016



BP Technology Outlook – November 2015





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European Energy Performance of Buildings Directive – 16/12/2002

DIRECTIVE 2002/91/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 16 December 2002

on the energy performance of buildings

Article 3

Member States (UK) shall adopt a methodology of calculation of the energy performance of buildings

Article 4

Member States (UK) shall ensure minimum energy performance requirements are set based on methodology

Article 5

Member States (UK) shall ensure that new buildings meet minimum energy performance requirements. If > 1000m^2, consider LZC systems

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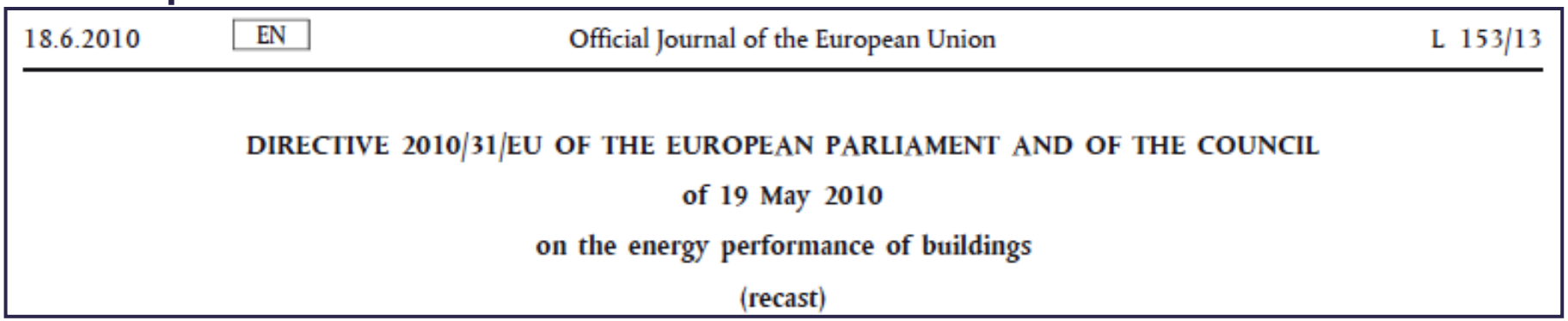
Energy Performance of Buildings - What Does It Mean For You?

The EPBD drives requirements for Building Regulations, Energy Performance and Display Energy Certificates, Plant inspections. The recent 'recast' places additional requirements on both the public and private sector to be implemented soon.



18.6.2010 EN Official Journal of the European Union L 153/13

DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 19 May 2010

on the energy performance of buildings

(recast)

Recast is 31 Articles over 16 pages and five annexes over 7 pages

The implementation of the EPBD in England & Wales is the responsibility of the Department for Communities and Local Government (CLG). Implementation in Northern Ireland and Scotland is the responsibility of the devolved administrations, respectively: the Department of Finance and Personnel (DFPNI) (supported by the Department for Social Development, DSDNI) and the Scottish Building Standards Division (part) of the Directorate for Communities and Local Government).

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EPBD – Recast 2010 Articles 3 - 10

Article 3

Adoption of a methodology for calculating the energy performance of buildings

Article 4

Setting of minimum energy performance requirements

Article 5

Calculation of cost-optimal levels of minimum energy performance requirements

Article 6

New buildings

Article 7

Existing buildings

Article 8

Technical building systems

Article 9

Nearly zero-energy buildings

Article 10

Financial incentives and market barriers

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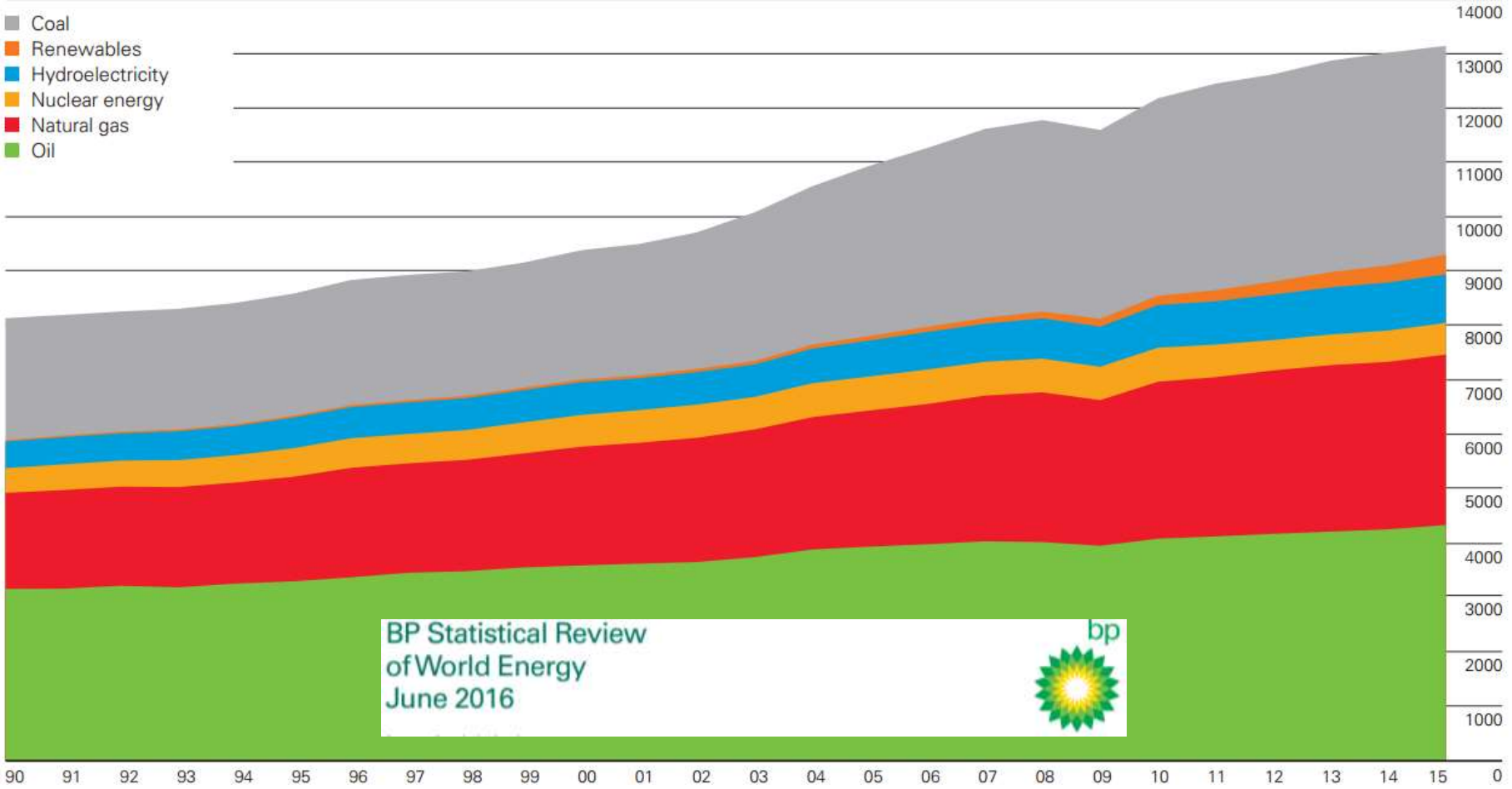
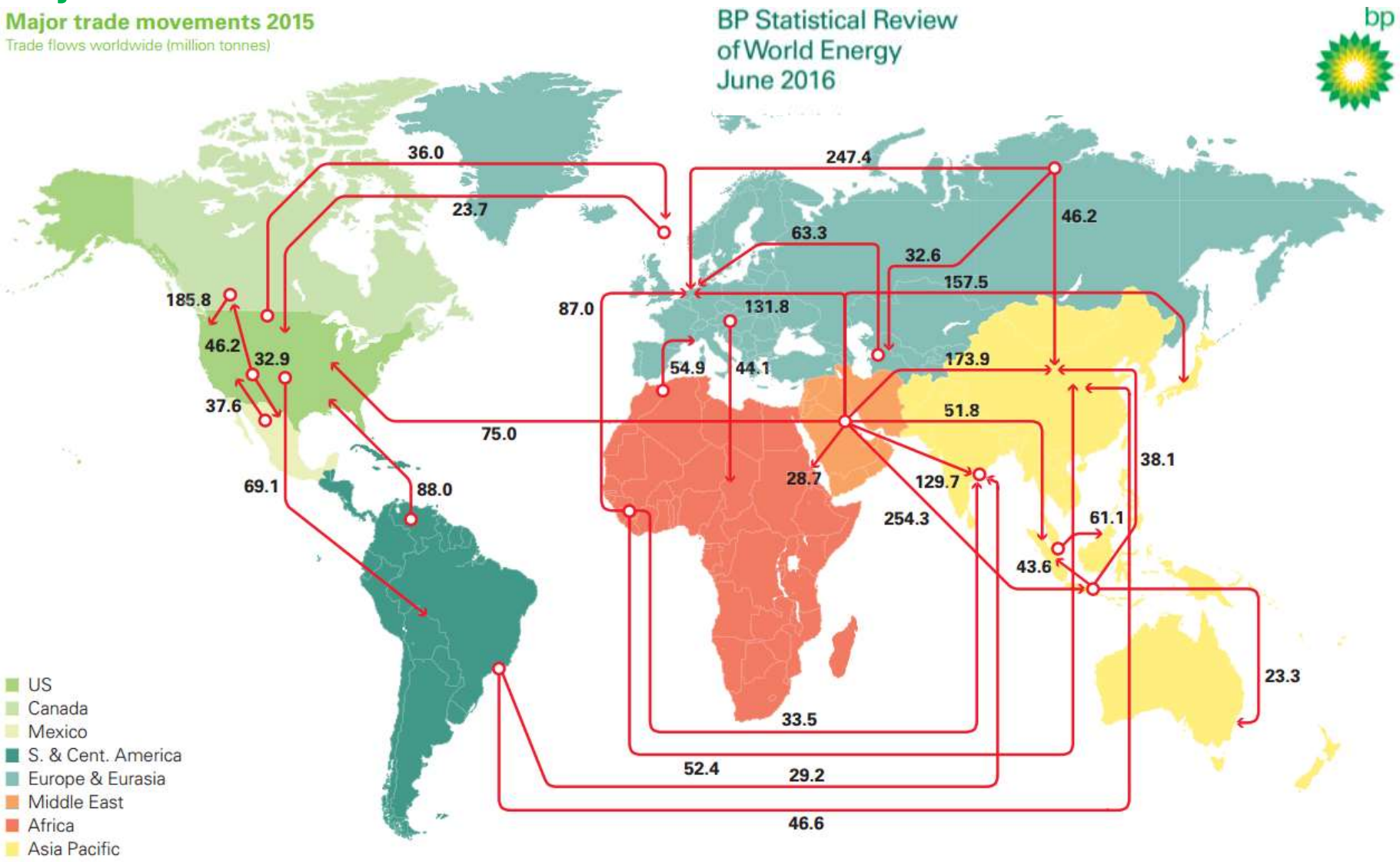
World Primary Energy Consumption from 1990 to 2015 (MTOe)



Growth was below average in all regions except Europe & Eurasia. All fuels except oil and nuclear power grew at below-average rates. Oil remains the world's dominant fuel and gained global market share for the first time since 1999, while coal's market share fell to the lowest level since 2005. Renewables in power generation accounted for a record 2.8% of global primary energy consumption.

Major Trade Movements in Oil in 2015 in Million Tonnes of Oil



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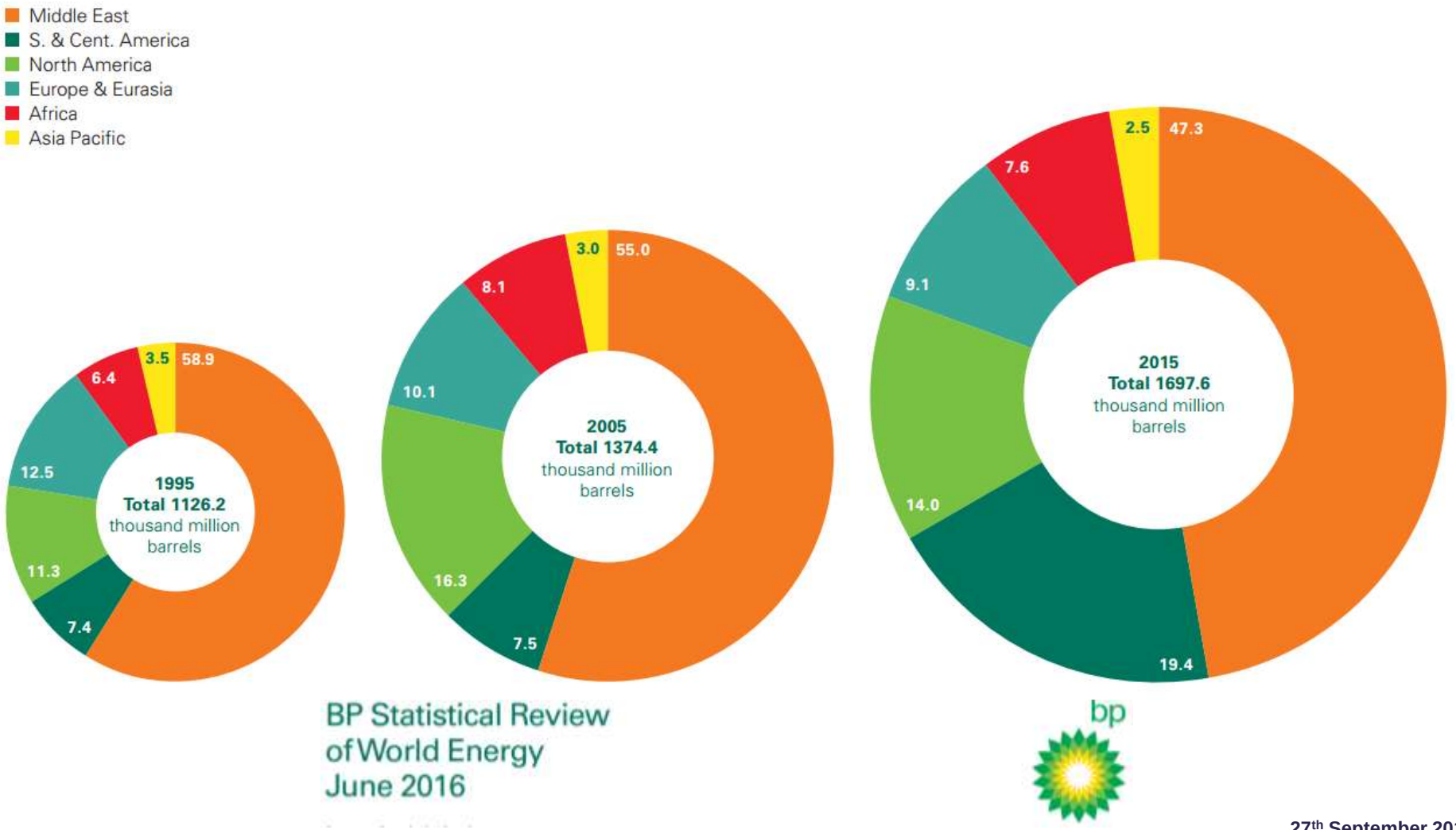
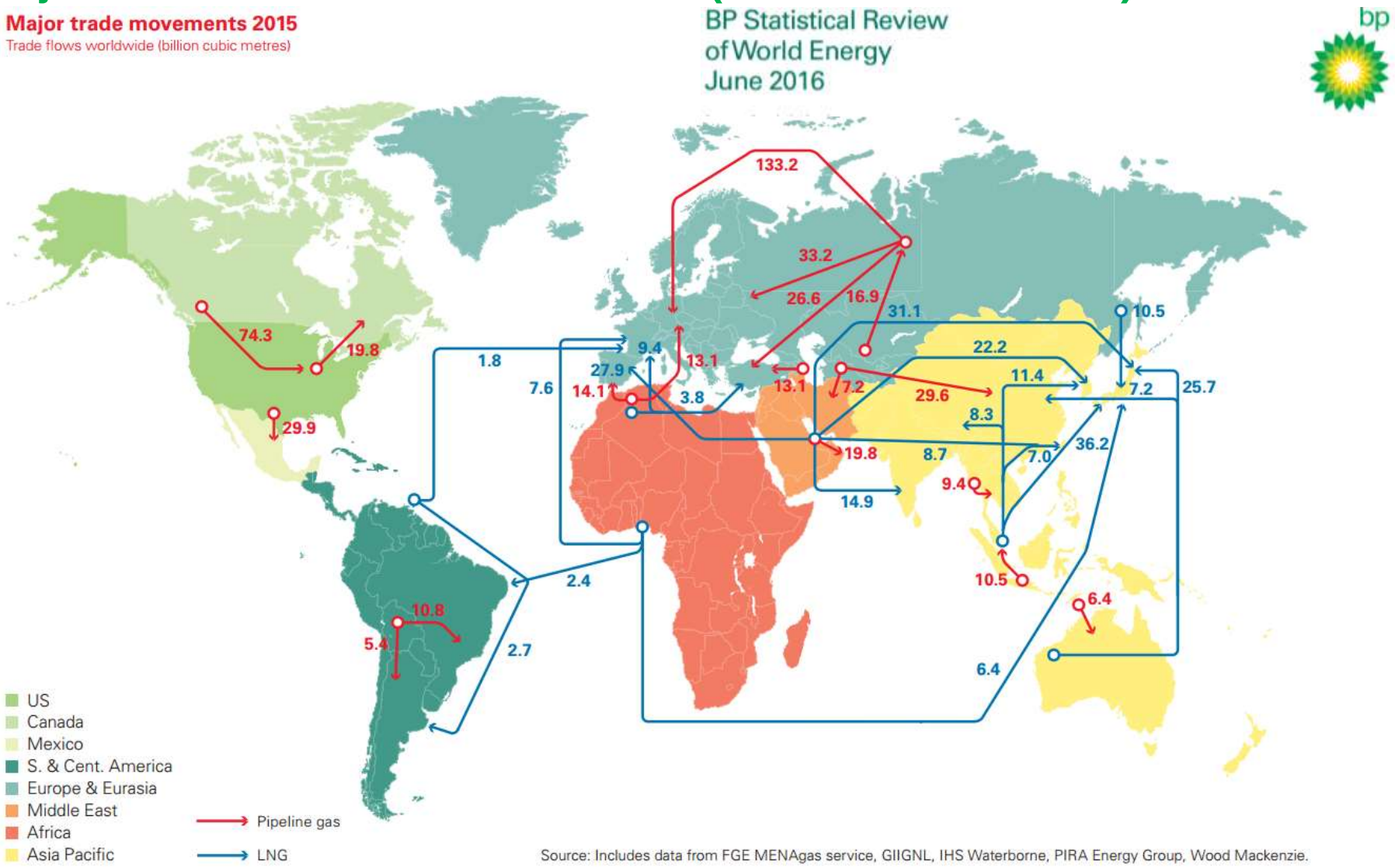
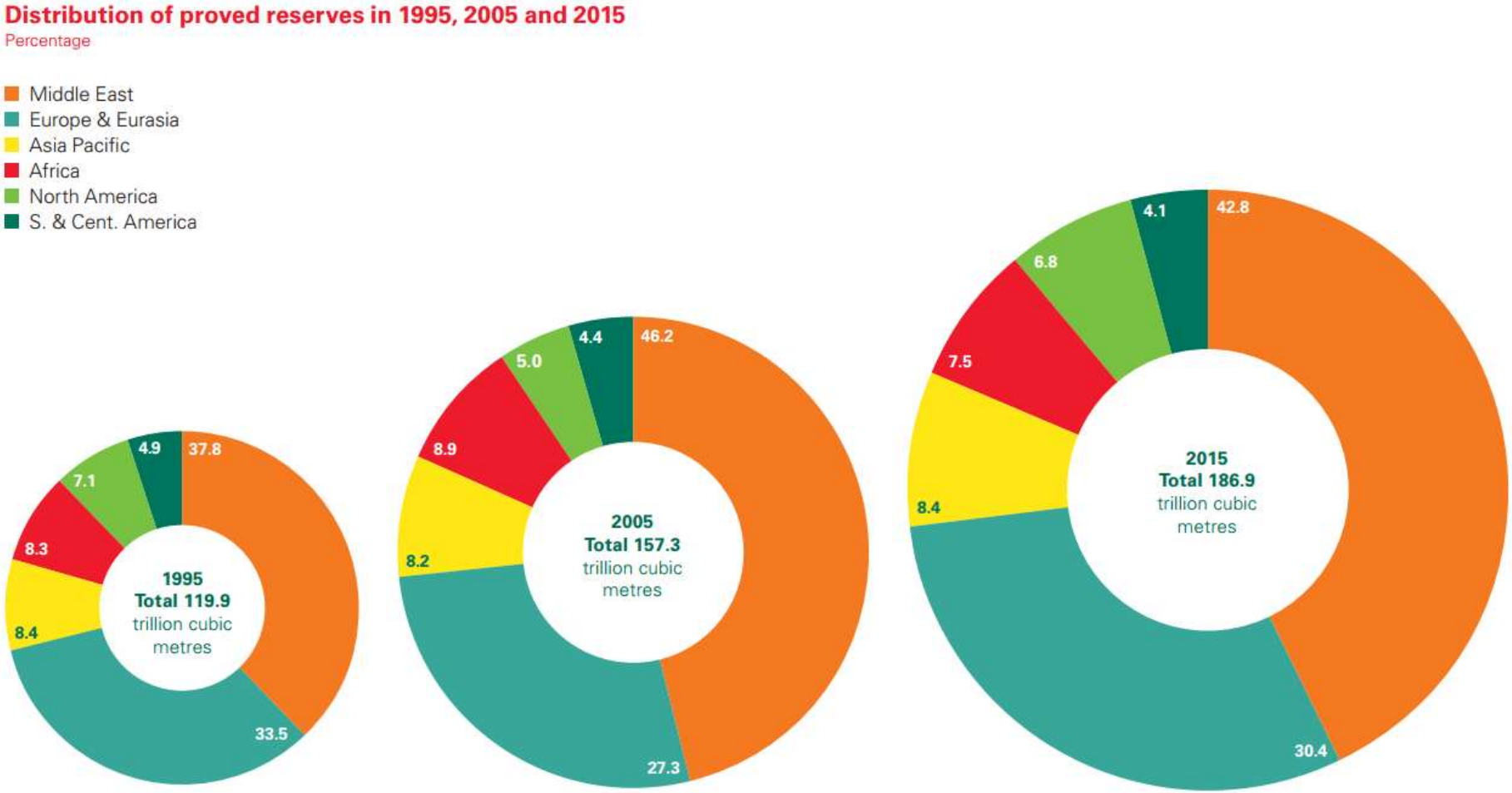
Distribution of Proved Oil Reserves 1995, 2005 & 2015



Major Gas Trade Movements in 2015 (Billion Cubic Metres)



Distribution of Proved Reserves of Gas in 1995, 2005 & 2015



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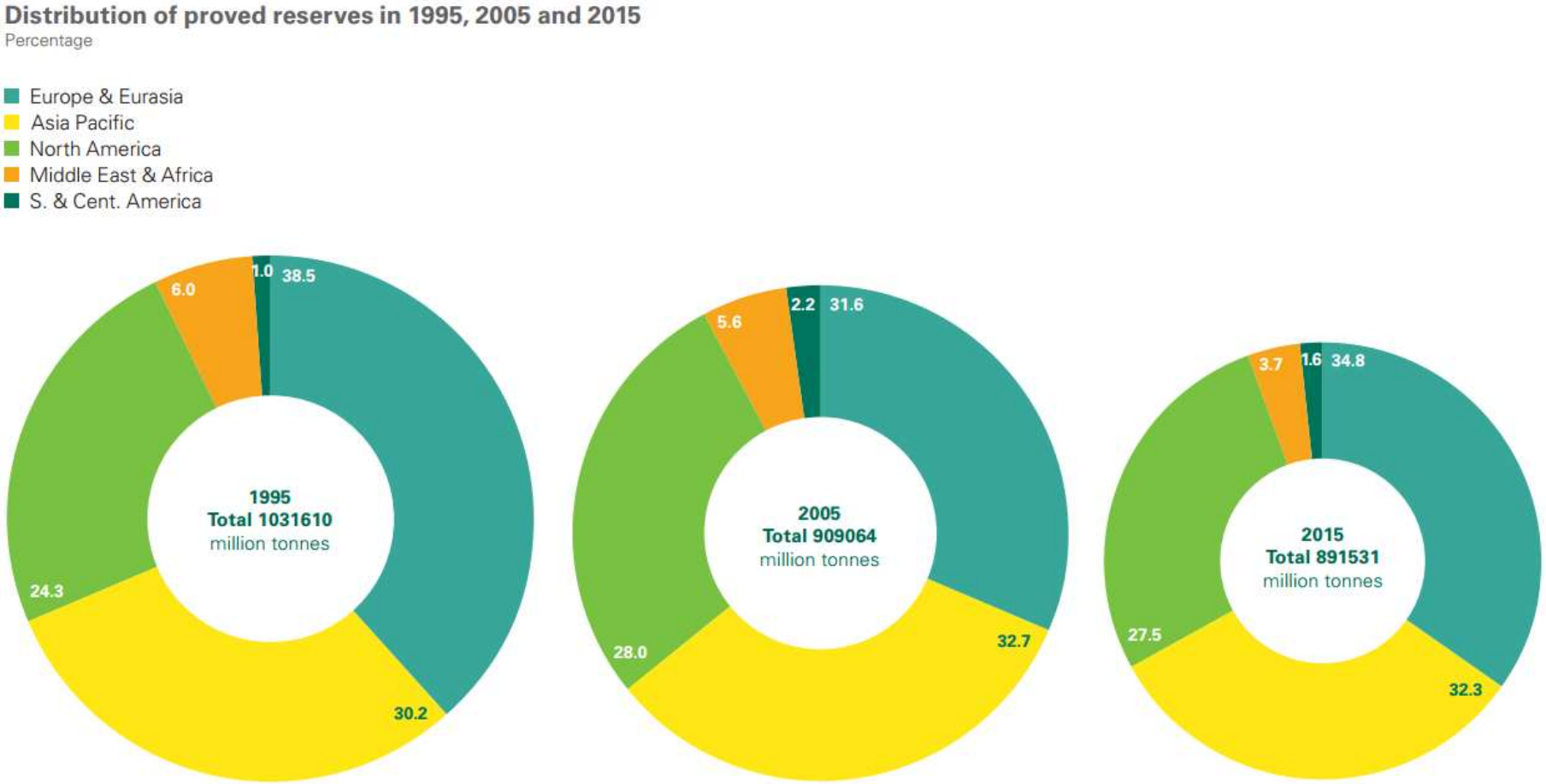
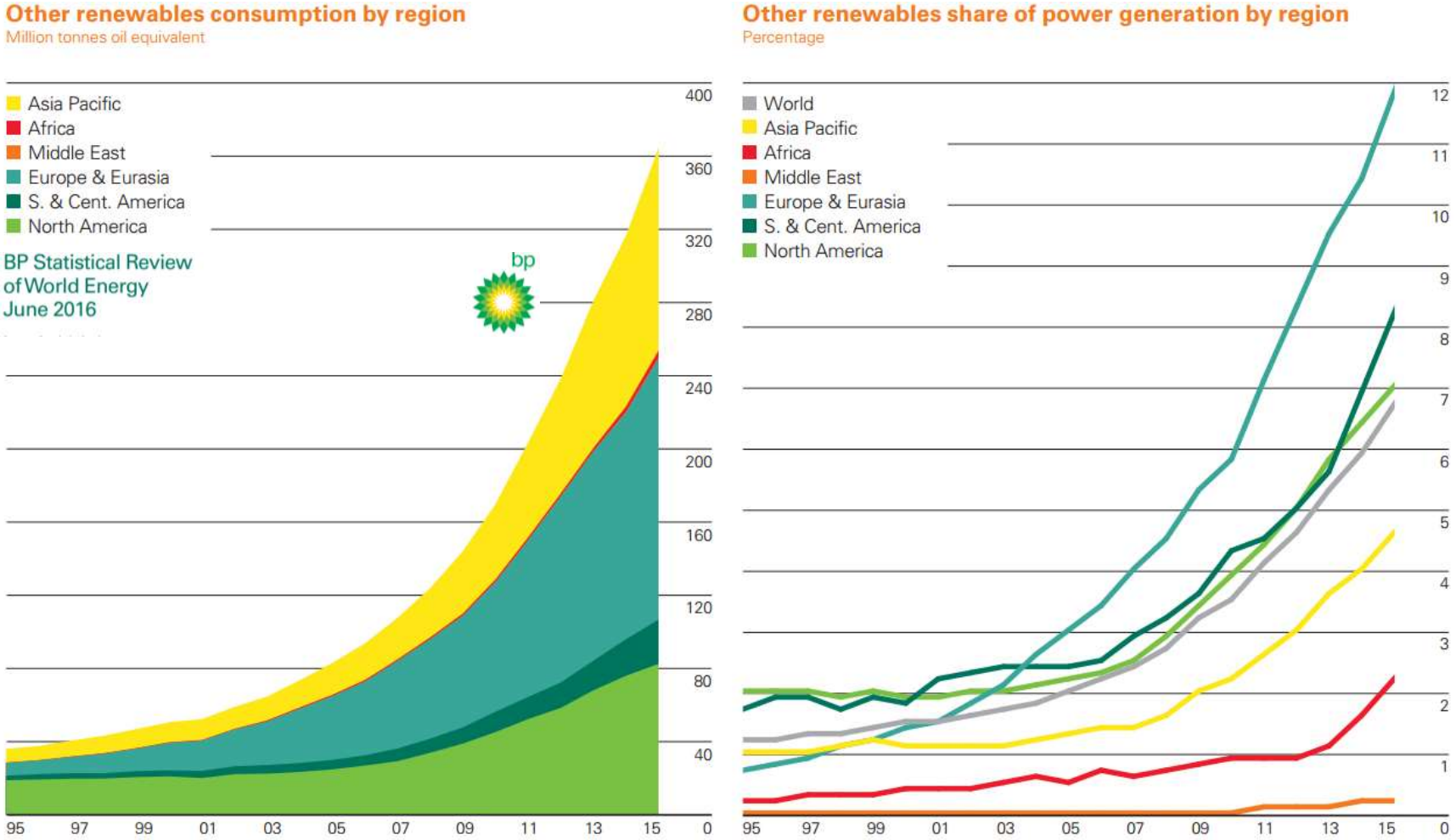
Distribution of Proved Reserves of Coal in 1995, 2005 & 2015



BP Statistical Review of World Energy June 2016

bp

Consumption and Generation from Other Renewable Power



Renewable energy in power generation grew by 15.2%, slightly below the 10-year average growth rate, but the largest increment on record (+48 mtoe). Globally, wind provided the largest growth increment (+28 mtoe), but solar had the highest growth rate (+32.6%). Regionally, Europe & Eurasia and Asia Pacific provided the largest growth increments (+18.8 mtoe and 17.5 mtoe, respectively). Non-hydro renewable energy accounted for 6.7% of global power generation in 2015, up from 2% a decade ago. The Europe & Eurasia region has the highest share of power from renewables, at 11.9% (reaching 18.6% in the EU).

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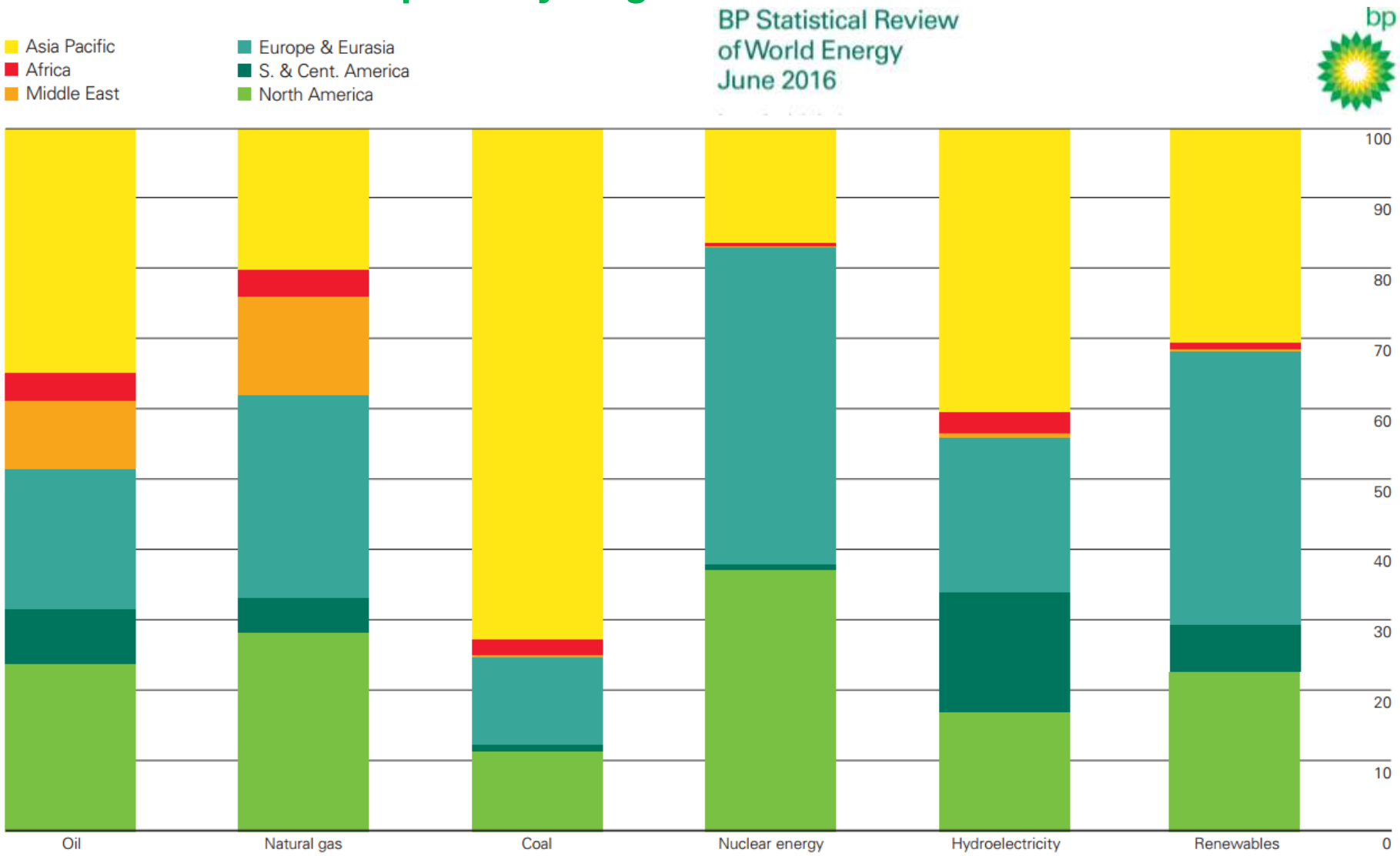
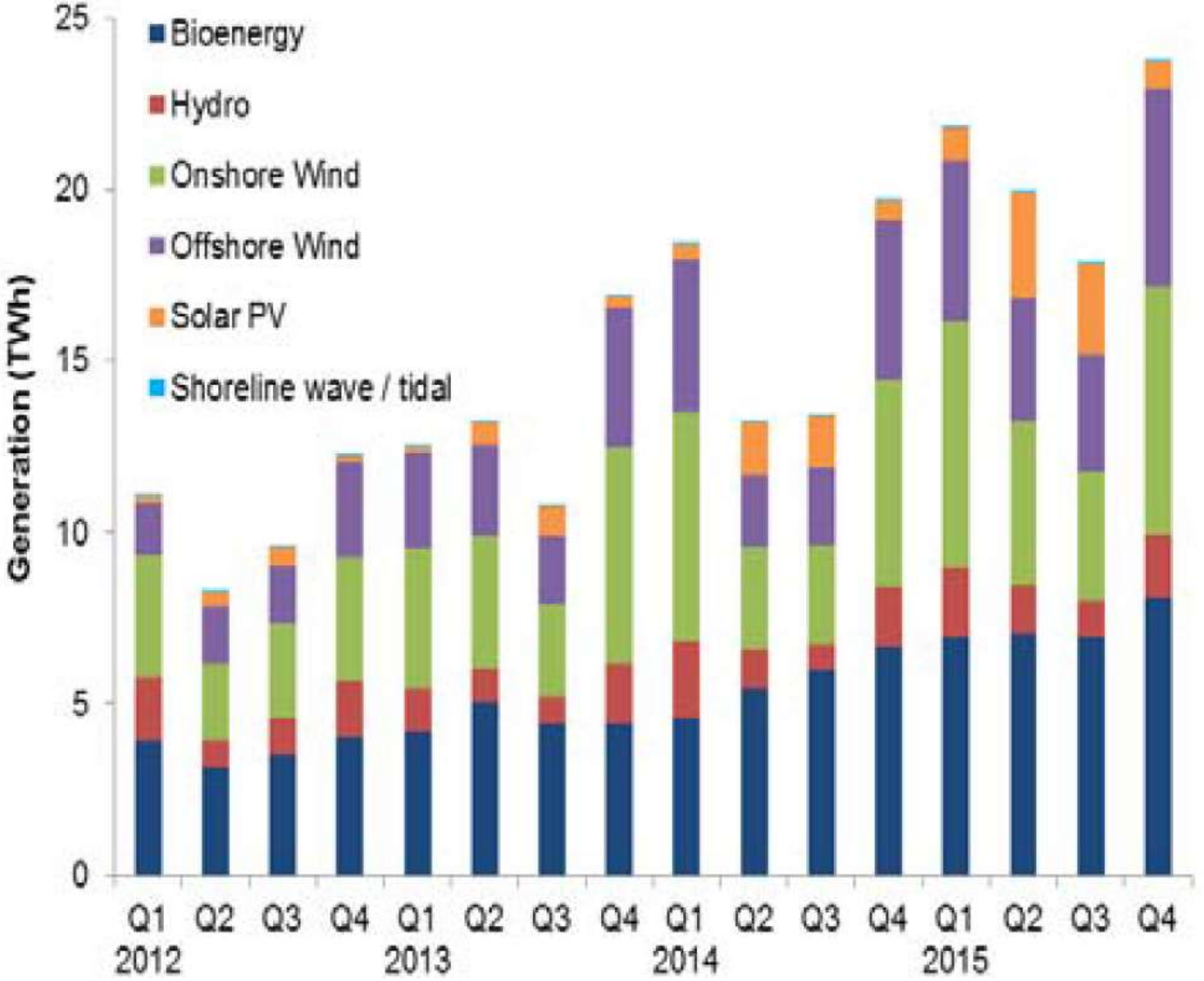
Global Fuel Consumption by Region in 2015



UK National Grid Electrical Generation (www.gridwatch.templar.co.uk)

Renewable Electricity Generation in the UK (2012-2015)



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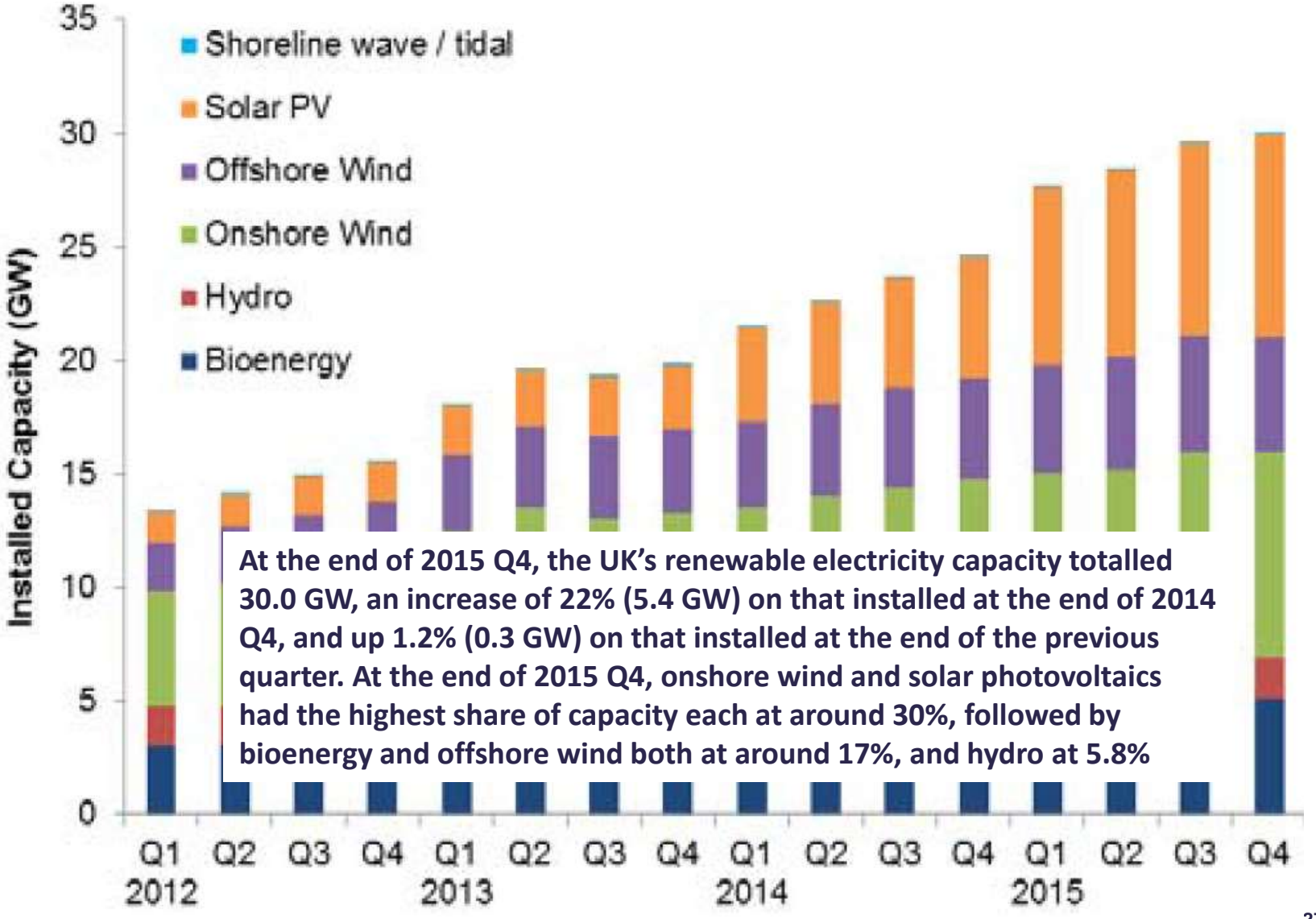
Renewable Electricity Capacity in the UK (at End of Quarter 2012-2015)



At the end of 2015 Q4, the UK's renewable electricity capacity totalled 30.0 GW, an increase of 22% (5.4 GW) on that installed at the end of 2014 Q4, and up 1.2% (0.3 GW) on that installed at the end of the previous quarter. At the end of 2015 Q4, onshore wind and solar photovoltaics had the highest share of capacity each at around 30%, followed by bioenergy and offshore wind both at around 17%, and hydro at 5.8%

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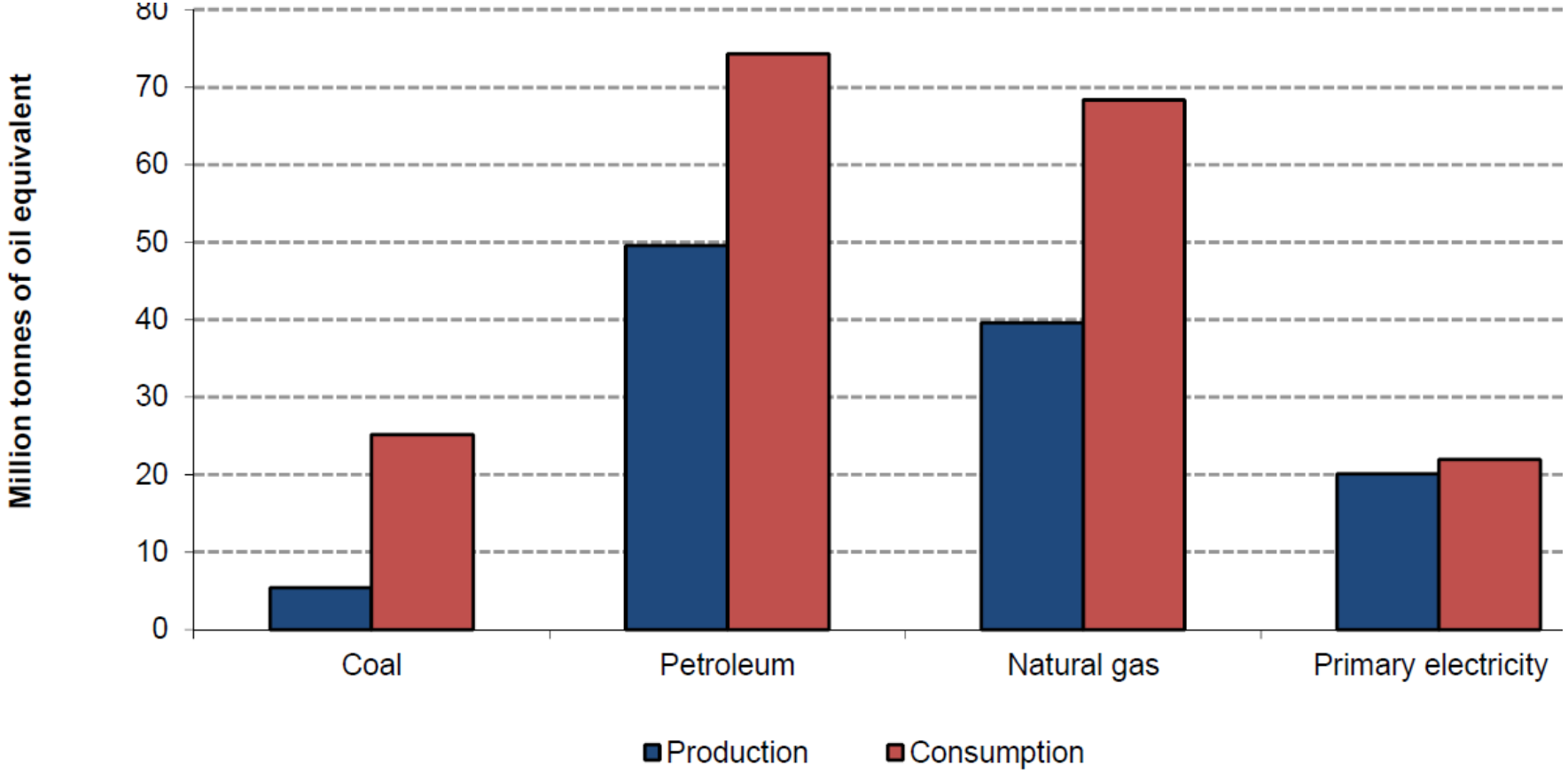
UK Production & Consumption of Primary Fuels I 2015



Note: Includes non-energy use of petroleum and gas. Differences between consumption and production are made up by foreign trade, marine bunkers and stock changes.

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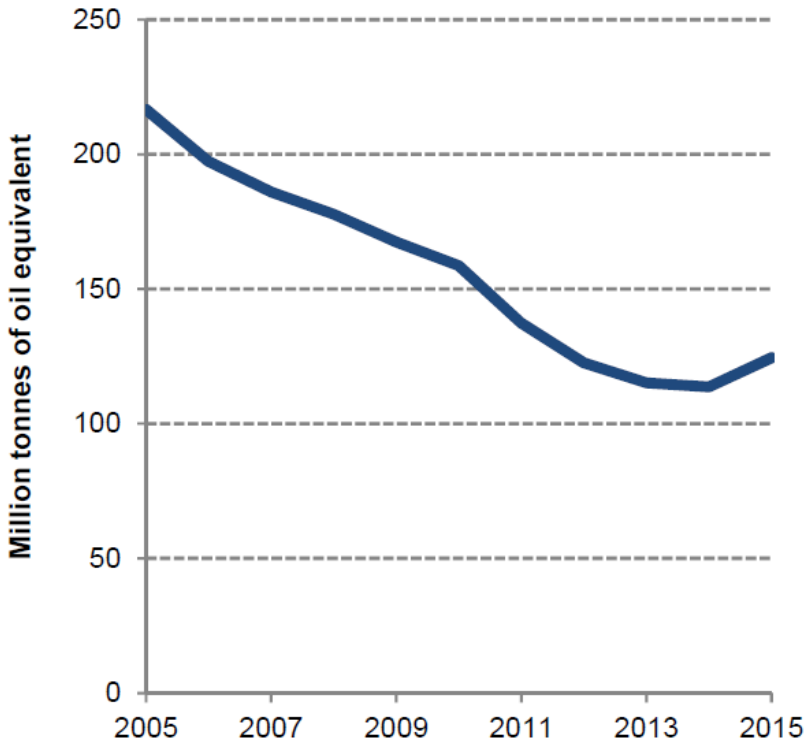
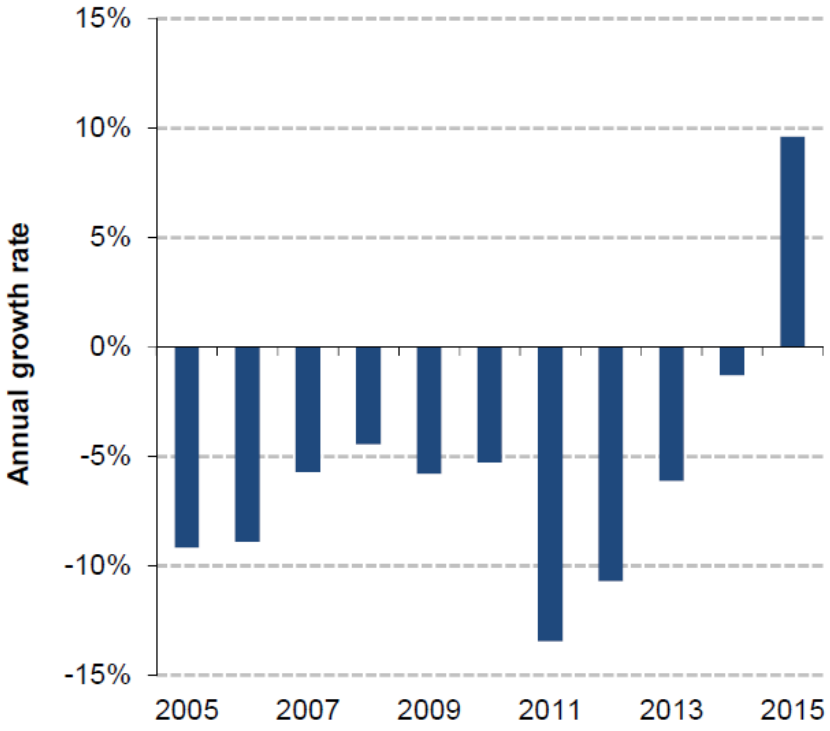
UK Energy Production and Annual Growth Rate

Level



Annual growth rate



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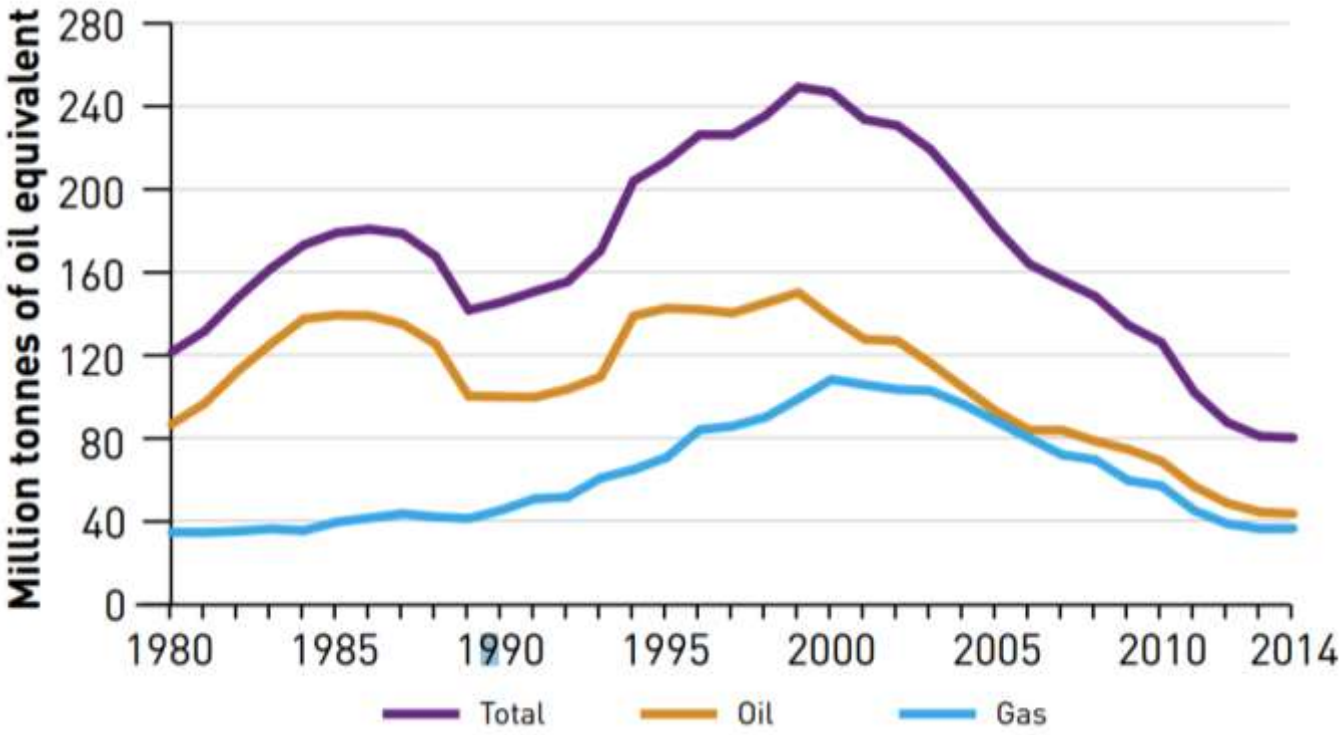
UK Production of Primary Fuels 1980 to 2014 - DUKES 2015



Million tonnes of oil equivalent

	1980	1990	2000	2010	2013	2014
Oil	86.9	100.1	138.3	69.0	44.5	43.7
Gas	34.8	45.5	108.4	57.2	36.5	36.6
Total	**121.7**	**145.6**	**246.7**	**126.2**	**81.0**	**80.3**

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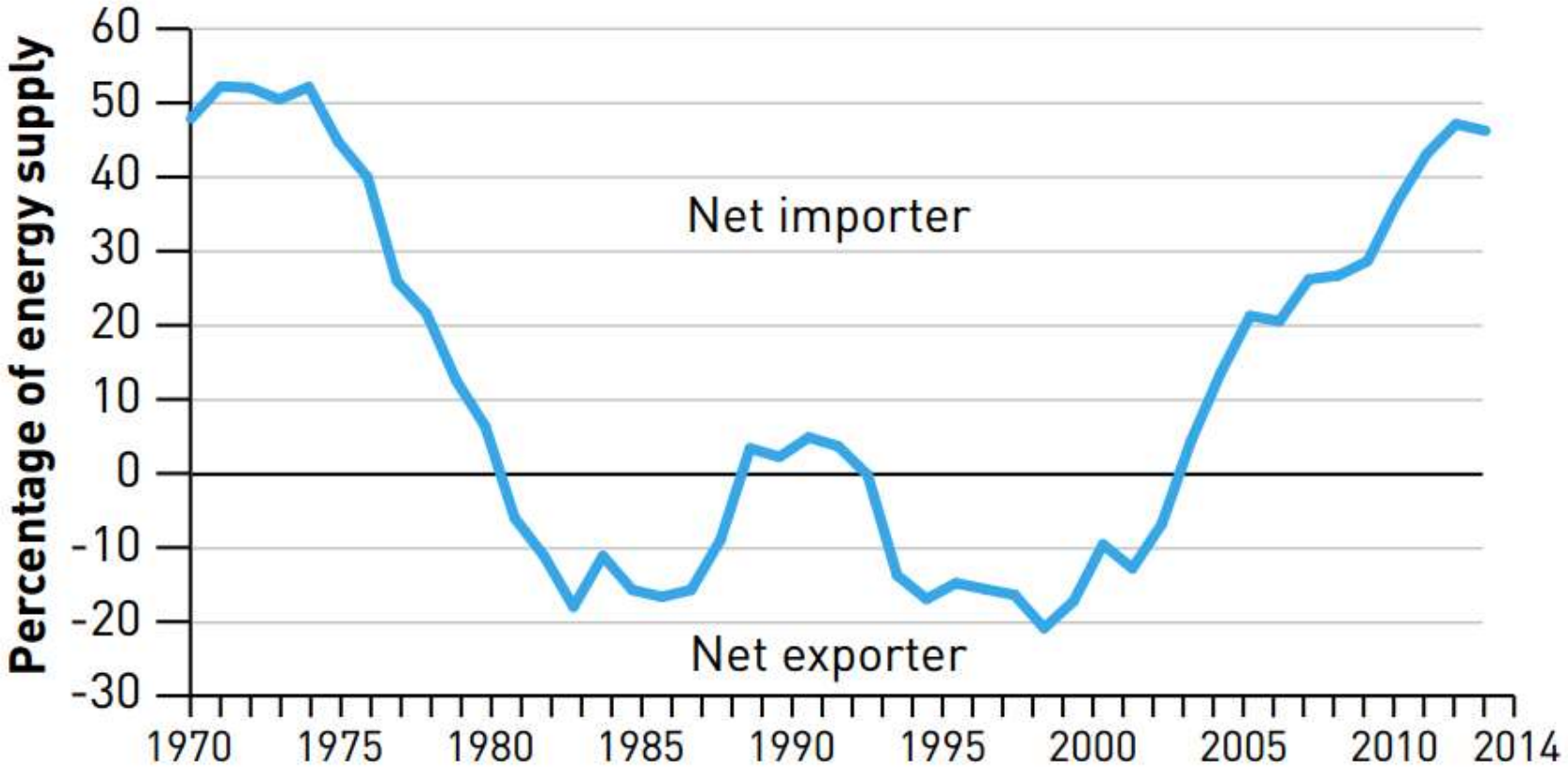
UK Import Dependency, 1970 - 2014



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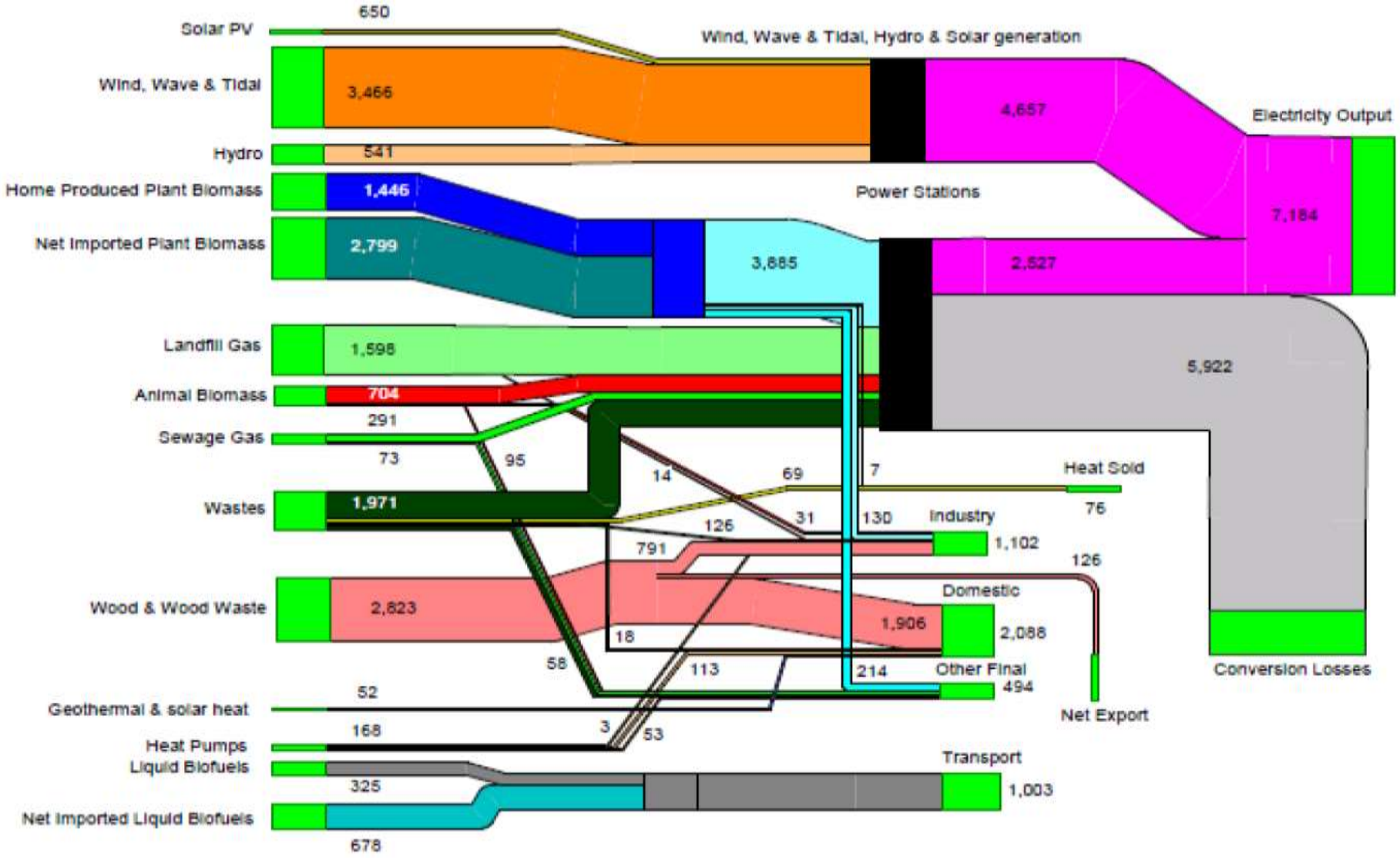
UK Renewables Flow Chart 2015 (Thousand Tonnes of Oil Equivalent)



UK Energy Watch (www.ukenergywatch.org)

Electricity Generation by Category

Generation Type	Power	CO_2 emissions
Combined Cycle Gas Turbine	19,050 MW	1,943 $Kg_{CO_2}\ s^{-1}$
Open Cycle Gas Turbine	0 MW	0 $Kg_{CO_2}\ s^{-1}$
Oil	0 MW	0 $Kg_{CO_2}\ s^{-1}$
Coal	2,234 MW	604 $Kg_{CO_2}\ s^{-1}$
Nuclear	7,989 MW	0 $Kg_{CO_2}\ s^{-1}$
Wind	1,513 MW	0 $Kg_{CO_2}\ s^{-1}$
Pumped Storage Hydro	305 MW	0 $Kg_{CO_2}\ s^{-1}$
Non Pumped Storage Hydro	695 MW	0 $Kg_{CO_2}\ s^{-1}$
Interconnect - France	994 MW	*Unknown*
Interconnect - Ireland	124 MW	*Unknown*
Interconnect - Netherlands	1,001 MW	*Unknown*
Other	1,265 MW	0 $Kg_{CO_2}\ s^{-1}$
Total	**35,170 MW**	**2,547 $Kg_{CO_2}\ s^{-1}$**
		0.261 $Kg_{CO_2}\ kWh^{-1}$

Updated: 26 September 2016 08:55:00
Settlement Date: 26 September 2016

city Generation by Category

Type	Power	CO_2 emissions
Gas Turbine	11,215 MW	1,144 $Kg_{CO_2}\ s^{-1}$
Turbine	0 MW	0 $Kg_{CO_2}\ s^{-1}$
	0 MW	0 $Kg_{CO_2}\ s^{-1}$
	549 MW	148 $Kg_{CO_2}\ s^{-1}$
	6,934 MW	0 $Kg_{CO_2}\ s^{-1}$
	3,960 MW	0 $Kg_{CO_2}\ s^{-1}$
Hydro	297 MW	0 $Kg_{CO_2}\ s^{-1}$
age Hydro	239 MW	0 $Kg_{CO_2}\ s^{-1}$
nce	1,997 MW	*Unknown*
and	0 MW	*Unknown*
herlands	1,001 MW	*Unknown*
	748 MW	0 $Kg_{CO_2}\ s^{-1}$
	26,940 MW	**1,292 $Kg_{CO_2}\ s^{-1}$**
		0.173 $Kg_{CO_2}\ kWh^{-1}$

Updated: 03 August 2016 15:10:00
Settlement Date: 03 August 2016

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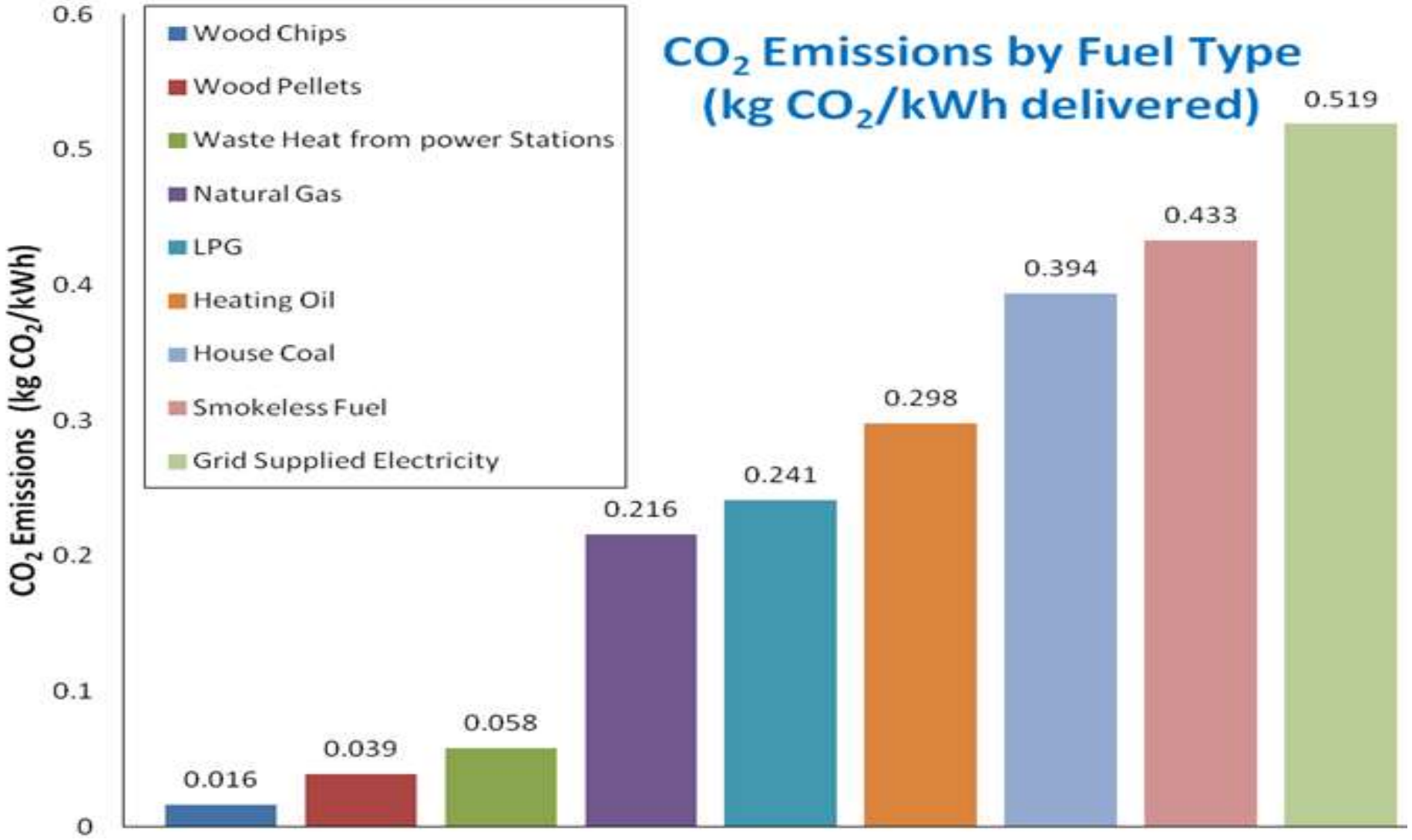
CO_2 Emission Factors by Fuel Type in SAP 2012



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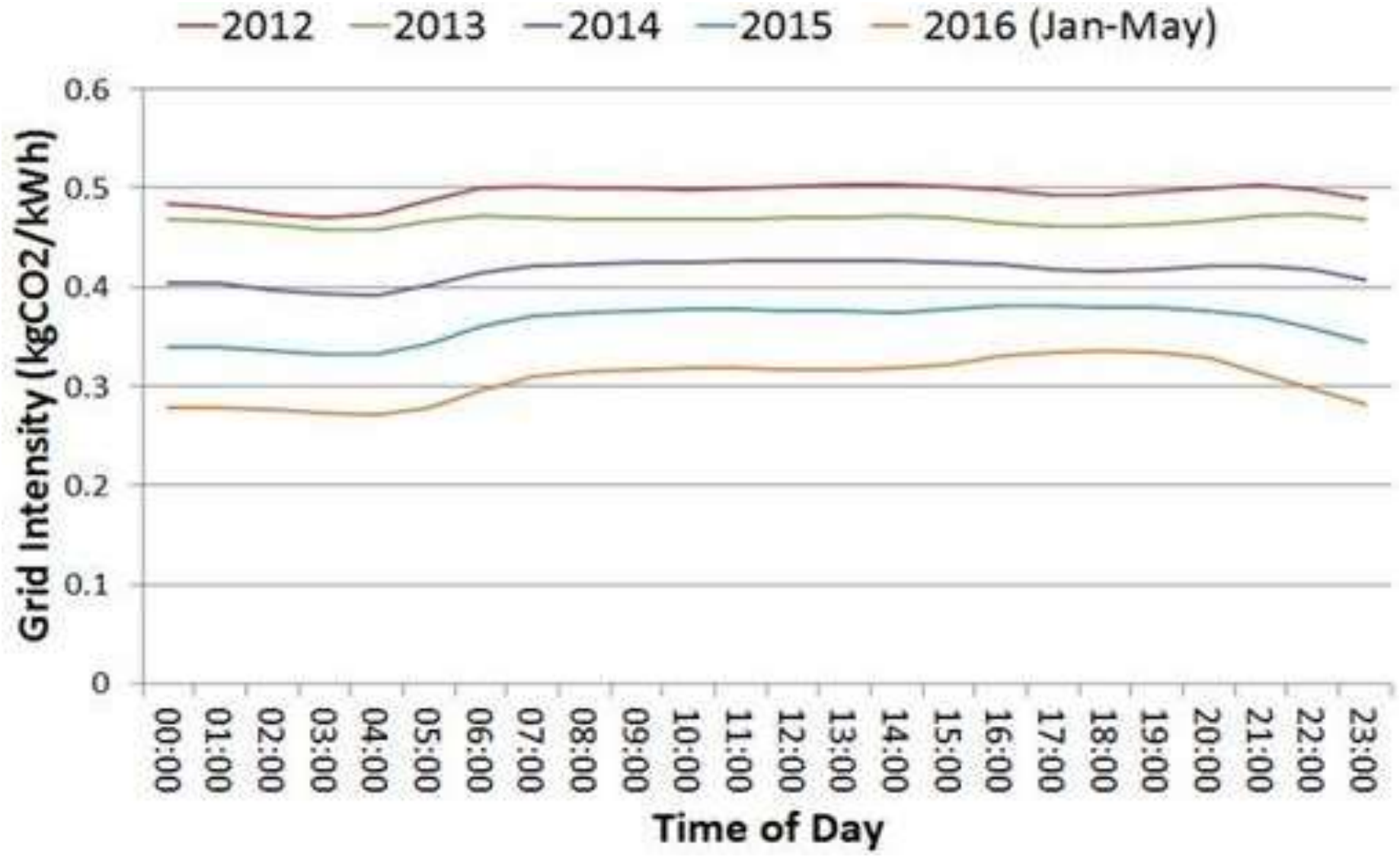
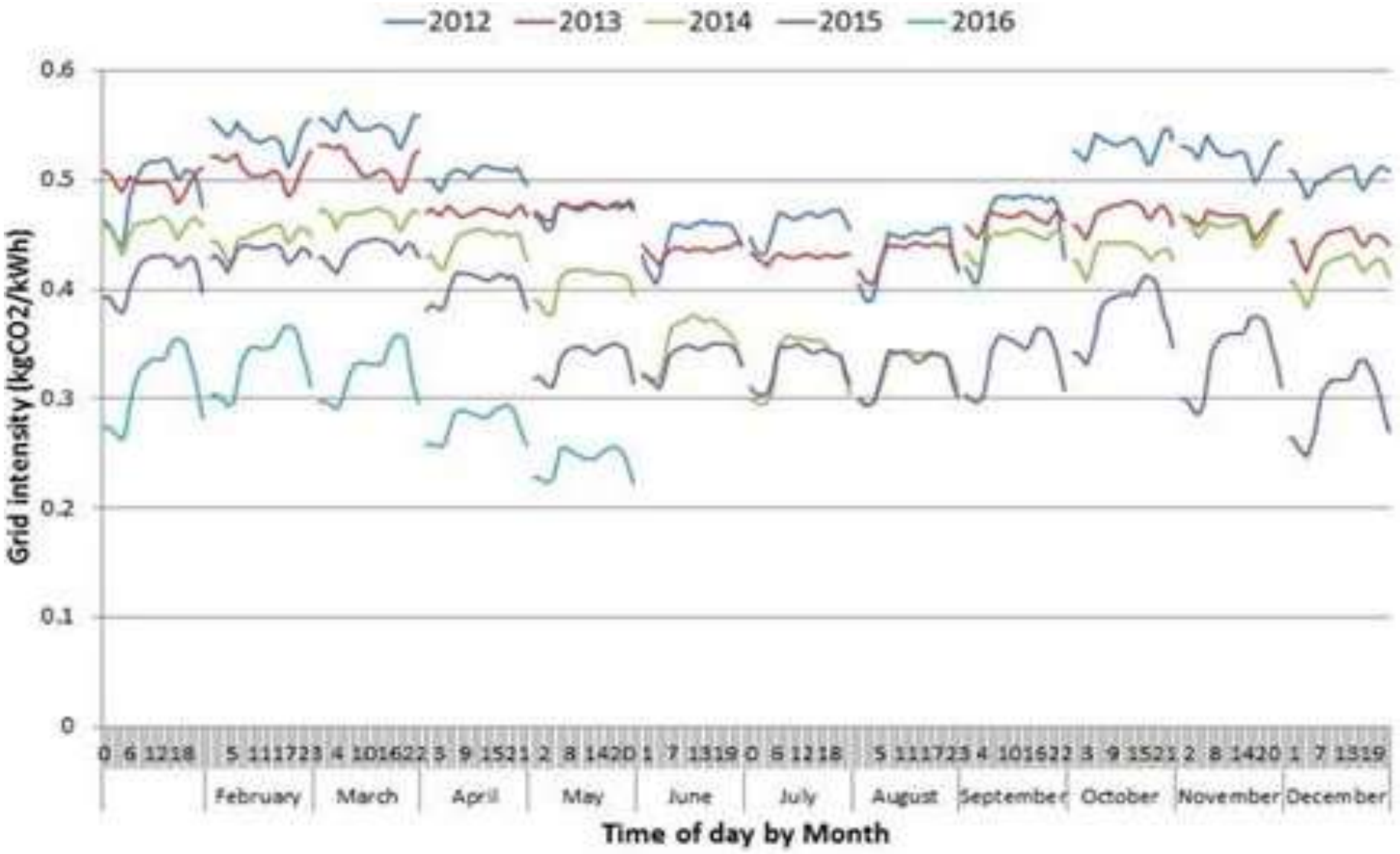
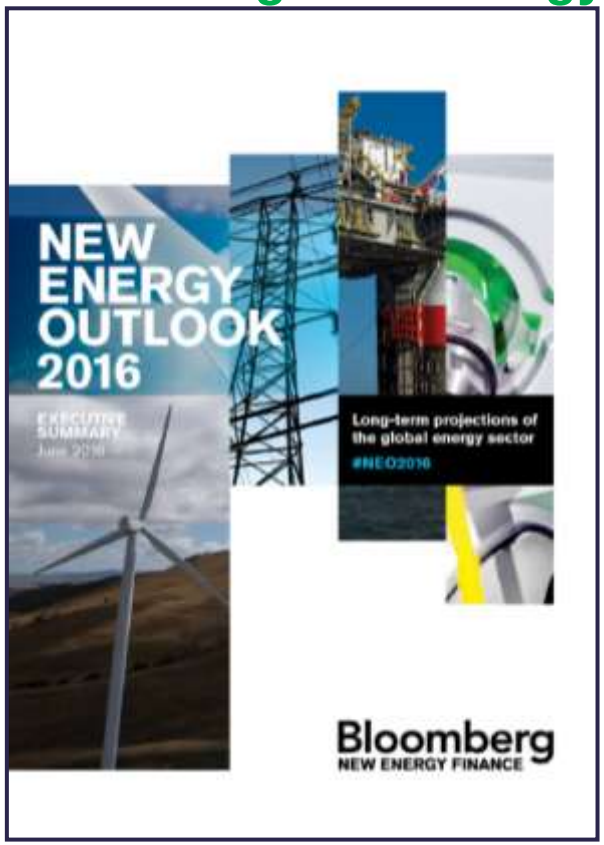
Average UK Grid Intensity for Time of Day 2012-2016



Electrical Grid CO_2 Intensity for UK ($kgCO_2/kWh$)



Bloomberg New Energy Outlook 2016



Compiled by some 65 specialist energy industry analysts, the New Energy Outlook report is based on a combination of the project pipeline in each country; current policies, power system dynamics and technology costs.

Within the report, BNEF has reduced its long-term forecasts for coal and gas prices, by 33% and 30% respectively - reflecting a projected supply glut for both commodities – which will see the cost of generating power by burning coal or gas fall.

But the cost of renewables will plummet even further – onshore wind will fall 41%, and solar will fall by 60%. Wind, solar, hydro and other renewable energy plants will generate 70% of Europe's power in 2040. In the US, the share of renewables in the energy mix will jump from 14% in 2015 to 44% in 2040.

In China, weaker GDP growth and a rebalancing of its economy will mean its emissions will peak as early as 2025. However, rising coal-fired generation in India and other Asian emerging markets indicate that the global power sector emissions figure in 2040 will still be some 700 megatonnes above 2015 levels – clearly not enough to reach the ambitious goals set in Paris.

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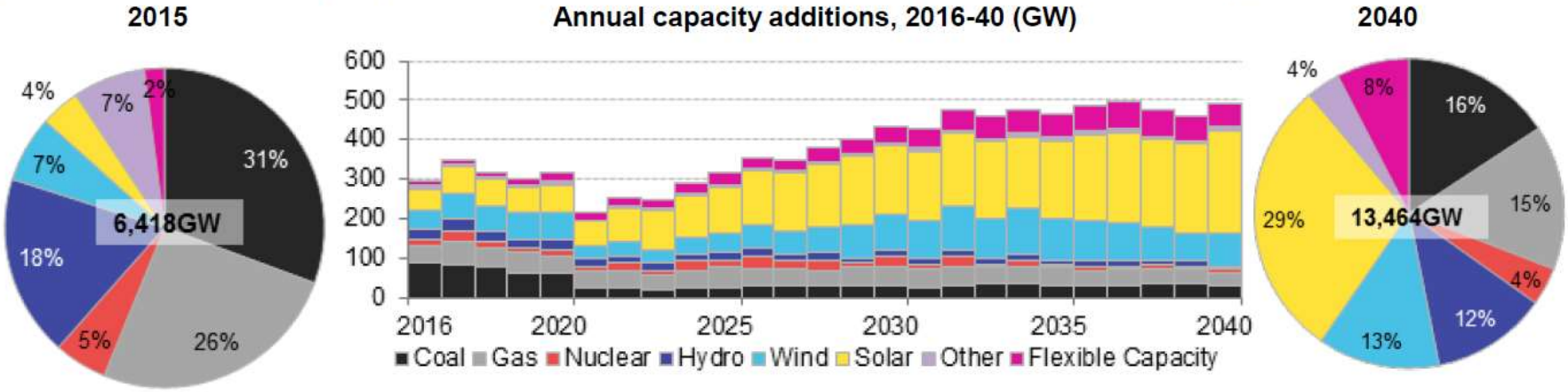
Electrical Generation Forecasts from Bloomberg

NEW ENERGY OUTLOOK 2016

Bloomberg NEW ENERGY FINANCE

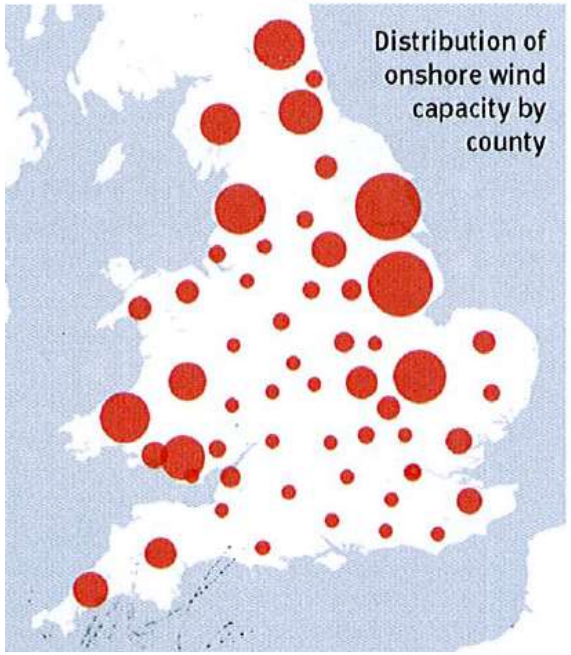
Figure 1: Global installed capacity in 2012 and 2040 and projected capacity additions, by technology (GW)



Source: Bloomberg New Energy Finance. Note: Flexible capacity includes power storage, demand response, and other potential resources.

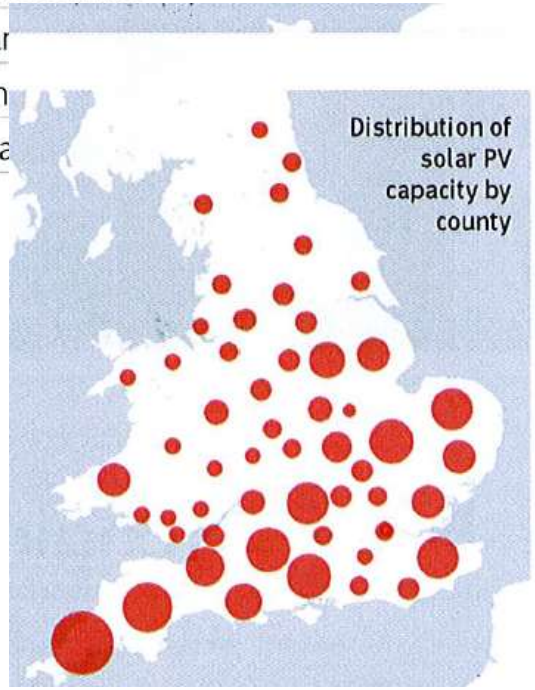
Cheaper coal and cheaper gas will not derail the transformation and decarbonisation of the world's power systems. By 2040, zero-emission energy sources will make up 60% of installed capacity. Wind and solar will account for 64% of the 8.6TW of new power generating capacity added worldwide over the next 25 years, and for almost 60% of the $11.4 trillion invested.

UK Onshore Wind and Solar Capacity in the UK



TOP 10 ONSHORE WIND COUNTIES

1. East Riding of Yorkshire
2. Lincolnshire
3. Cambridgeshire
4. Lancashire
5. Dyfed
6. Northumberland
7. Mid Glar
8. Durham
9. Cumbria
10. Powys



TOP 10 SOLAR COUNTIES

1. Cornwall
2. Devon
3. Hampshire
4. Wiltshire
5. Cambridgeshire
6. Kent
7. Norfolk
8. Oxfordshire
9. Somerset
10. Dorset

www.green-alliance.org.uk/

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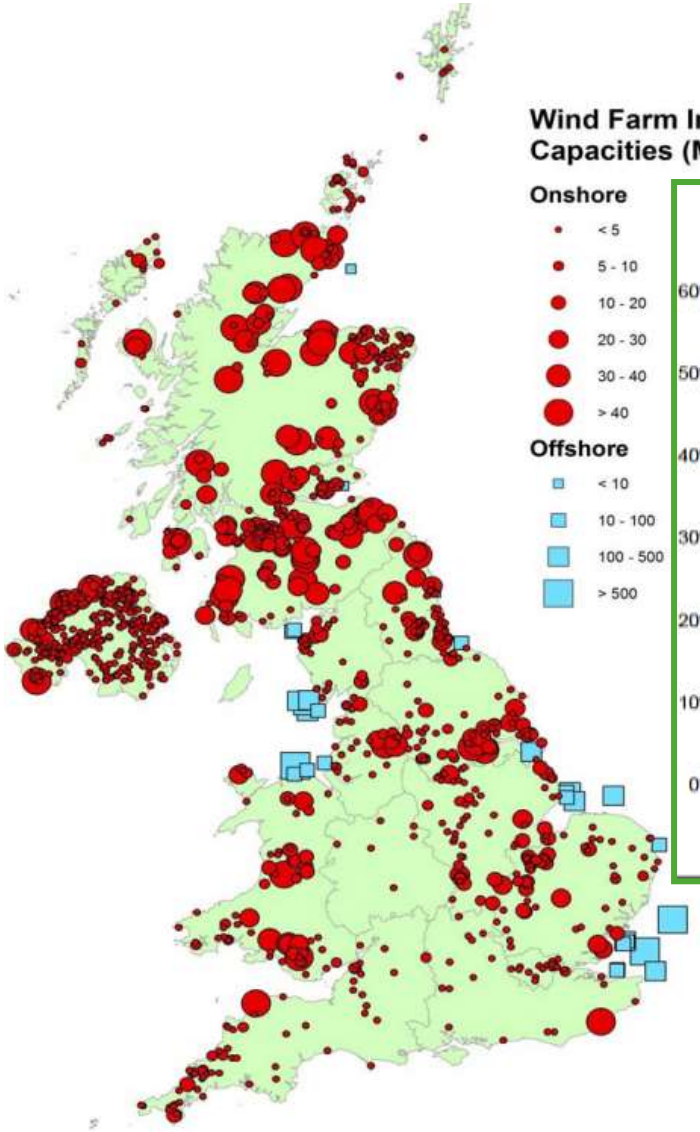
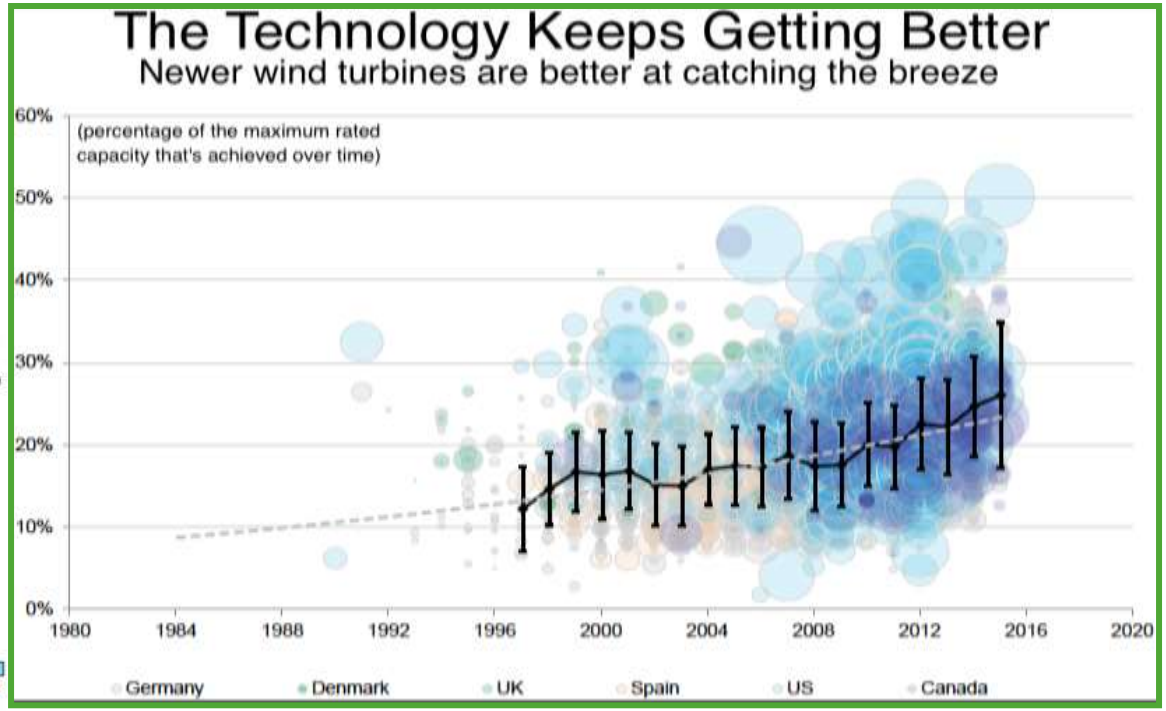
Onshore and Offshore Wind Farms in the UK and Capacities (MW)





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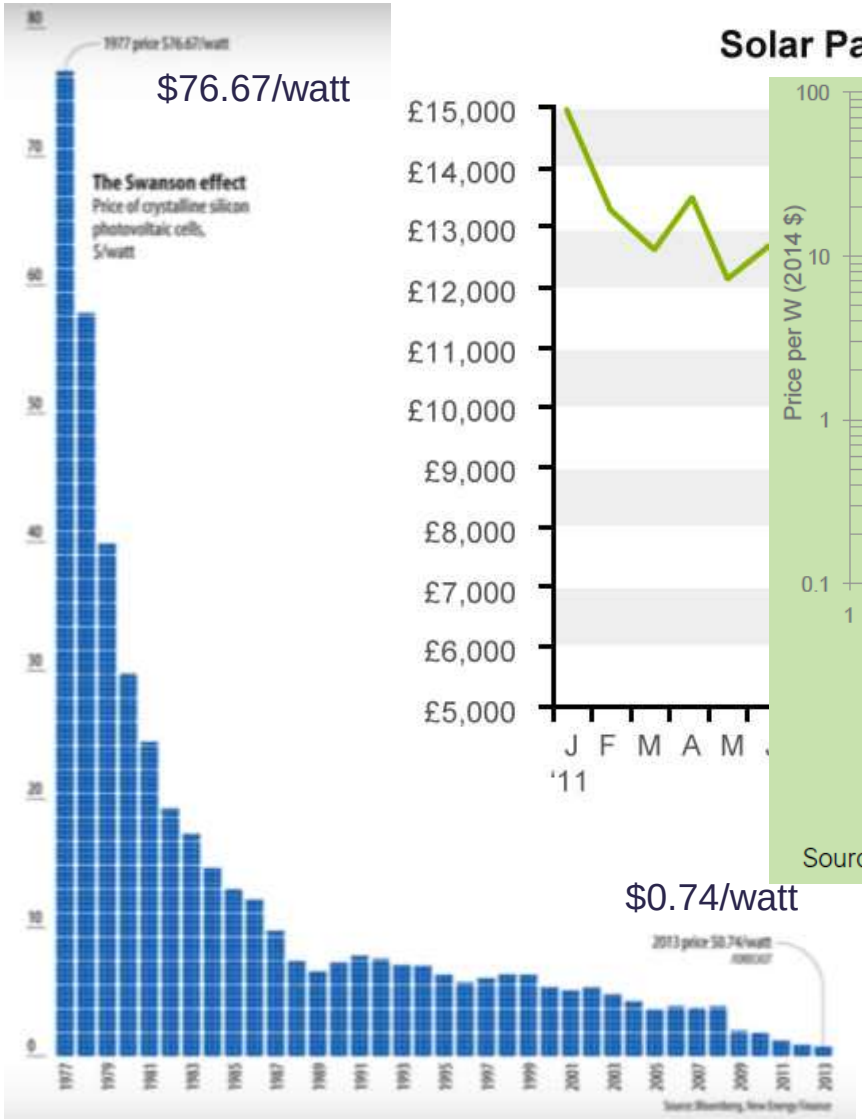
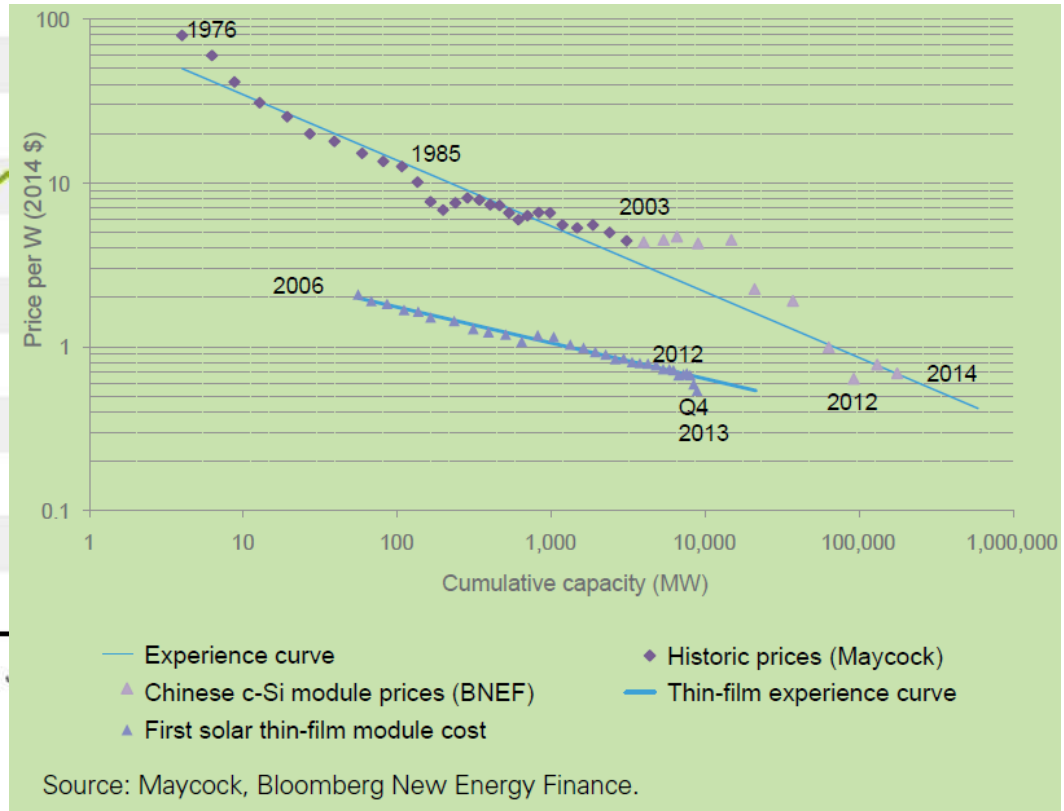
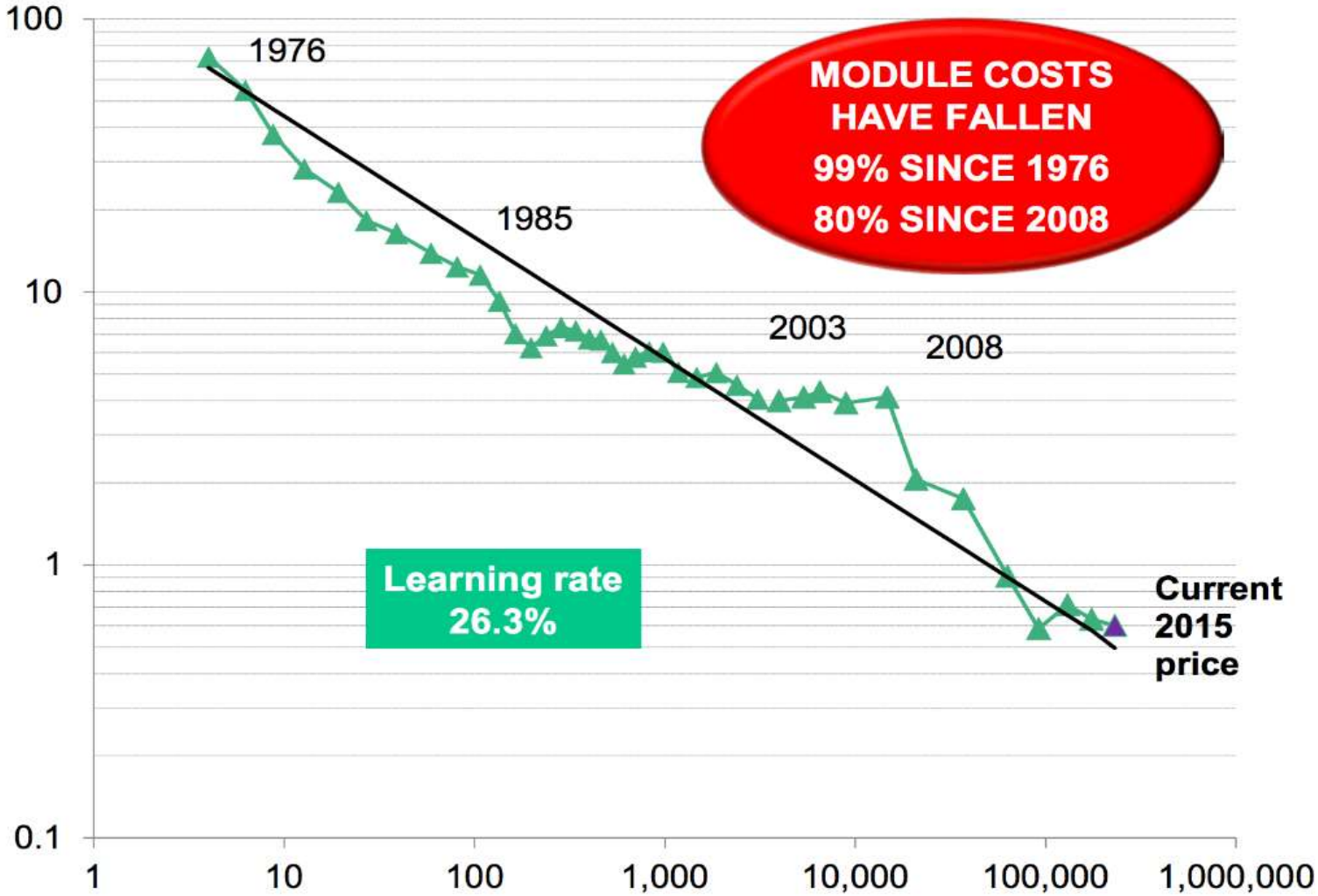
The Price of Solar Panels



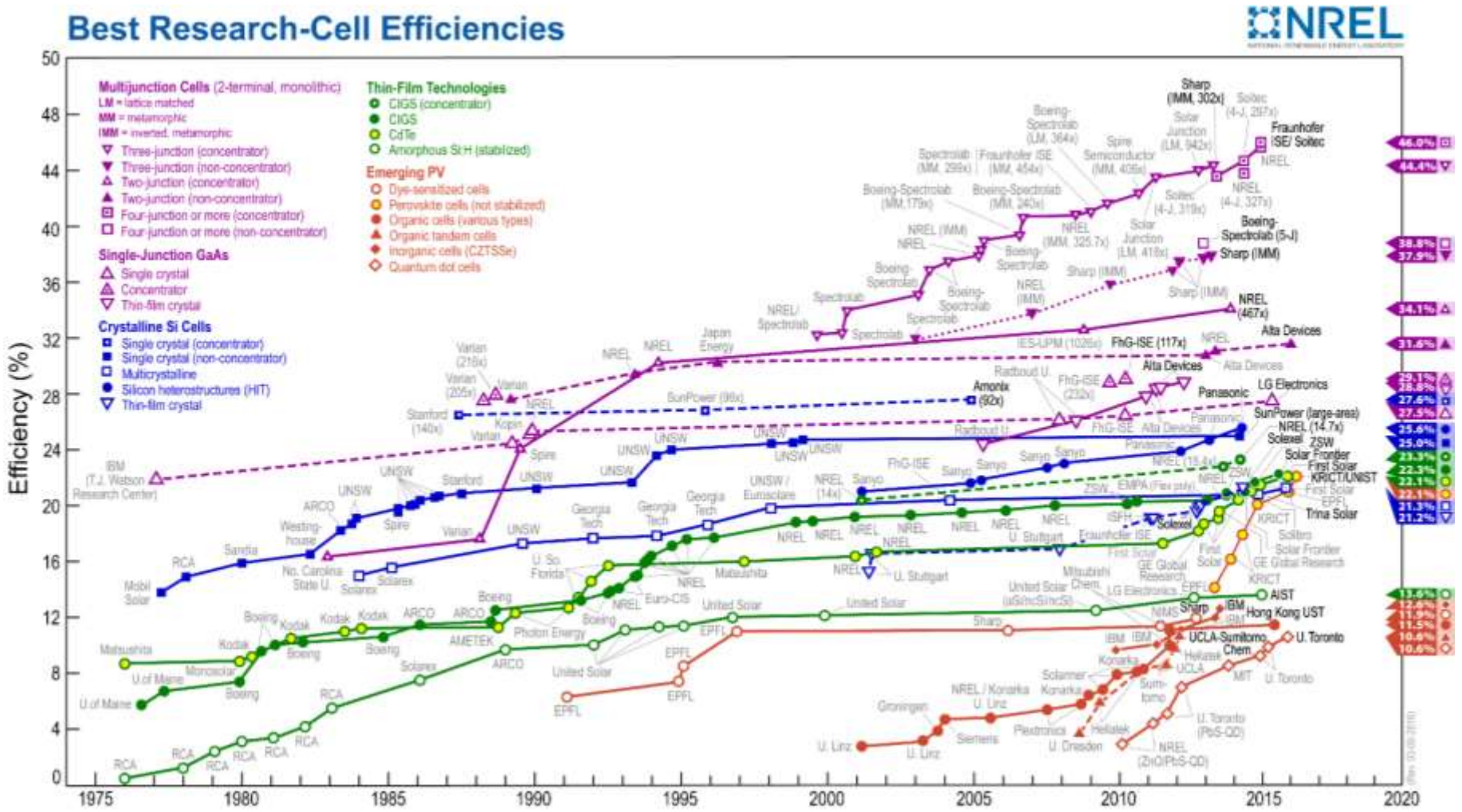


Electrical Solar

Every time the world's solar power doubles, the cost of panels falls 26%



Best Research-Cell Efficiencies from Photovoltaics



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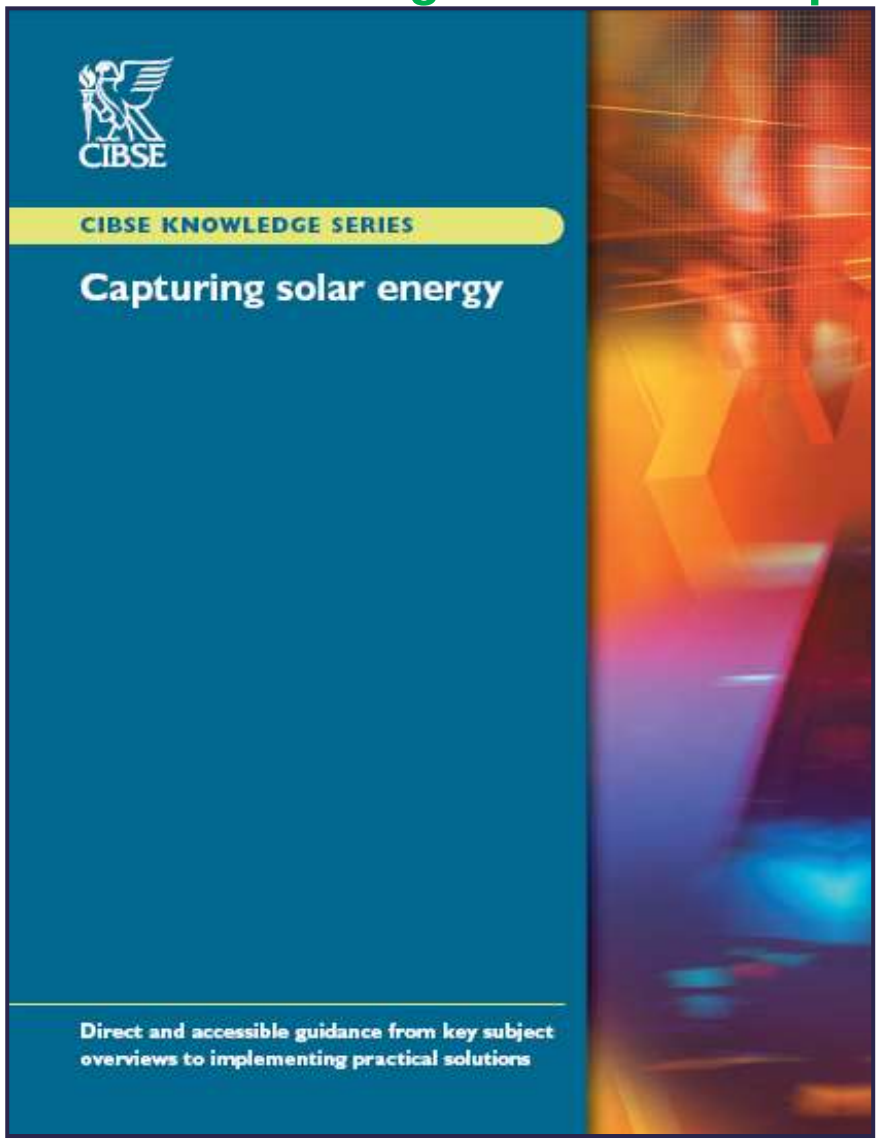
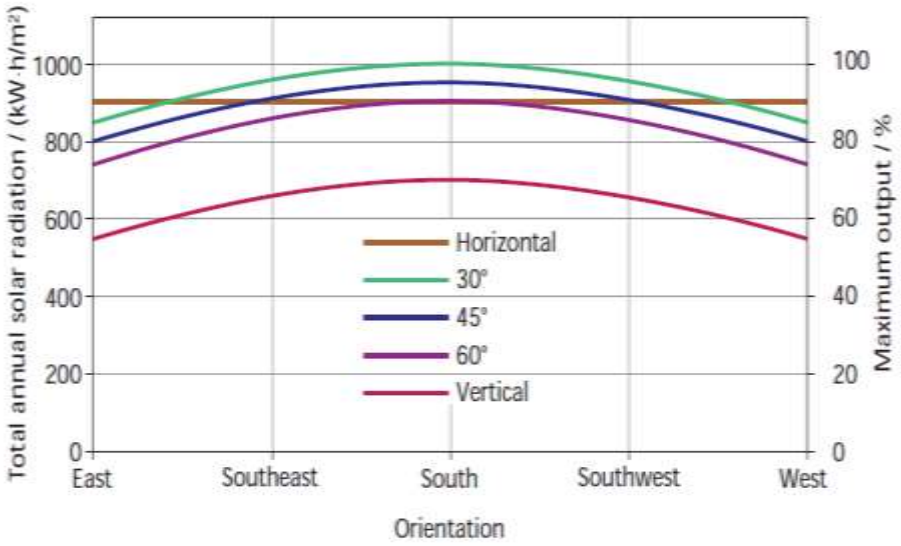
CIBSE Knowledge Series on Capturing Solar Energy



Location	Daily mean irradiation (kW·h/m²) for stated month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
London	1.11	1.89	2.74	4.03	4.78	5.03	4.98	4.68	3.39	2.45	1.14	0.93
Manchester	1.11	1.81	2.67	4.05	4.78	4.77	4.86	4.53	3.46	2.24	1.38	0.88
Edinburgh	0.83	1.57	2.67	3.77	4.75	4.81	4.70	4.03	3.05	1.80	1.09	0.51



Solar PV Farms and Domestic PV Installations in Nottingham

Solar supplies business park

Work on the final elements of Scottow Moor Solar's solar farm, located on the Scottow Enterprise Park (the former RAF Coltishall airbase, north-east of Norwich), has been completed and the scheme is now generating renewable energy for the local grid. The near 50 MW solar farm is one of the largest to be built in the UK.

The final elements of the solar farm consisted of four separate solar generating units, each connected and supplying renewable electricity to aircraft hangars that form part of the Scottow Enterprise Park. Phase 1 of the solar farm, owned and operated by Scottow Moor Solar (SMS), was completed in March 2015.

Supplies to the hangar buildings mean that tenants on the Park, who lease one or more of

Monitoring domestic PV

Energy management specialist EkkoSense has won a tender from Nottingham City Council to supply a monitoring system for over 3,000 domestic solar installations. Nottingham City Council has an extensive solar panel programme across its council houses and EkkoSense's web-based monitoring system will check each solar installation daily, providing the information needed to claim income generated by the solar panels along with detailed performance data analytics.

The EkkoSense system will also ensure that households are able to get the maximum amount of electricity from the system, thus reducing their energy bills. Monitoring solar PV installations in this way also identifies any repair or maintenance requirements almost immediately.

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Europe's Largest Floating Solar PV System in Greater Manchester

United Utilities appoints Forrest to deliver Europe's largest floating solar power system on Godley reservoir

North West utilities giant, United Utilities, has appointed contractor Forrest ar Solar UK to construct a floating solar power system on its Godley reservoir in is the largest in Europe.

The £3.5 million, three megawatt system will consist of 12,000 solar panels fl water and will cover an area of 45,500 sq m – making it the second largest flo the world.

The target is to complete the installation, test it and bring it into operation bef complete, the 12-week project will provide United Utilities with 2.7 GWh per y carbon power to be used directly by the site. The scheme is part of United Ut reduction strategy.

15 February 2016

Europe's biggest ever floating solar panel array is being installed on London's Queen Elizabeth II reservoir as part of Thames Water's ambitious bid to self-generate a third of its own energy by 2020.

Just over 23,000 solar photovoltaic (PV) panels will be floated on the reservoir near Walton-on-Thames, utilising a normally redundant suburban space on the surface, following an agreement between Thames Water, Ennoviga Solar and Lightsource Renewable Energy.

The innovative floating pontoon will cover around a tenth of the reservoir – enough to fill eight Wembley football pitches.

It will have a total installed peak capacity of 6.3 megawatts and is expected to generate 5.8 million kilowatt hours in its first year – equivalent to the annual consumption of around 1,800 homes

Kyocera Floating Solar Electrical Power Plants in Japan

Kyocera TCL Solar LLC installed the two "mega" solar Power plants at the end of March 2016 at Nishihira Pond and Higashihira Pond in Kato City, Japan.

They will generate approximately 3,300 megawatt hours (MWh) of electricity per year, which is enough to power around 920 households. The farms have more than 11,000 solar panels and a total capacity of 2.9MW. Floating solar power systems are said to generate more electricity than other systems due to the cooling effect of the water.

The platforms are 100% recyclable and resist corrosion and are designed to withstand extreme physical stress, including typhoons.

Large PV Solar System

30MW Mountain Smart PV Plant, Sichuan, China

A smart PV plant built on a coal mountain slope. The overall terrain is low in northwest and high in southeast; the west and south sides are steep slopes with a gradient greater than 50 degrees. This project may be one of the mountain PV plants with the greatest construction difficulty so far. Daily cleaning and maintenance are difficult.

Huawei Solution:

- 600 PCS SUN2000-28KTL
- Smart PV wireless transmission system

20MW Ground-Mounted PV Plant, Trowbridge, UK

One of Huawei's projects in the UK, where it was the largest inverter supplier of 2015 to ground-mount PV plants.

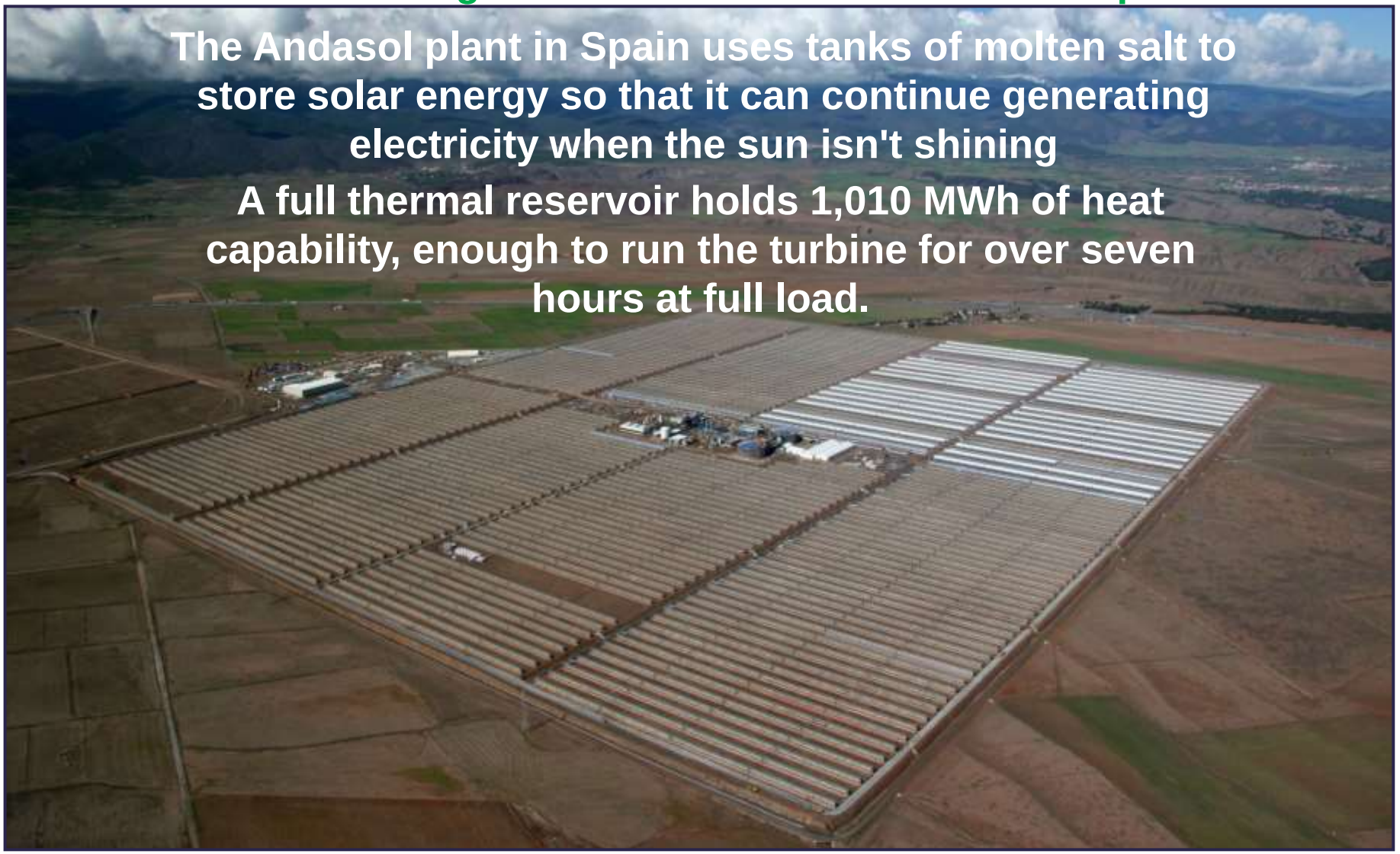
Huawei Solution:

- 700 PCS SUN2000-20KTL

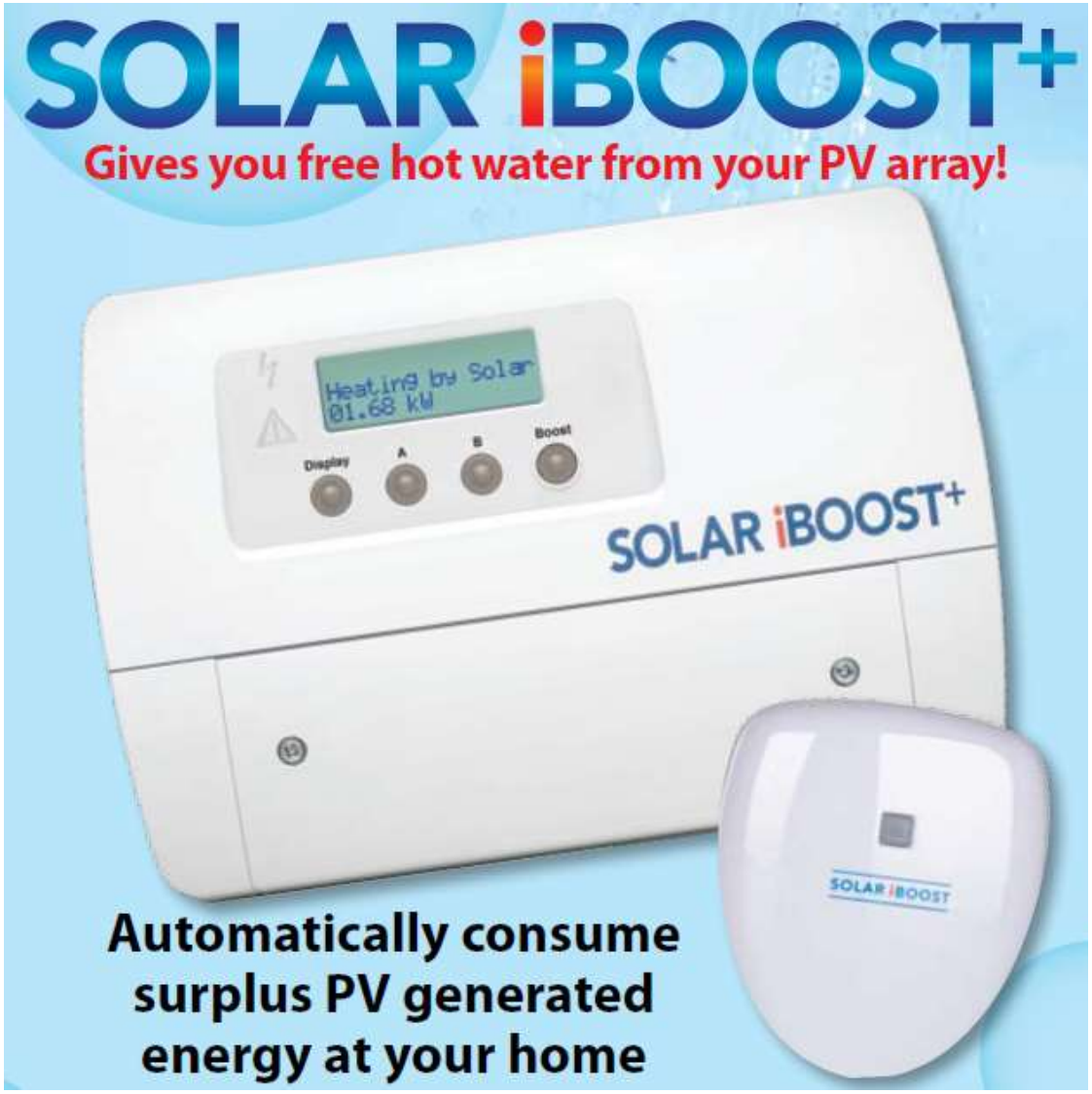
Customer Value:

- Multiple MPPTs adopted to increase energy yield
- IP65, natural cooling, maintenance-free design
- Easy to install, simple construction, reducing project duration.

150 MW Parabolic Trough Solar Thermal Power Plant in Spain



Hot Water Storage by Solar iBOOST+



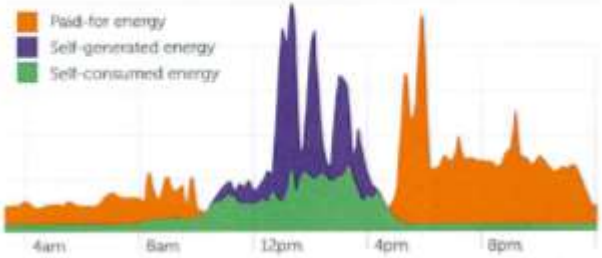
Surplus PV Energy Generation to Heat Water

Without immersun®

Even though you have microgeneration technology installed, on average, up to 80% of generated energy is exported back to the grid. This results in very little being self-consumed.

Rather than exporting surplus green energy to the grid, the immersun® allows you to make better use of self-generated power within the home. The graphs highlight the benefits of complementing your microgen system with an immersun®.

The first image illustrates typical energy consumption without using an immersun®. Despite having green technologies fitted, a high percentage of power is sent to the grid, rather than being used in the home.



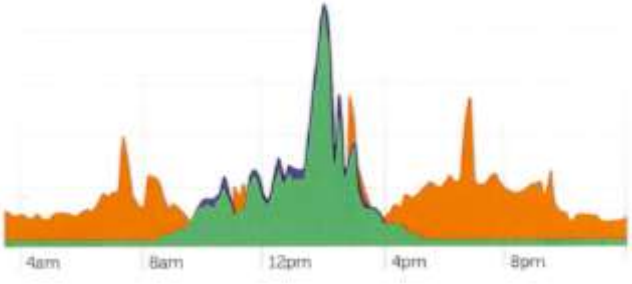
With immersun®

By diverting surplus power to an immersion water heater or other suitable heating load, up to 100% of green energy can be self-consumed throughout the day. This minimises reliance on fossil fuels, thus reducing your homes' utility bills.

At peak times this energy is bought back, meaning users see little benefit from embracing renewables.

However, the graph above demonstrates how fitting an immersun® alongside microgen systems can minimise reliance on mains supply.

By diverting surplus power to a heating element, almost 100% of green energy is effectively self-consumed throughout the day. This reduces demand for mains supply and therefore minimises utility bills.



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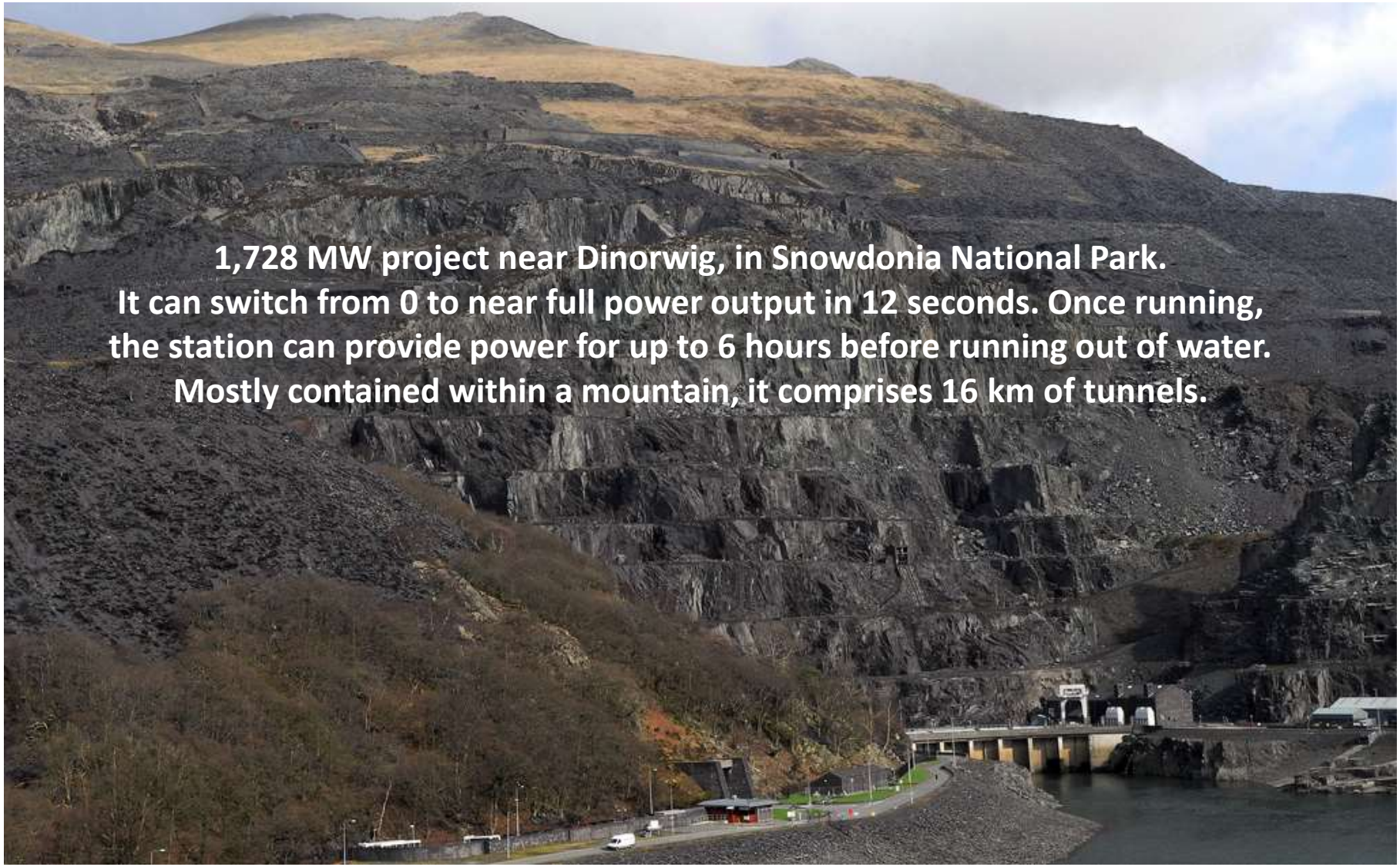
Dinorwig Pumped Hydro Storage Power Station, Snowdonia



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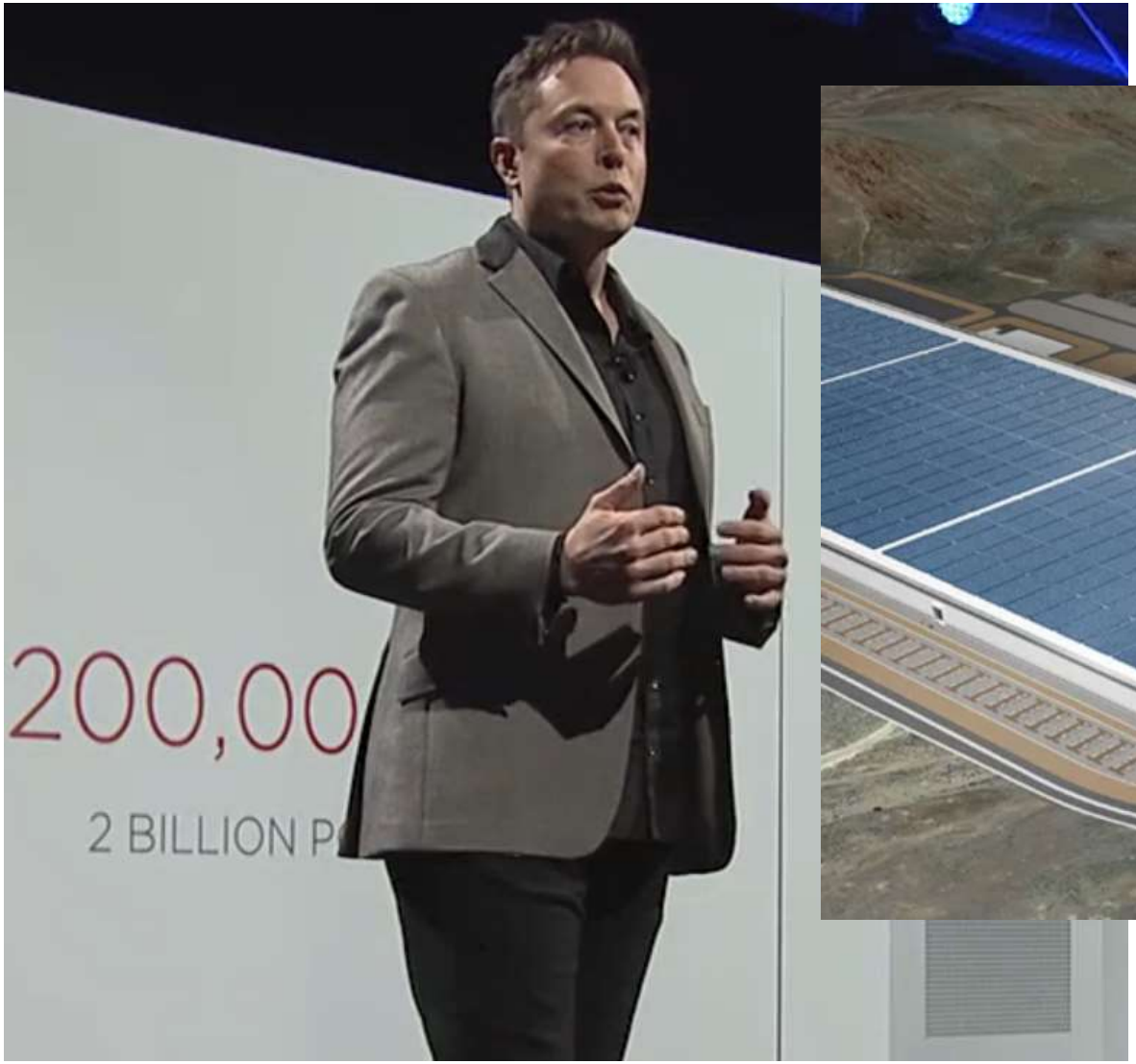
Tesla Powerwall and Power Pack

POWERWALL
TESLA HOME BATTERY

Tesla GigaFactory 1 Making Power Packs



GIGAFACTORY 1

Tesla Model S p100d Fully-Electric Car With 100kWh Battery

Tesla has announced another big breakthrough with the latest update of the company's flagship fully-electric saloon, the Model S p100d, which is now classified as one of the fastest accelerating production cars ever produced. (August 2016)

Thanks to the incorporation of a new 100kWh battery pack, the p100d reportedly achieves 0-60mph in 2.5 seconds in its 'ludicrous mode', making it the third-fastest-accelerating production car ever made. The new battery also increases the energy storage capacity to 315 miles - by far the longest single-charge range of any electric production vehicle.

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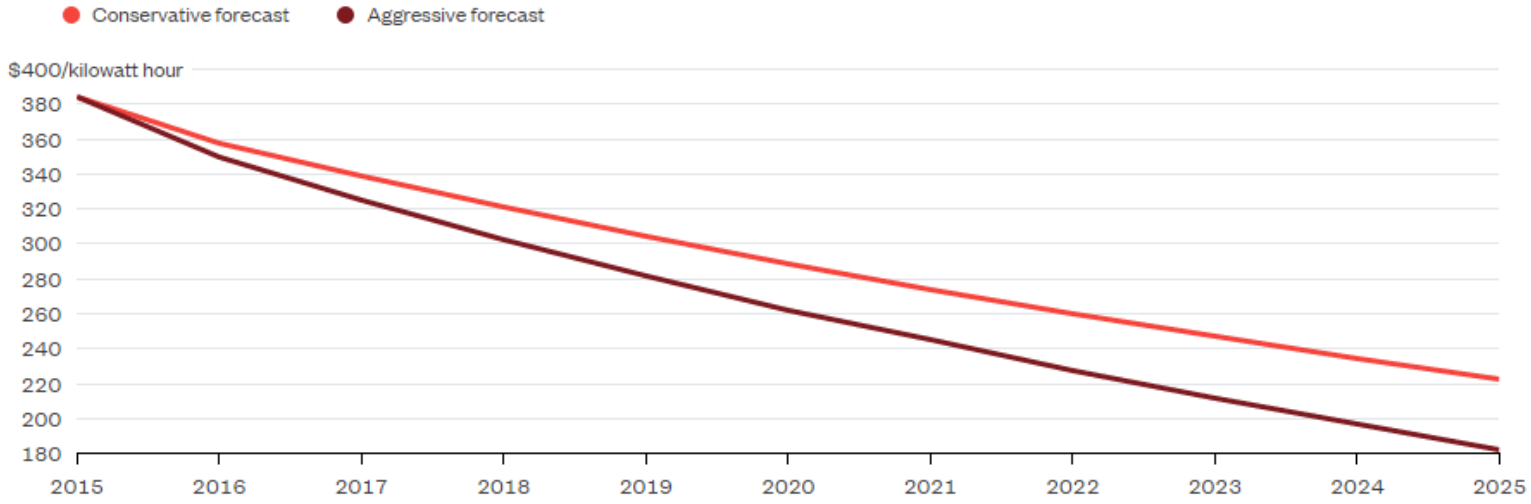
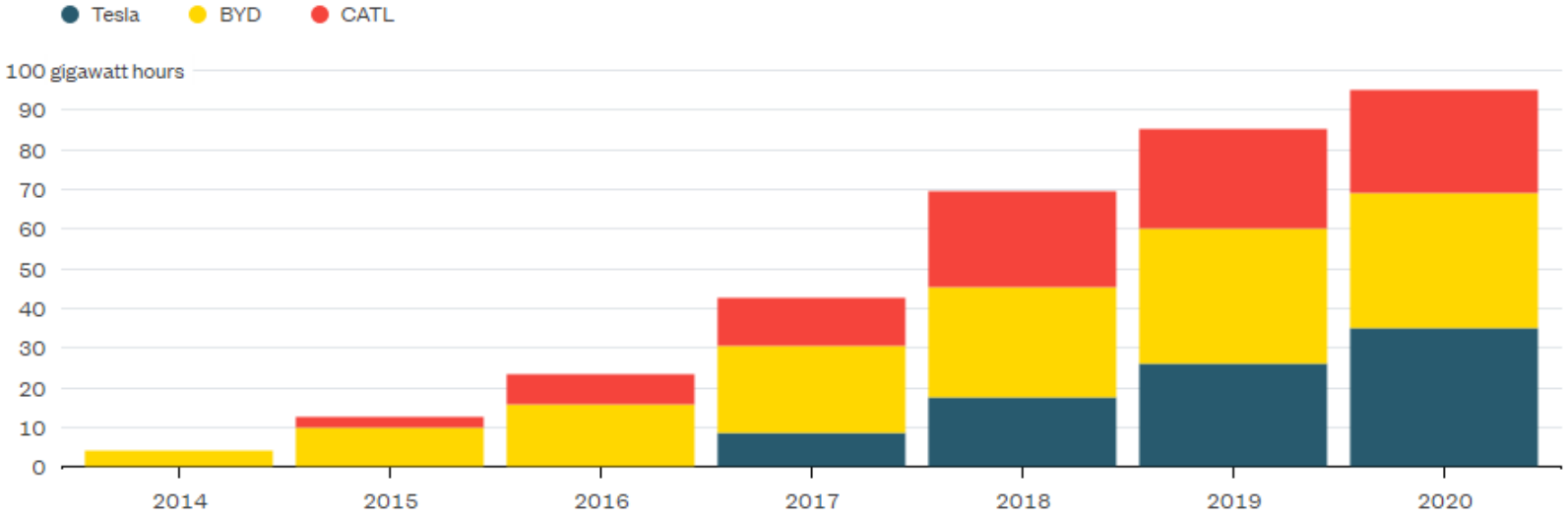
Lithium-ion Battery Pack Production to Increase and Costs to Plummet



Source: Bloomberg New Energy Finance



Source: Bloomberg New Energy Finance, Company data, BofA Merrill Lynch Global research

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Battery Storage Systems

Tesla Powerwall

NOW AVAILABLE IN THE UK

Enphase Envoy S

REVOLUTIONISING SOLAR STORAGE

Samsung SDI Storage

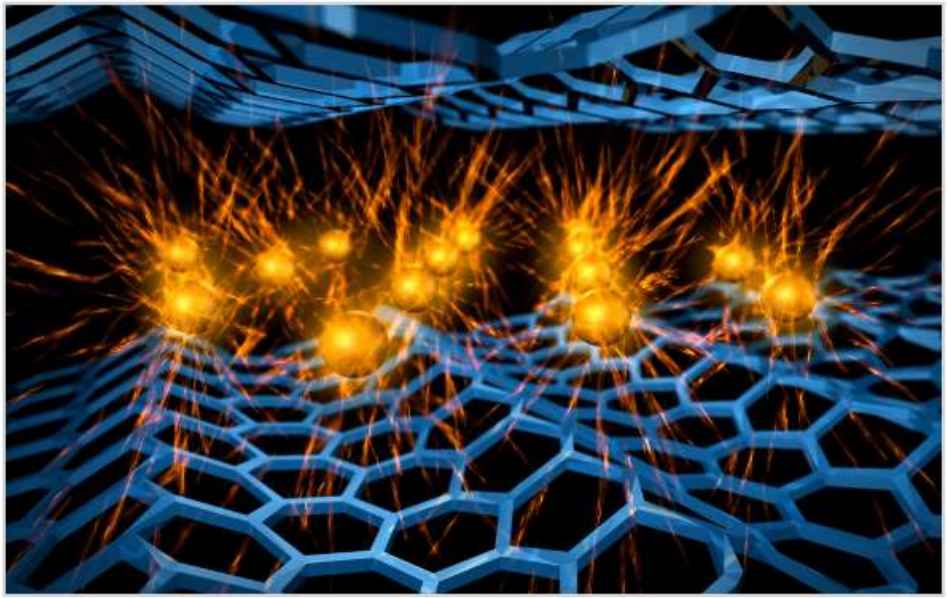
THE SMART ENERGY SOLUTION

Graphene as a Super Conductor

Graphene superconducting property discovered

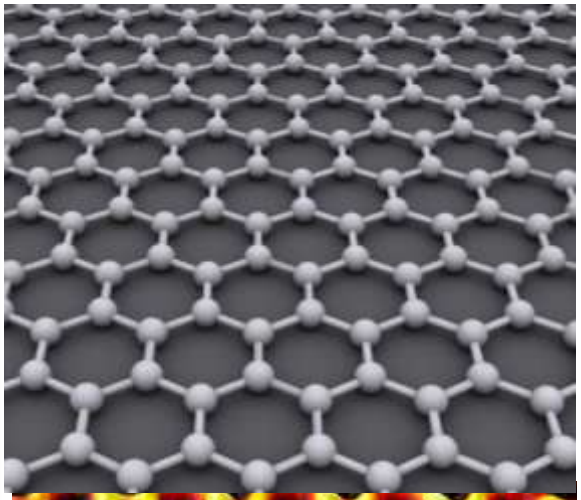
SLAC National Accelerator Laboratory see electrons dancing in superconducting material, setting a foundation for future explorations

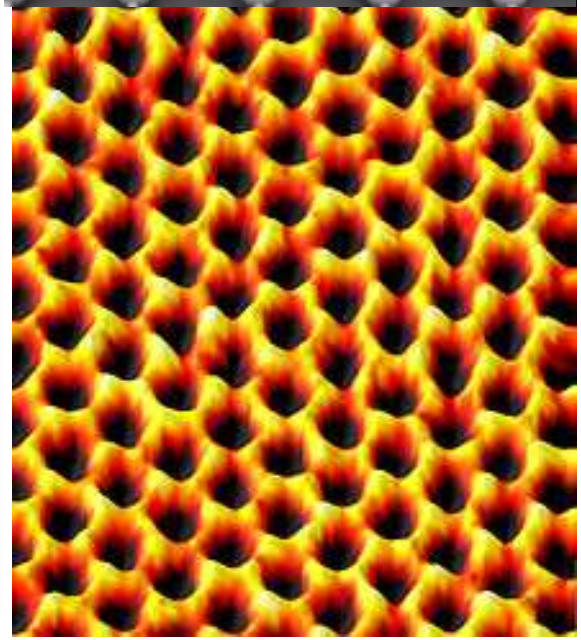
March 21, 2014



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 percen efficiency.





Graphene Battery Technology

This Graphene Batteries market report, brought to you by the world's leading graphene experts, is a comprehensive guide to graphene technologies for the batteries market. Graphene has the potential to enable high energy density batteries that are lighter and faster than current batteries on the market - leading to long range electric cars and long lasting mobile devices and it's no wonder that the industry is very excited about graphene materials.

Reading this report, you'll learn all about:

- ✔ The advantages of using graphene in batteries
- ✔ The different ways graphene can be used in batteries
- ✔ Various types of graphene materials
- ✔ What's on the market today

LWP says that an Al-graphene battery under development by the company offers 15% more power, 7.5 times the stored energy, eight times the range, and significantly shorter recharging time compared with lithium-ion batteries. The technology is still early-stage and under development, though.

HM Government Construction 2025 Strategy Plan – July 2013

HM Government

Industrial Strategy: government and industry in partnership

Construction 2025

July 2013

Working together, industry and Government have developed a clear and defined set of aspirations for UK construction.

It begins with a clear vision of where UK construction will be in 2025:

- **PEOPLE** An industry that is known for its talented and diverse workforce
- **SMART** An industry that is efficient and technologically advanced
- **SUSTAINABLE** An industry that leads the world in low-carbon and green construction exports
- **GROWTH** An industry that drives growth across the entire economy
- **LEADERSHIP** An industry with clear leadership from a Construction Leadership Council

This vision will provide the basis for the industry to exploit its strengths in the global market.

Lower costs

33%

reduction in the initial cost of construction and the whole life cost of built assets

Faster delivery

50%

reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Lower emissions

50%

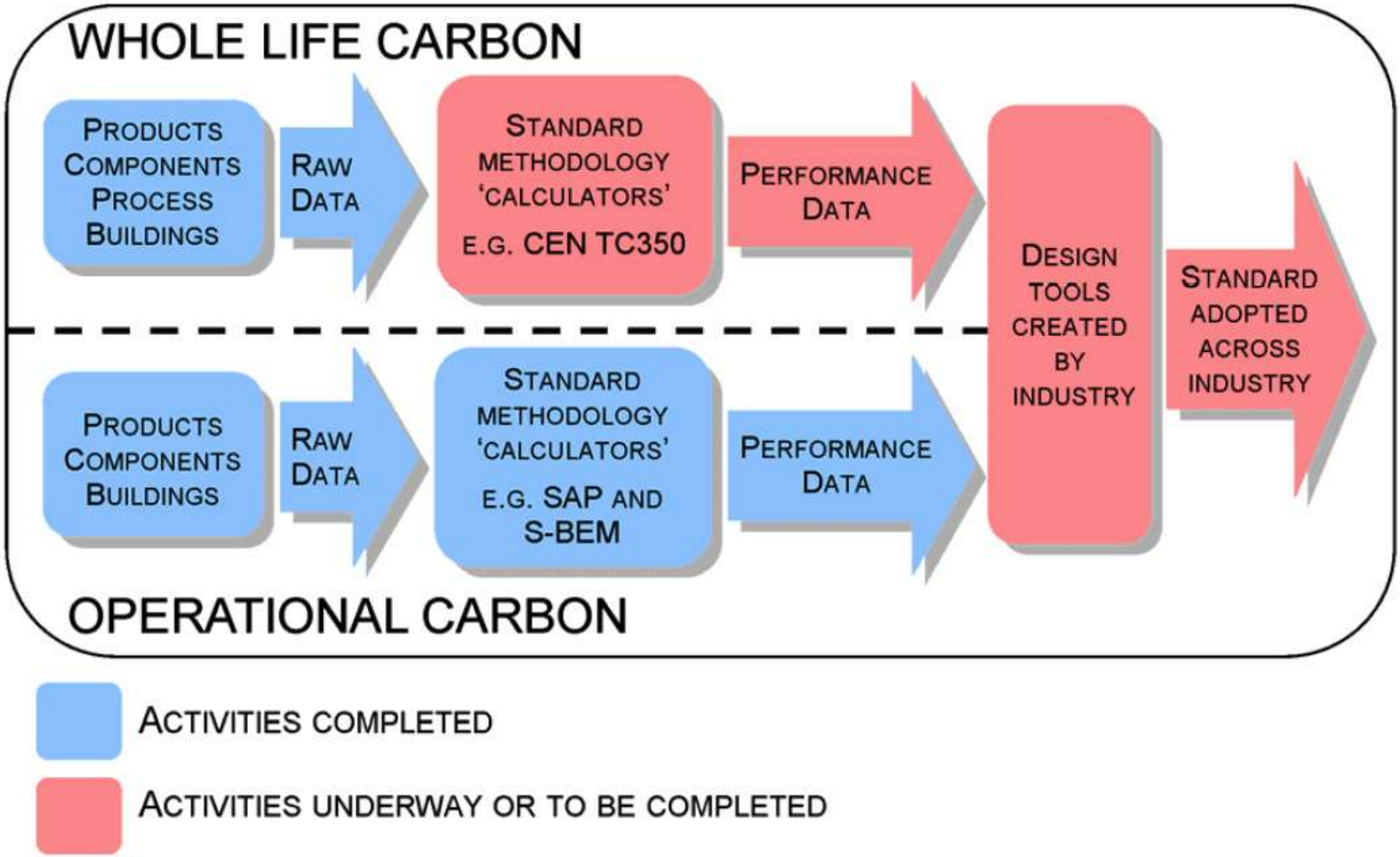
reduction in greenhouse gas emissions in the built environment

Improvement in exports

50%

reduction in the trade gap between total exports and total imports for construction products and materials

Developing Carbon Measurement Tools



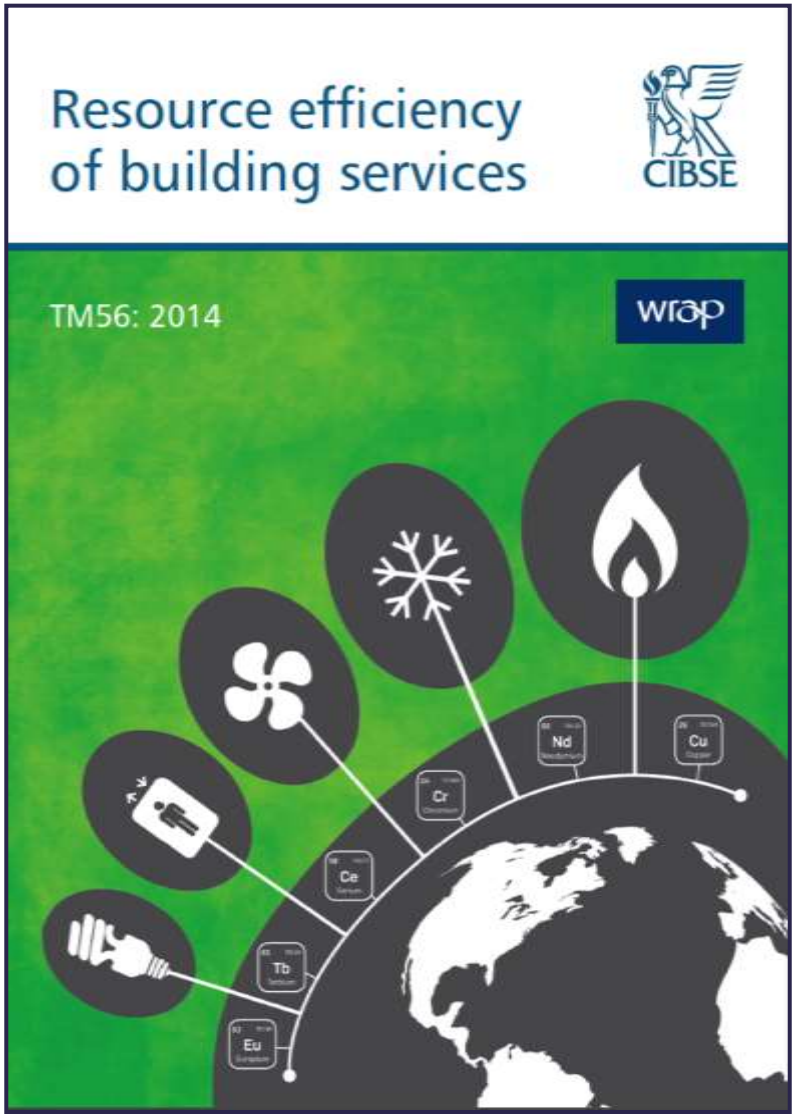
The CIBSE TM56 - 2014

The CIBSE Technical Memoranda is divided into three main parts.

1) **Explains resource efficiency**

2) **Sets out the key principles**

3) **Covers the opportunities for resource efficiency in:-**
   a. **Heating**
   b. **Cooling**
   c. **Ventilation**
   d. **Lighting**
   e. **Lifts and escalators**



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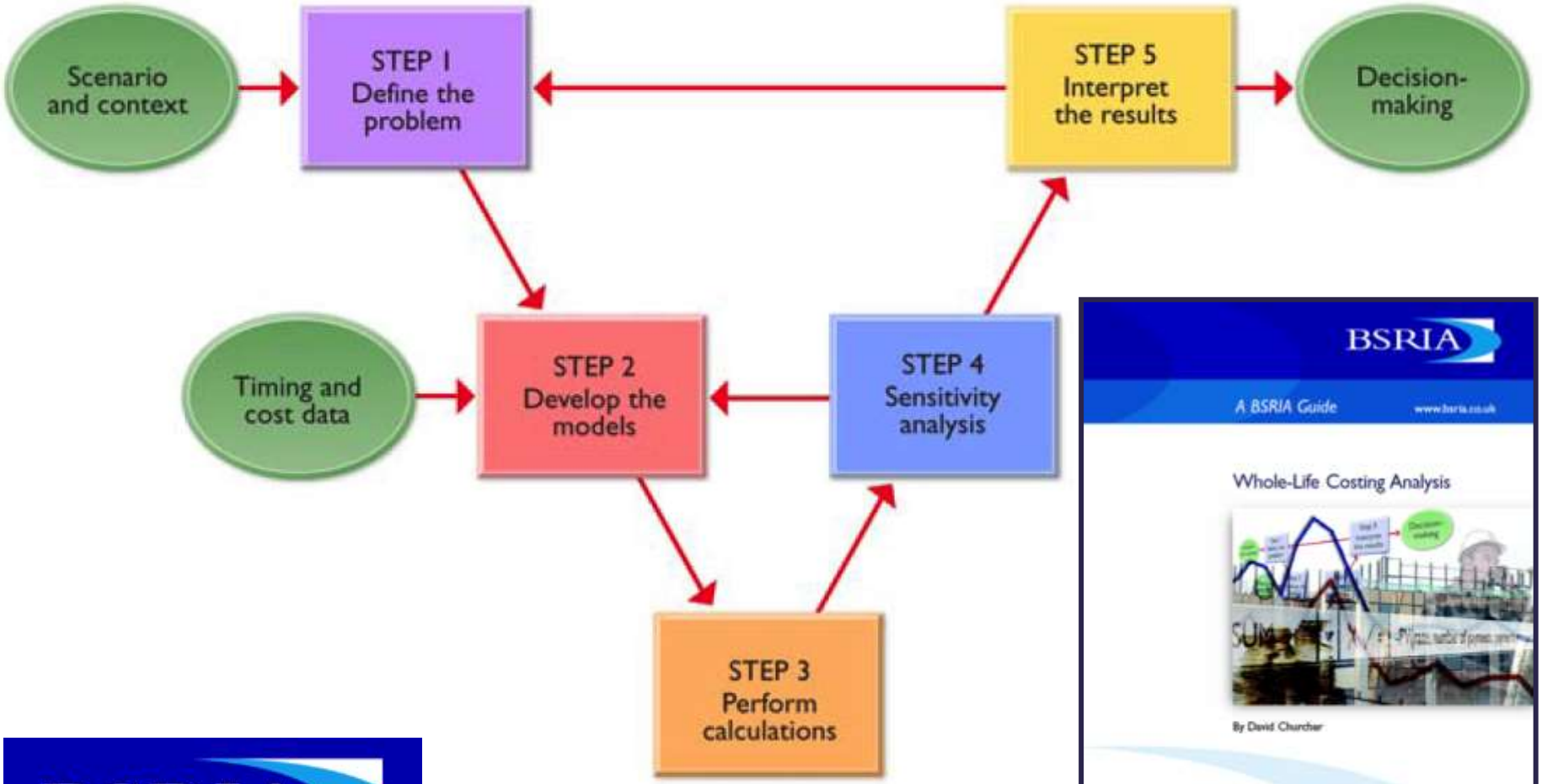
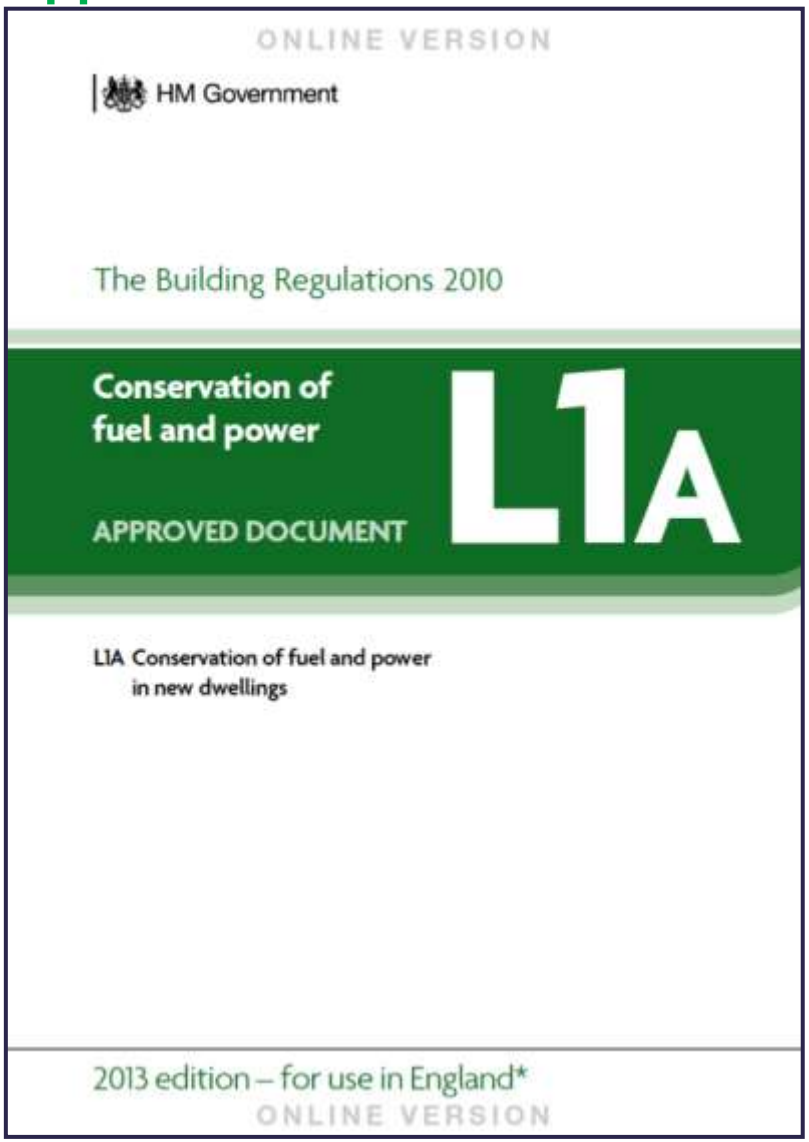
Whole-Life Cost Analysis



Approved Document L1A – 2013 Edition



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Main Changes to ADL1A 2013

The main changes in this approved document are that:

- A new requirement, regulation 26A, has been introduced that requires new dwellings to achieve or be

Fabric energy efficiency target introduced for new homes.

- The notional dwelling used to determine carbon dioxide and fabric energy efficiency targets is the same size and shape as the actual dwelling, constructed to a concurrent specification. The Part L

Part L 2013 Strengthened to deliver 6% carbon dioxide savings across the new homes building mix relative to Part L 2010.

cross the n

- A summary of the Part L 2013 notional dwelling is published at Table 4 in the Approved Document with the full detail in SAP 2012 Appendix R. If the actual dwelling is constructed entirely to the notional dwelling specifications it will meet the carbon dioxide and fabric energy efficiency targets and the limiting values for individual fabric elements and buildings services. Developers are however free to vary the specification, provided the same overall level of carbon dioxide emissions and fabric energy efficiency performance is achieved or bettered.
- The document consolidates the amendments made in December 2012 requiring the feasibility of high-efficiency alternative systems to be taken into account before construction commences.
- The guidance for insulation of circulation pipes within communal spaces is given greater prominence.
- The document is in a new style format and an index has been introduced.

Building Regulations Part L of Schedule 1

Requirement *Limits on application*

Schedule 1 – Part L Conservation of fuel and power

L1. Reasonable provision shall be made for the conservation of fuel and power in buildings by:

(a) limiting heat gains and losses–

(i) through thermal elements and other parts of the building fabric; and

(ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;

(b) providing fixed building services which–

(i) are energy efficient;

(ii) have effective controls; and

(iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

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New-Build Dwellings 2013: The Five Compliance Steps

1. Achieving the TER (Regulation 26) and the TFEE (Regulation 26A)

   Domestic Emission Rate (DER) ≤ Target Emission Rate (TER) and

   Dwelling Fabric Energy Efficiency (DFEE) ≤ Target Fabric Energy Efficiency (TFEE)

2. Limits on design flexibility

3. Limiting the effects of heat gains in summer

4. Building Performance Consistent with DER - Quality of construction & commissioning (Regulation 43 & 44)

5. Provisions for energy efficient operation of the dwelling - Providing information / O&M instructions (Regulation 40)

Consideration of High-efficiency Alterative Systems

Regulation 25A Consideration of high-efficiency alternative systems for new buildings

(1) Before construction of a new building starts, the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available—

(a) decentralised energy supply systems based on energy from

(b) cogeneration;

(c) district or block heating or cooling, particularly where it is based entirely or pa
renewable sources; and

(d) heat pumps.

Renewable Energy Sources

CHP or CCHP

District Heating

Heat Pumps

(2) The person carrying out the work must—

(a) not later than the beginning of the day before the day on which the work starts, give the local authority a notice which states that the analysis referred to in paragraph (1)—

(i) has been undertaken;

(ii) is documented; and

(iii) the documentation is available to the authority for verification purposes; and

(b) ensure that a copy of the analysis is available for inspection at all reasonable times upon request by an officer of the local authority.

(3) An authorised officer of the local authority may require production of the documentation in order to verify that this regulation has been complied with.

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Comparison of English and Welsh: Criteria 2 – Fabric Limits

Fabric elemental backstops have been updated in Wales for 2014

Whereas in Part L 2010 the limits were advisory, they are now mandatory for Part L 2014 in Wales.

The English Part L backstops continue to be advisory and same values as Part L 2010 for Part L 2013

Limiting Fabric Parameters			
		English 2013	Welsh 2014
Roof	W/m^2.K	**0.20**	**0.15**
External Wall	W/m^2.K	**0.30**	**0.21**
Floor	W/m^2.K	**0.25**	**0.18**
Party Wall	W/m^2.K	**0.20**	**0.20**
Windows, doors, curtain walling	W/m^2.K	**2.0**	**1.60**
Air permeability	m^3/hr.m^{-2} @50Pa	**10**	**10**

Criterion 4 - Air Permeability and Pressure Testing - 2013

43.– Pressure testing

(1) This regulation applies to the erection of a building in relation to which paragraph L1(a)(i) of Schedule 1 imposes a requirement.

(2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with regulation 26 and paragraph L1(a)(i) of Schedule 1:

a. ensure that:

i. pressure testing is carried out in such circumstances as are approved by the Secretary of State; and

ii. the testing is carried out in accordance with a procedure approved by the Secretary of State; and

b. subject to paragraph (5), give notice of the results of the testing to the local authority.

(3) The notice referred to in paragraph (2)(b) shall:

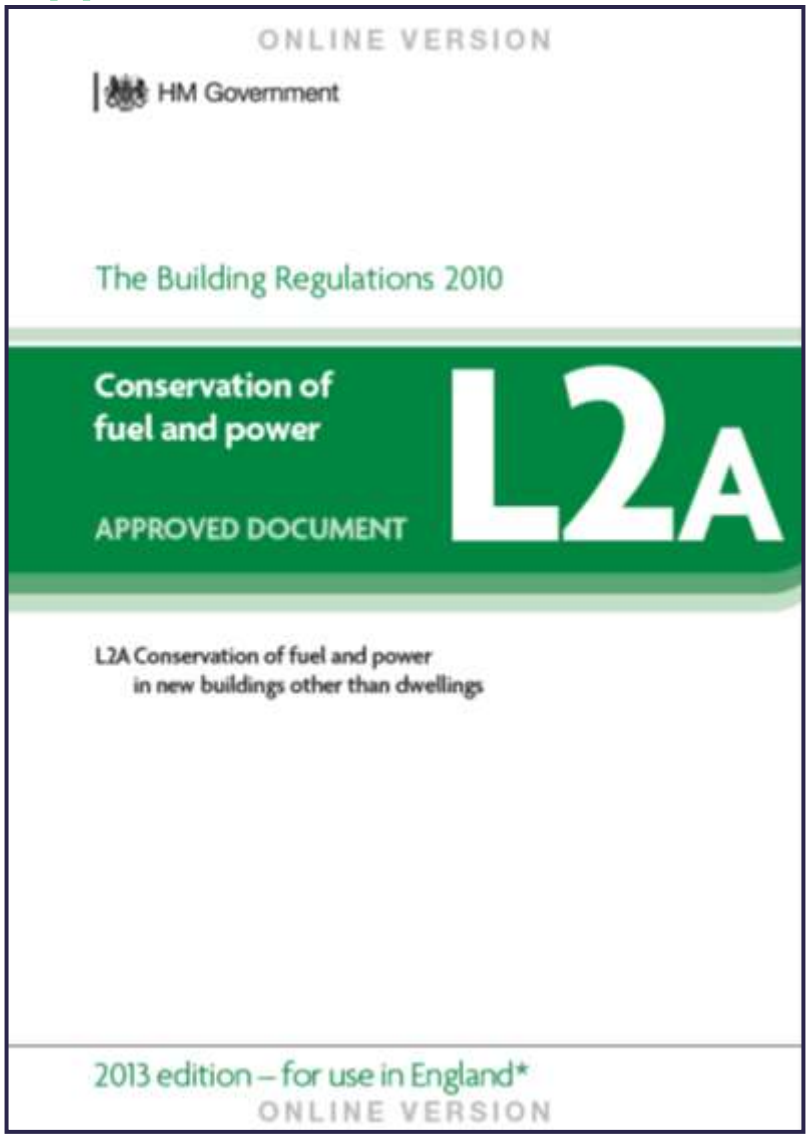
a. record the results and the data upon which they are based in a manner approved by the Secretary of State; and

b. be given to the local authority not later than seven days after the final test is carried out.

(4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the British Institute of Non-destructive Testing or the Air Tightness and Testing and Measuring Association in respect of pressure testing for the air tightness of buildings.

(5) Where such a certificate contains the information required by paragraph (3)(a), paragraph (2)(b) does not apply.

Approved Document L2A – 2013 Edition



Main Changes to Approved Document L2A 2013

- The notional building used to determine carbon dioxide targets is the same size and shape as the actual building, constructed to a concurrent specification. The Part L 2013 specifications have bee ding mix

Part L 2013 Strengthened to deliver 9% carbon dioxide savings across the new non-domestic building mix relative to Part L 2010.

- A wider set of notional buildings has now been defined for top-lit, side-lit (heated only) and side-lit (heated and cooled) buildings. The notional building air permeability has been further sub-divided by size.
- A summary of the Part L 2013 notional buildings is published at Table 5 in the Approved Document with the full detail in the *National Calculation Modelling (NCM) Guide*. If the actual building is constructed entirely to the notional building specifications it will meet the carbon dioxide targets and the limiting fabric and buildings services parameters. Developers are however free to vary the specification, provided the same overall level of carbon dioxide emissions is achieved or bettered.
- The document consolidates the amendments made in December 2012 requiring the feasibility of high-efficiency alternative systems to be taken into account before construction commences.
- The document is in a new style format and an index has been introduced.

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Five Criteria for Part L2A Compliance 2013 in England

1. **Building Emission Rate ≤ Target Emission Rate (Regulation 26)**
2. **Limits on design flexibility**
3. **Limiting the effects of solar gains in summer**
4. **Quality of construction & commissioning (Regulation 43 & 44)**
5. **Providing information / O&M instructions (Regulation 40)**

Limiting Fabric Parameters in ADL2A 2013

Table 3 Limiting fabric parameters	
Roof	0.25 W/m².K
Wall	0.35 W/m².K
Floor	0.25 W/m².K
Swimming pool basin[1]	0.25 W/m².K
Windows, roof windows, roof-lights[4], curtain walling and pedestrian doors[2,3]	2.2 W/m².K
Vehicle access and similar large doors	1.5 W/m².K

Notes:

1. Where a swimming pool is constructed as part of a new building, reasonable provision should be made to limit heat loss from the pool basin by achieving a U-value no worse than 0.25 W/m².K as calculated according to BS EN ISO 13370.
2. Excluding display windows and similar glazing. There is no limit on design flexibility for these exclusions but their impact on CO_2 emissions must be taken into account in calculations.
3. In buildings with high internal heat gains, a less demanding area weighted average U-value for the glazing may be an appropriate way of reducing overall CO_2 emissions and hence the BER. If this case can be made, then the average U-value for windows can be relaxed from the values given above. However, values should be no worse than 2.7 W/m².K.
4. For the purposes of checking compliance with the limiting fabric values for roof-lights, the true U-value based on aperture area can be converted to the U-value based on the developed area of the roof-light. Further guidance on evaluating the U-value of out-of-plane roof-lights is given in Assessment of thermal performance of out-of-plane roof-lights, NARM Technical Document NTD 2 (2010).

Energy Meters in ADL2A 2013

Energy meters

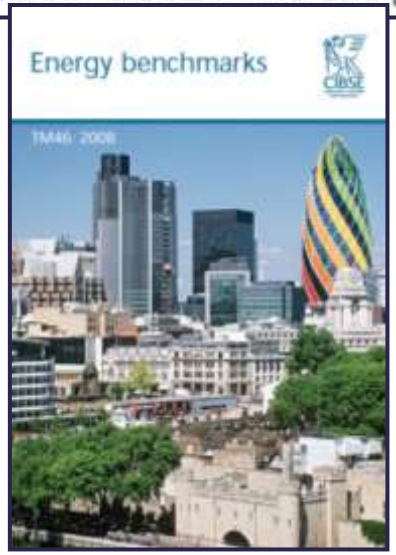
2.47 Reasonable provision for energy meters would be install energy metering systems that enable:

a. at least 90 per cent of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories (heating, lighting etc.). Detailed guidance on how this can be achieved is given in *CIBSE TM39 Building energy metering*; and

b. the output of any renewable system to be separately monitored; and

c. in buildings with a total useful floor area greater than 1000m², automatic meter reading and data collection facilities.

2.48 The metering provisions should be designed such as to facilitate the benchmarking of energy performance as set out in *CIBSE TM46 Energy benchmarks*.



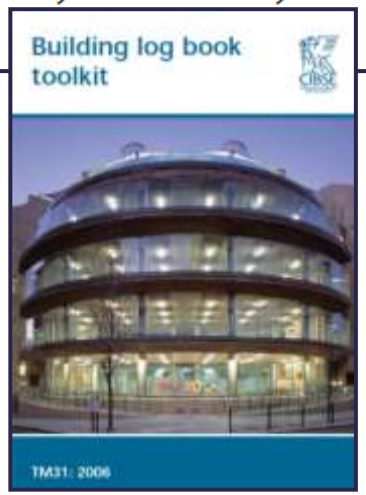
Building Log Books – CIBSE TM31 and BSRIA BG26/2011

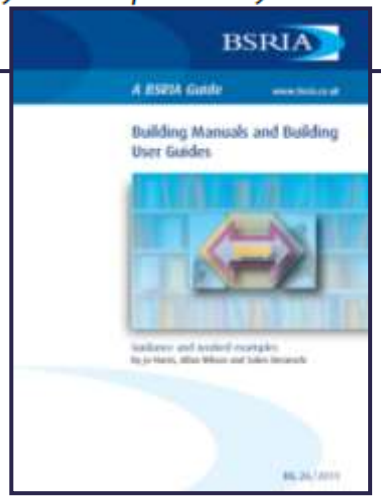
4.2 A way of showing compliance with regulation 40 would be to produce information following the guidance in *CIBSE TM 31 Building log book toolkit*. The information should be presented in templates as or similar to those in the TM. The information could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the CDM Regulations.

NOTE: *Further advice is provided in BSRIA BG26/2011 Building Manuals and Building User Guides.*

4.3 The data used to calculate the TER and the BER should be included with the log book. The occupier should also be provided with the recommendations report generated with the 'on-construction' Energy Performance Certificate. This will inform the occupier how the energy performance of the building might be further improved.

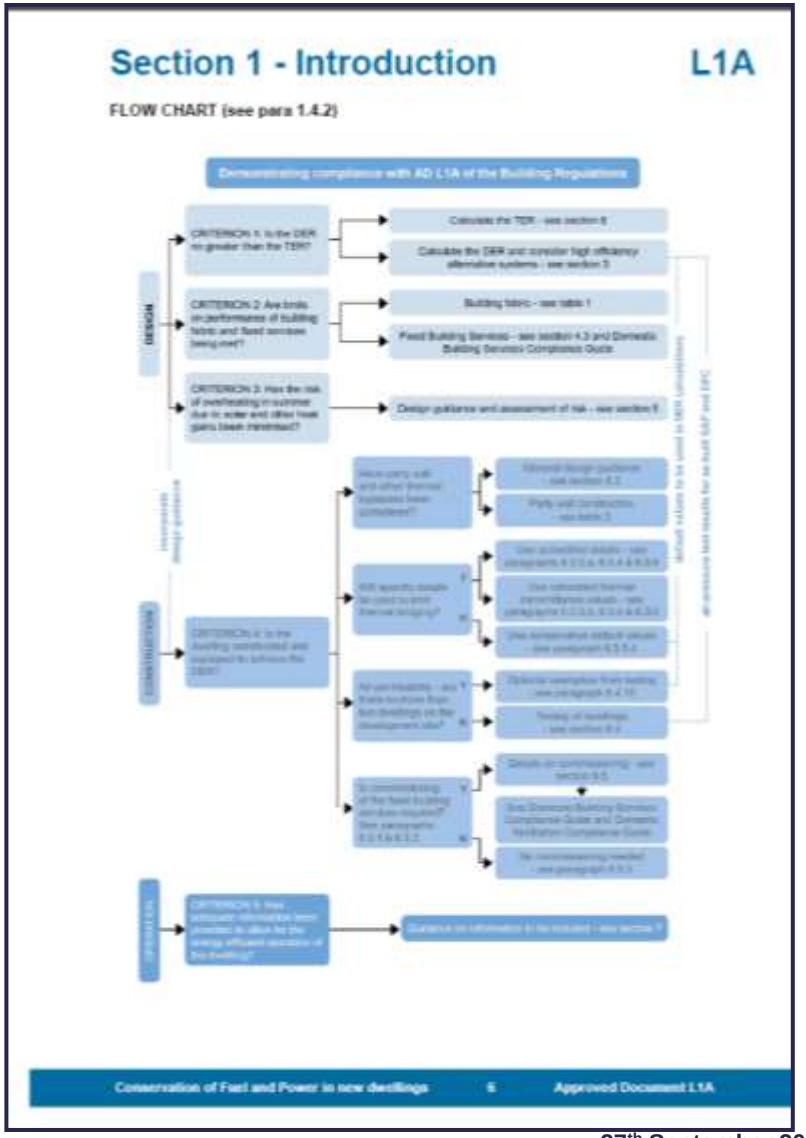
NOTE: *It would also be sensible to retain an electronic copy of the TER/BER input file for the energy calculation to facilitate any future analysis that may be required by the owner when altering or improving the building.*



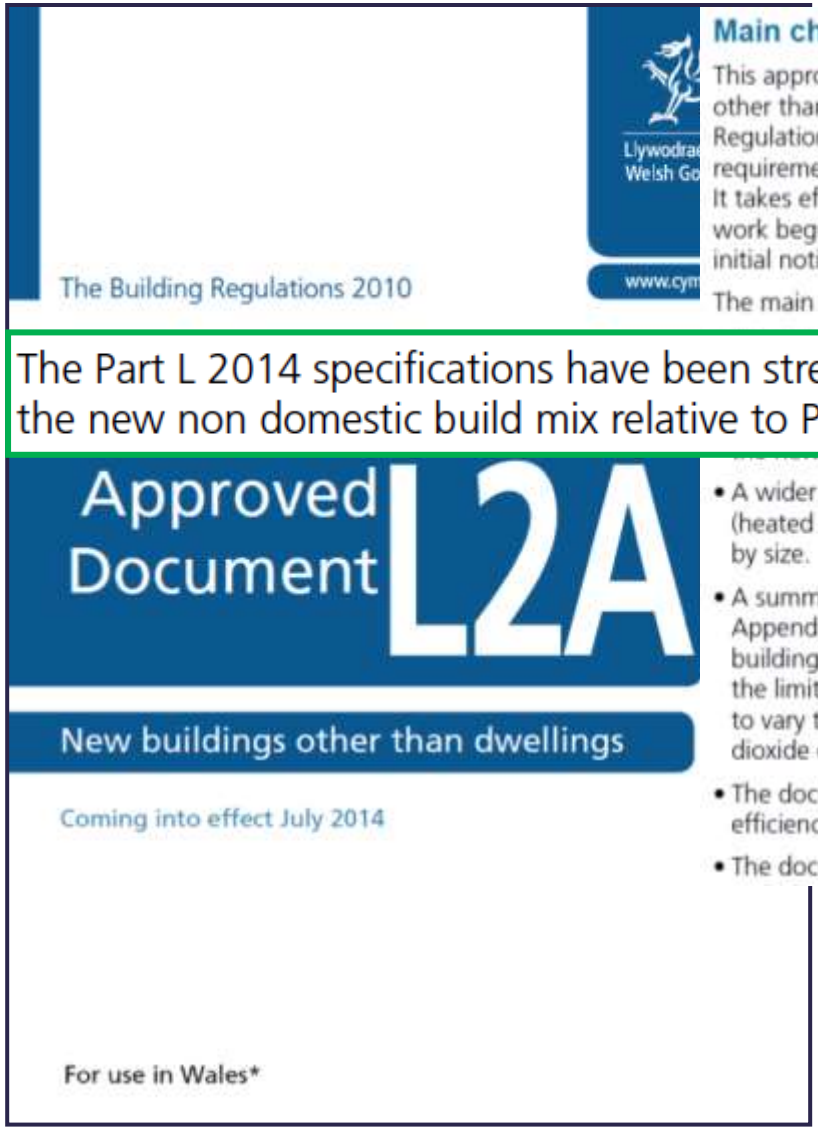


Welsh Part L 2014 Building Regulations

Welsh ADL1A 2014 – New Dwellings



Welsh ADL2A 2014 – New Buildings Other Than Dwellings



Main changes in the 2014 edition

This approved document, Approved Document L2A: Conservation of fuel and power in new buildings other than dwellings supports the energy efficiency requirements of the Building Regulations. Regulation 2(1) of the Building Regulations defines the energy efficiency requirements as the requirements of regulations 23, 25A, 25B, 26, 26A, 26B, 28, 29 and 40 and Part L of schedule 1. It takes effect on 31 July 2014 and is for use in Wales*. The 2010 edition will continue to apply to work begun before 31 July 2014, or to work subject to a building notice, full plans application or initial notice submitted before 31 July 2014.

The main changes in the approved document are that:

The Part L 2014 specifications have been strengthened to deliver 20% carbon dioxide savings across the new non domestic build mix relative to Part L 2010.

- A wider set of notional buildings has now been defined for top-lit, side-lit (heated only) and side-lit (heated and cooled) buildings. The notional building air permeability has been further sub-divided by size.
- A summary of the Part L 2014 elemental specification of these notional buildings is published at Appendix B in the Approved Document. If the actual building is constructed entirely to the notional building specifications it will meet the carbon dioxide and primary energy consumption targets and the limiting values for individual fabric elements and building services. Developers are however free to vary the specification, provided the same overall level of primary energy consumption and carbon dioxide emissions is achieved or bettered.
- The document consolidates the amendments made in SI 2013/747 requiring the feasibility of high efficiency alternative systems to be taken into account before construction commences.
- The document is in a new style format.

Welsh Regulations 26 and 26A

Regulation 26 – CO_2 emission rates for new buildings

Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25.

Regulation 26A – Primary energy consumption rates for new buildings

Where a building (other than a dwelling) is erected, it must not exceed the target primary energy consumption rate for the building which has been approved pursuant to regulation 25C (a).

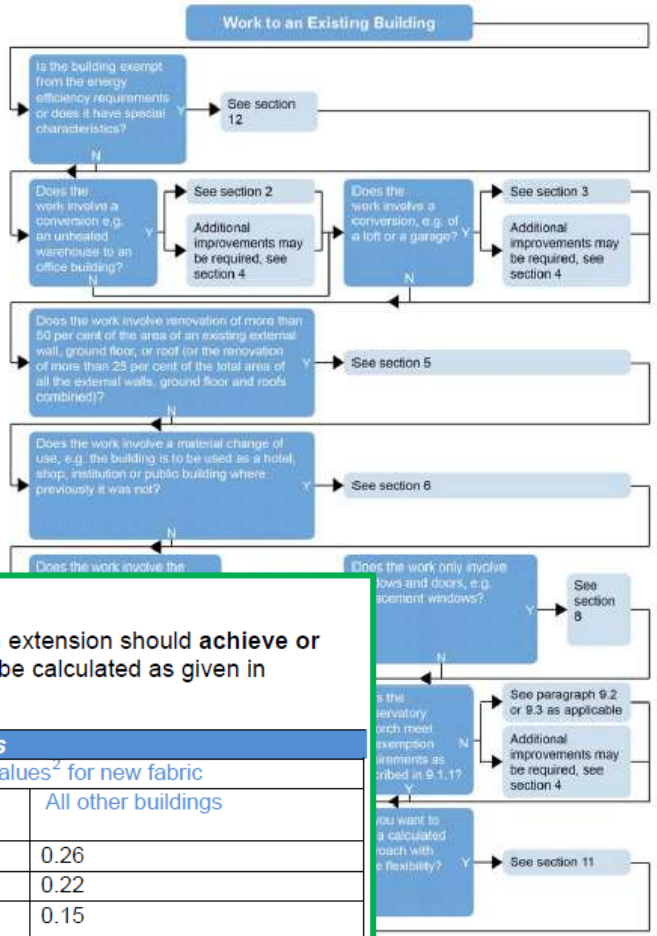
3.1.1 Criterion 1 is a mandatory requirement and must be met by all new buildings as stated.

3.1.2 To comply with ***regulation 26A and regulation 26*** it will need to be demonstrated that:

a. the calculated ***Building Primary Energy Consumption (BPEC)*** rate does not exceed the ***Target Primary Energy Consumption (TPEC);*** and
b. the calculated ***Building CO_2 Emissions Rate (BER)*** rate does not exceed the ***Target CO_2 Emissions Rate (TER)***

3.1.3 This section focuses on the calculation of the ***BPEC*** and the ***BER***. Details of how the ***TPEC*** and ***TER*** are calculated are set out in Section 8. Special considerations for specific building categories are given in sections 3.7 to 3.10.

Welsh ADL2B -2014 – Existing Buildings Other Than Dwellings



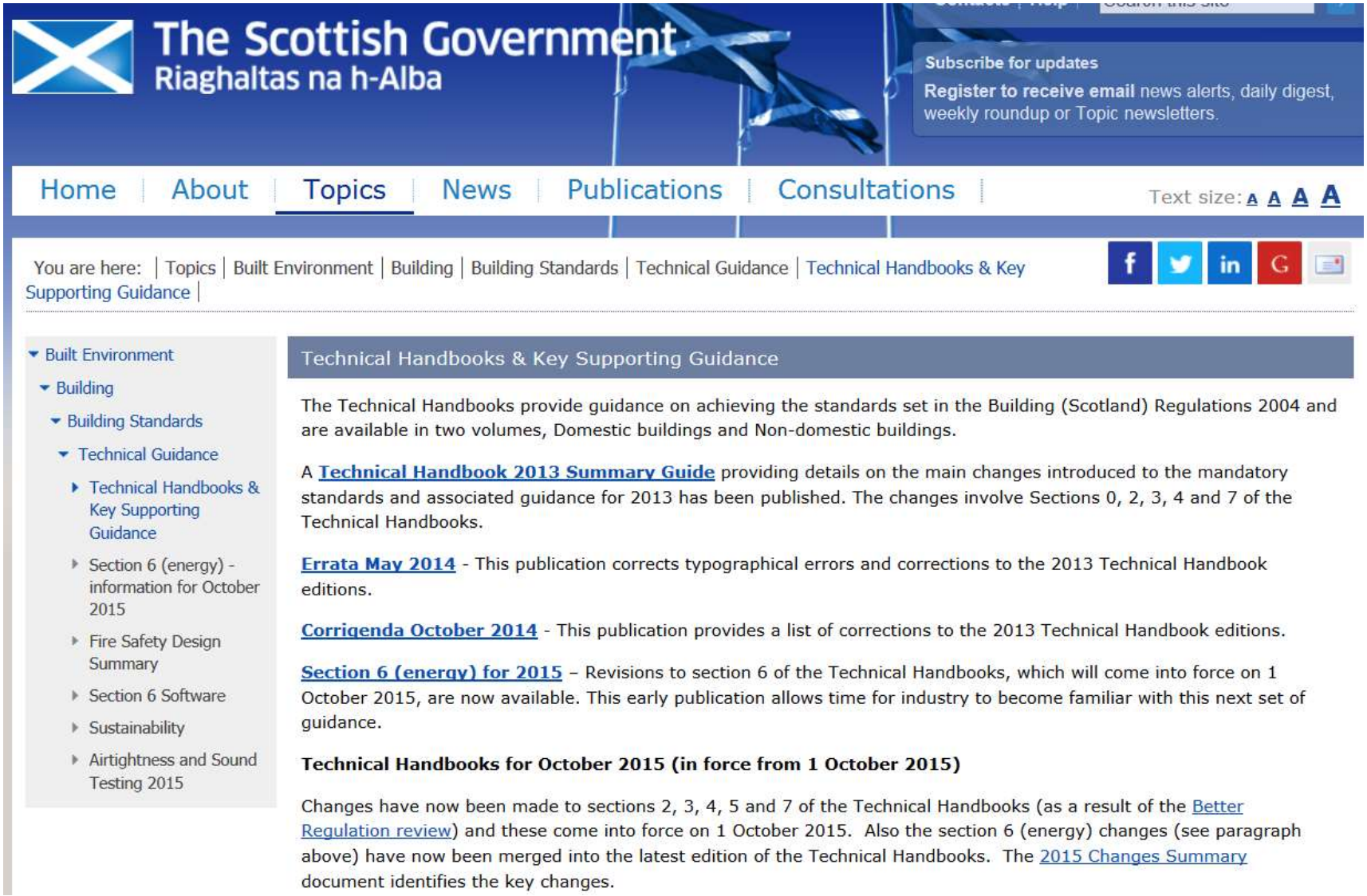
2.2 Building Fabric

2.2.1 New ***thermal elements*** constructed as part of an extension should **achieve or better** the U-values set out in Table 1. U-values should be calculated as given in Appendix C.

Table 1: U-values (W/m^2.K) for new *thermal elements*

Elements[1]	Maximum U-values[2] for new fabric	
	Buildings that are essentially domestic in character[3]	All other buildings
Wall	0.21	0.26
Floors[4]	0.18	0.22
Pitched roofs – insulation at ceiling level	0.15	0.15
Pitched roofs – insulation at rafter level	0.15	0.18
Flat roof or roof with integral insulation	0.15	0.18
Swimming pool basin	0.25	0.25

Scottish Technical Handbooks – Section 6



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    - Building Standards
      - Technical Guidance
        - Technical Handbooks & Key Supporting Guidance
        - Section 6 (energy) - information for October 2015
        - Fire Safety Design Summary
        - Section 6 Software
        - Sustainability
        - Airtightness and Sound Testing 2015

Technical Handbooks & Key Supporting Guidance

The Technical Handbooks provide guidance on achieving the standards set in the Building (Scotland) Regulations 2004 and are available in two volumes, Domestic buildings and Non-domestic buildings.

A **Technical Handbook 2013 Summary Guide** providing details on the main changes introduced to the mandatory standards and associated guidance for 2013 has been published. The changes involve Sections 0, 2, 3, 4 and 7 of the Technical Handbooks.

Errata May 2014 - This publication corrects typographical errors and corrections to the 2013 Technical Handbook editions.

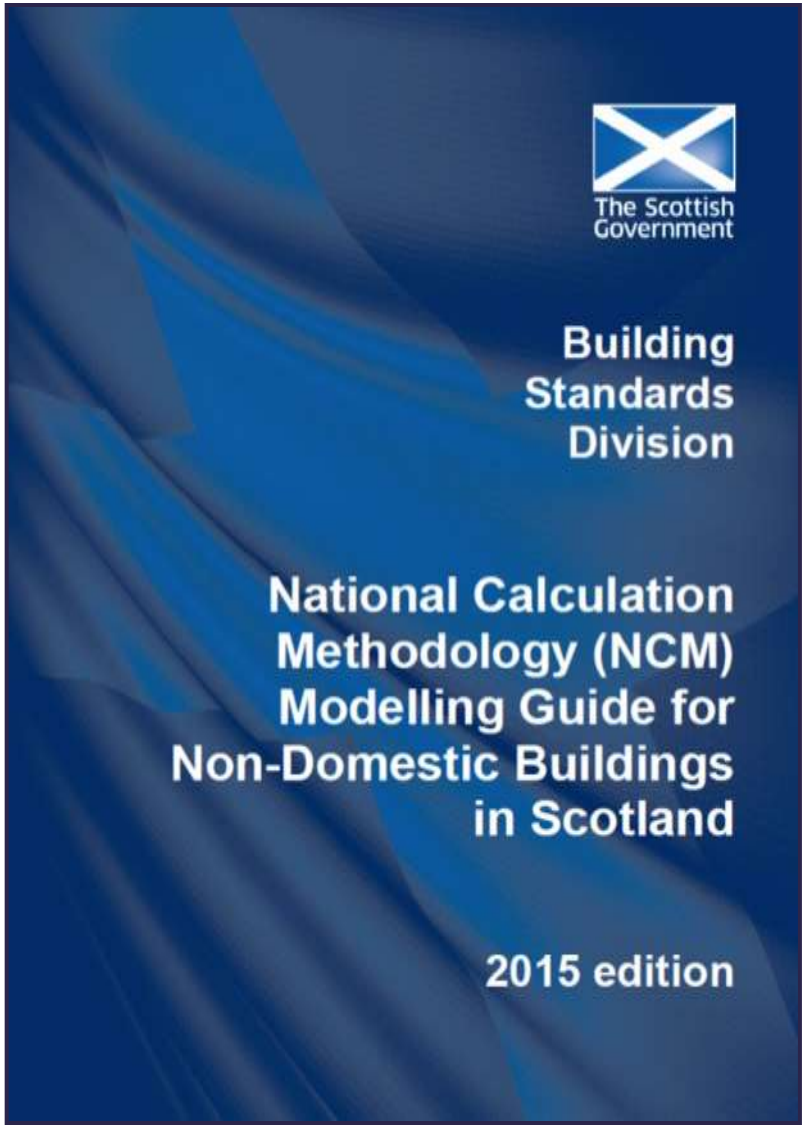
Corrigenda October 2014 - This publication provides a list of corrections to the 2013 Technical Handbook editions.

Section 6 (energy) for 2015 – Revisions to section 6 of the Technical Handbooks, which will come into force on 1 October 2015, are now available. This early publication allows time for industry to become familiar with this next set of guidance.

Technical Handbooks for October 2015 (in force from 1 October 2015)

Changes have now been made to sections 2, 3, 4, 5 and 7 of the Technical Handbooks (as a result of the Better Regulation review) and these come into force on 1 October 2015. Also the section 6 (energy) changes (see paragraph above) have now been merged into the latest edition of the Technical Handbooks. The 2015 Changes Summary document identifies the key changes.

Scottish NCM – 2015 Edition



Building fabric

33. The U-values in the notional building must be as specified in Table 1. Taking into account guidance in BR 443[8], all U-values should be calculated in accordance with BS EN ISO 6946: 2007, where the U-values calculation methods are inclusive of repeating thermal bridges.

Table 1: U-values of construction elements in the notional building (W/m².K)

Element	Heated and naturally ventilated	Heated and cooled or Heated and mechanically ventilated
Roofs	0.18	0.16
Walls	0.23	0.20
Floors	0.22	0.2
Windows	1.8	1.6
Roof-lights	1.8	1.8
External personnel doors	2.0	2.0
Vehicle access and similar large doors	1.5	1.5
Internal walls	0.48	0.48
Internal windows	3.85	3.85
Internal ceilings	1.00	1.00

Notes:

Any part of a roof having a pitch greater or equal to 70° is considered as a wall.

U-value of rooflights is the overall U-value including the frame and edge effects, and also relates to adjustment for slope as detailed in section 11.1 of BR443.

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GSL and BIM are Linked

Government Soft Landings (GSL)

Thank you for visiting the Government Soft Landings (GSL) micro-site.

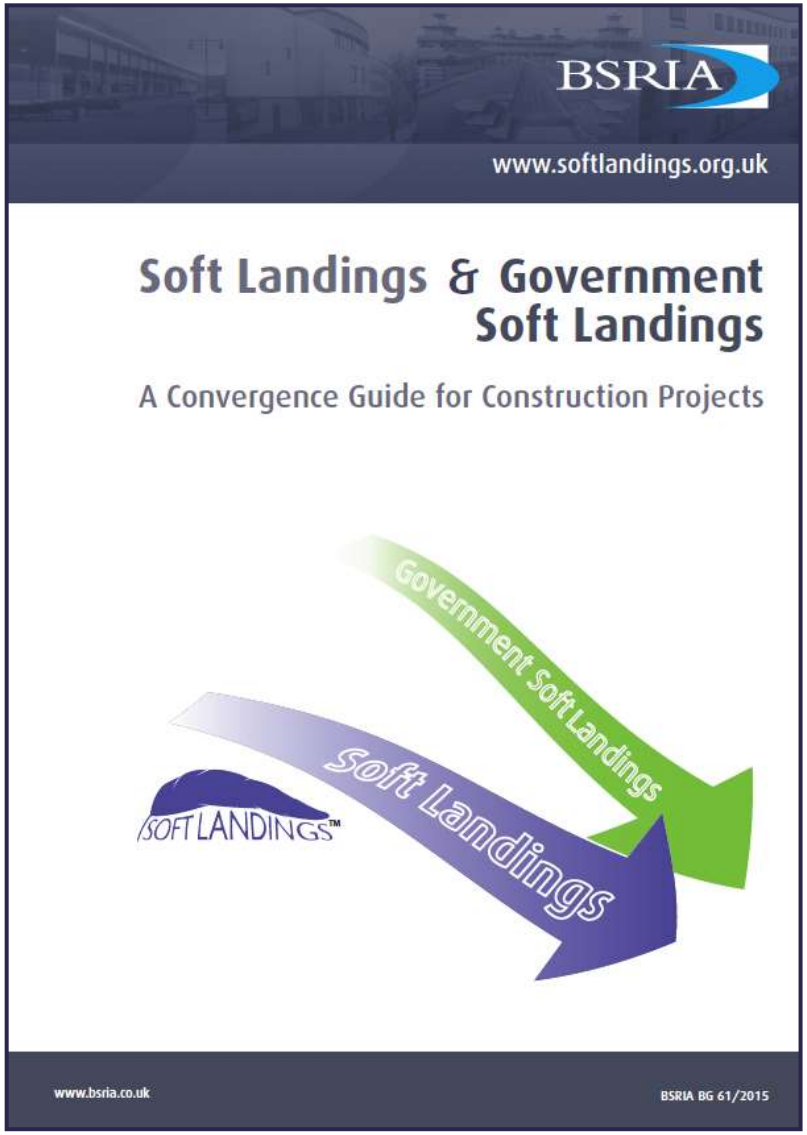
This site will provide you with an overview of GSL and how it works. It will be updated to support your implementation of GSL.

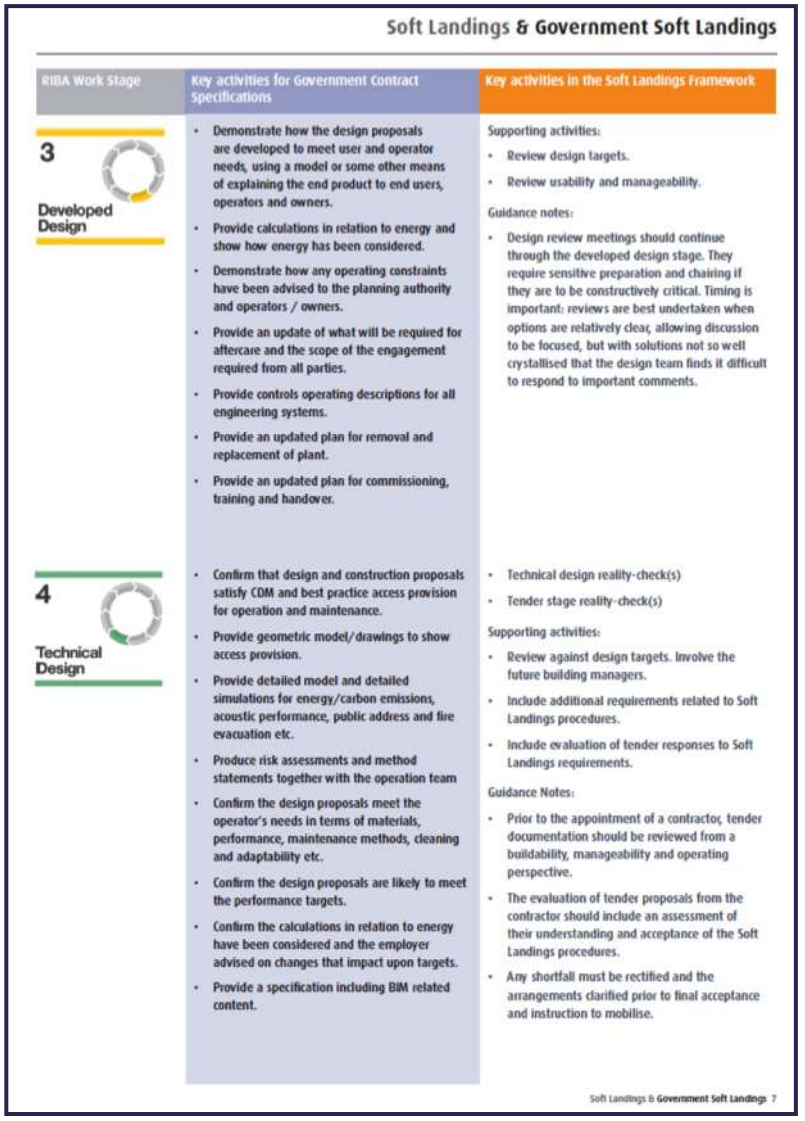
The Government objective is to champion better outcomes for our built assets during the design and construction stages through Government Soft Landings (GSL) powered by a Building Information Model (BIM) to ensure that value is achieved in the operational lifecycle of an asset.

Government Soft Landings

- Home – GSL
- GSL Policy
- GSL Summary
- FAQs
- Early Adopters
- Standard Presentation
- Department Implementation Brief
- Department Guidance Documents
- Links
- Contacts

Soft Landings and Government Soft Landings





Soft Landings & Government Soft Landings

RIBA Work Stage	Key activities for Government Contract Specifications	Key activities in the Soft Landings Framework
3 Developed Design	• Demonstrate how the design proposals are developed to meet user and operator needs, using a model or some other means of explaining the end product to end users, operators and owners. • Provide calculations in relation to energy and show how energy has been considered. • Demonstrate how any operating constraints have been advised to the planning authority and operators / owners. • Provide an update of what will be required for aftercare and the scope of the engagement required from all parties. • Provide controls operating descriptions for all engineering systems. • Provide an updated plan for removal and replacement of plant. • Provide an updated plan for commissioning, training and handover.	Supporting activities: • Review design targets. • Review usability and manageability. Guidance notes: • Design review meetings should continue through the developed design stage. They require sensitive preparation and chairing if they are to be constructively critical. Timing is important: reviews are best undertaken when options are relatively clear, allowing discussion to be focused, but with solutions not so well crystallised that the design team finds it difficult to respond to important comments.
4 Technical Design	• Confirm that design and construction proposals satisfy CDM and best practice access provision for operation and maintenance. • Provide geometric model/drawings to show access provision. • Provide detailed model and detailed simulations for energy/carbon emissions, acoustic performance, public address and fire evacuation etc. • Produce risk assessments and method statements together with the operation team • Confirm the design proposals meet the operator's needs in terms of materials, performance, maintenance methods, cleaning and adaptability etc. • Confirm the design proposals are likely to meet the performance targets. • Confirm the calculations in relation to energy have been considered and the employer advised on changes that impact upon targets. • Provide a specification including BIM related content.	• Technical design reality-check(s) • Tender stage reality-check(s) Supporting activities: • Review against design targets. Involve the future building managers. • Include additional requirements related to Soft Landings procedures. • Include evaluation of tender responses to Soft Landings requirements. Guidance Notes: • Prior to the appointment of a contractor, tender documentation should be reviewed from a buildability, manageability and operating perspective. • The evaluation of tender proposals from the contractor should include an assessment of their understanding and acceptance of the Soft Landings procedures. • Any shortfall must be rectified and the arrangements clarified prior to final acceptance and instruction to mobilise.

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Scottish BIM Implementation Plan

BIM Roadmap & Soft Landings Activities

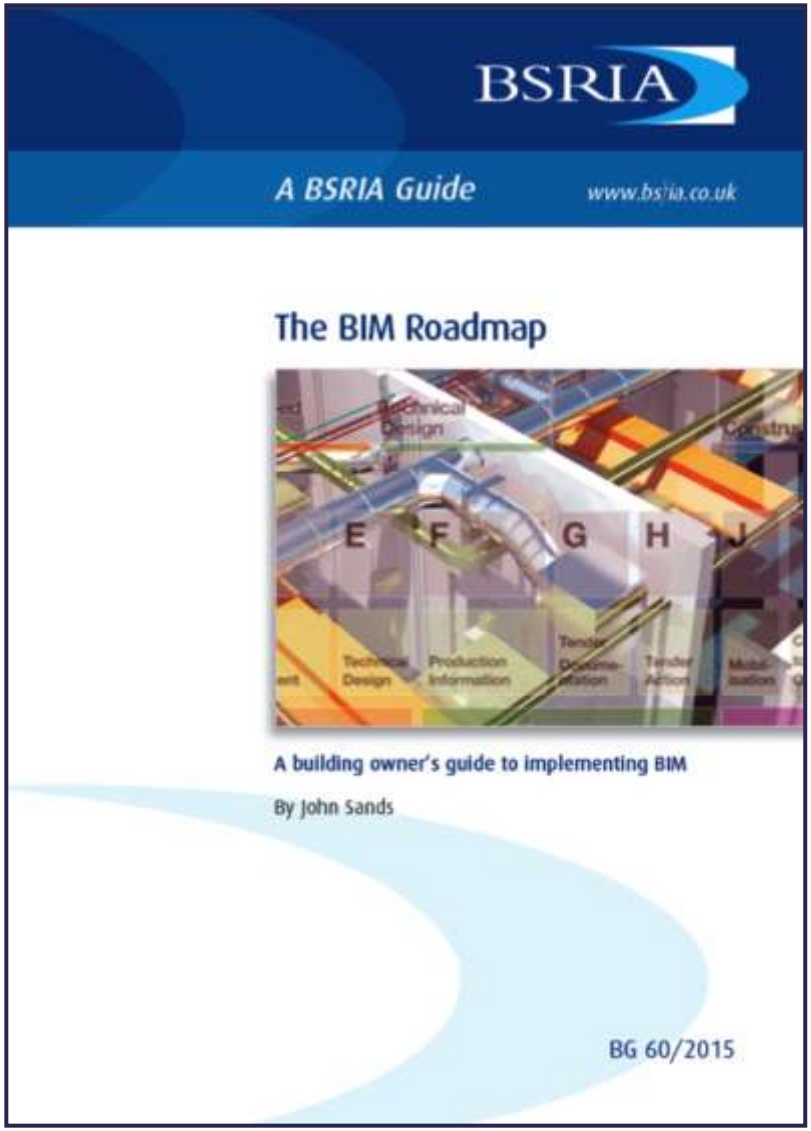
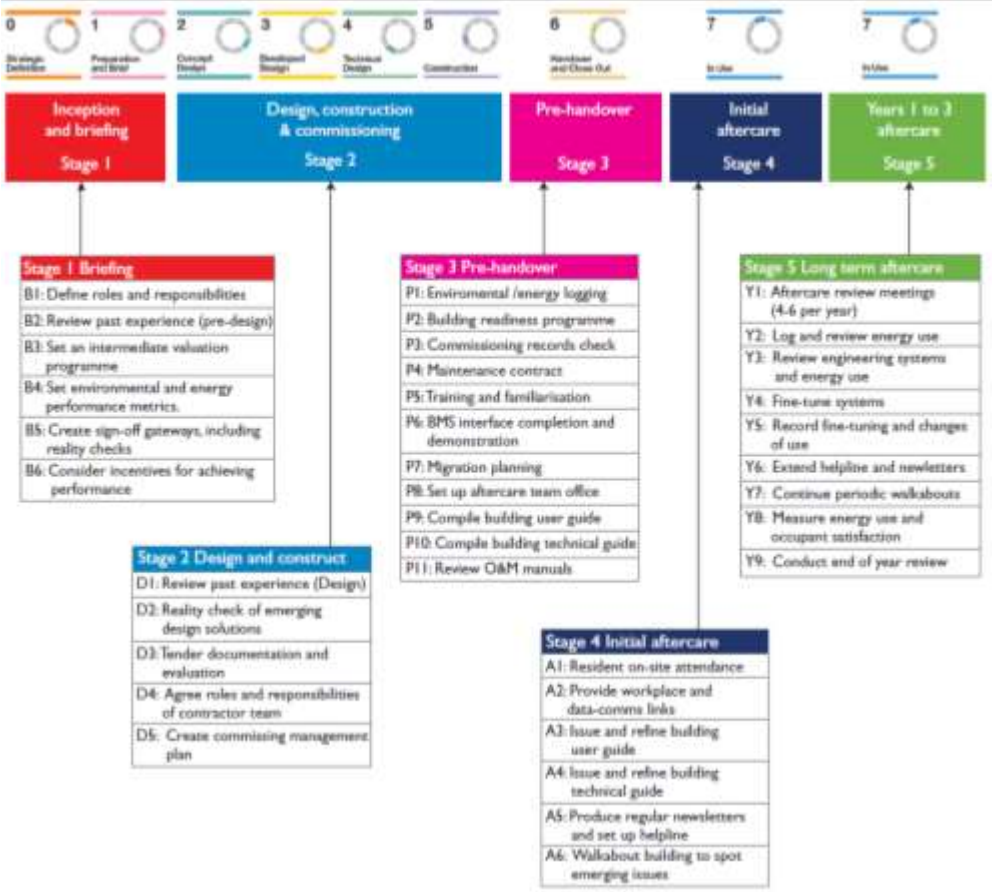


Figure 6: Soft Landings activities related to the RIBA Plan of Work



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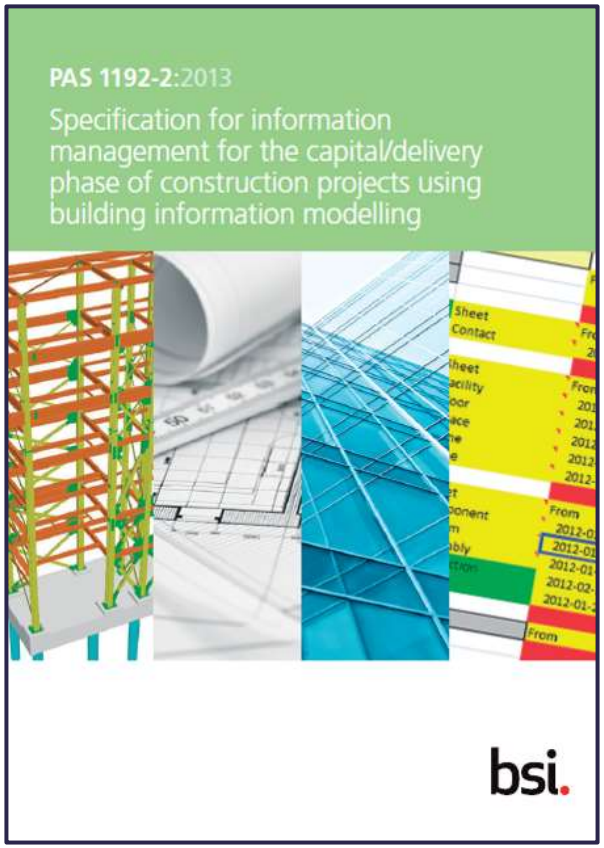
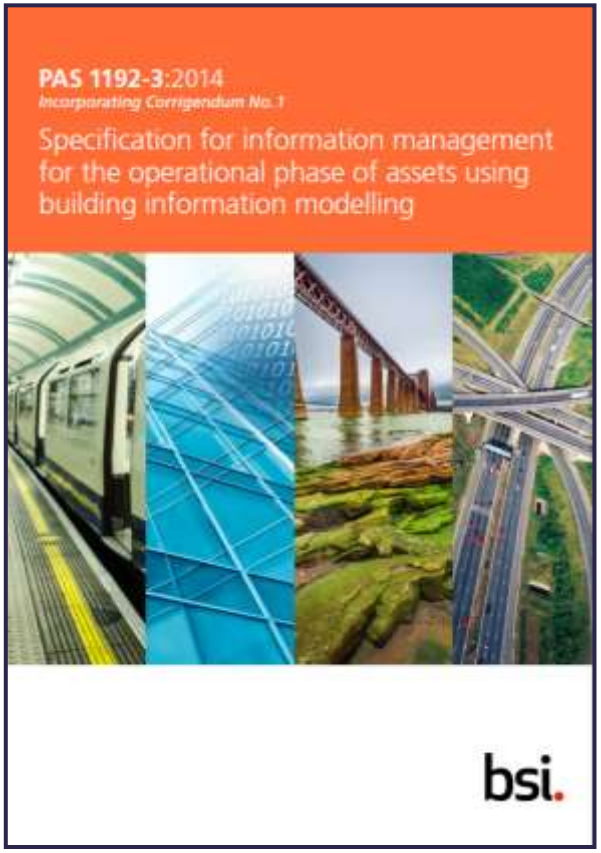
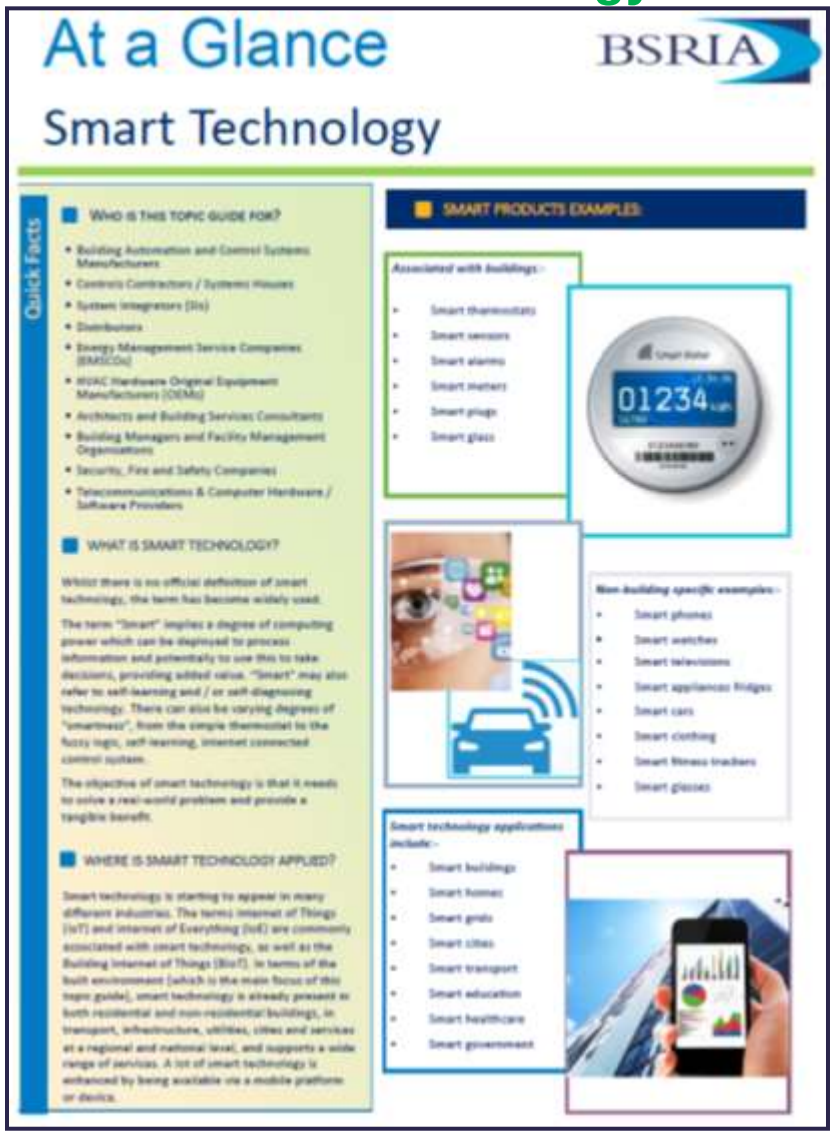
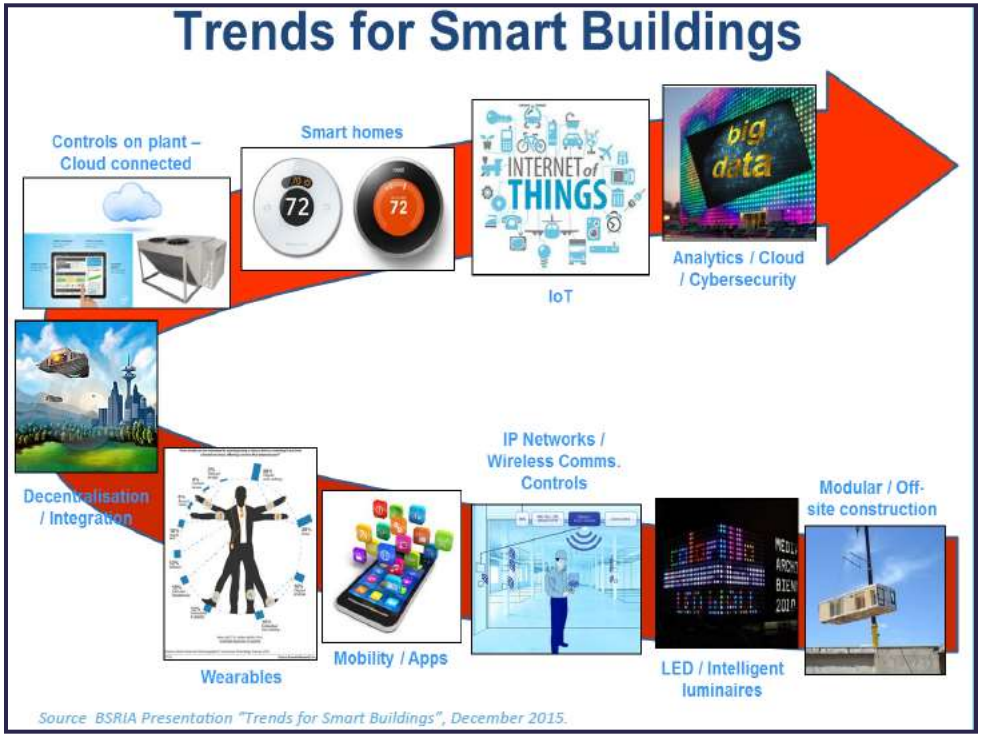
PAS 1192-2:2013, PAS 1192-3:2014 and PAS 1192-5:2015





BSRIA Smart Technology at a Glance





BSRIA – Smart Evolution

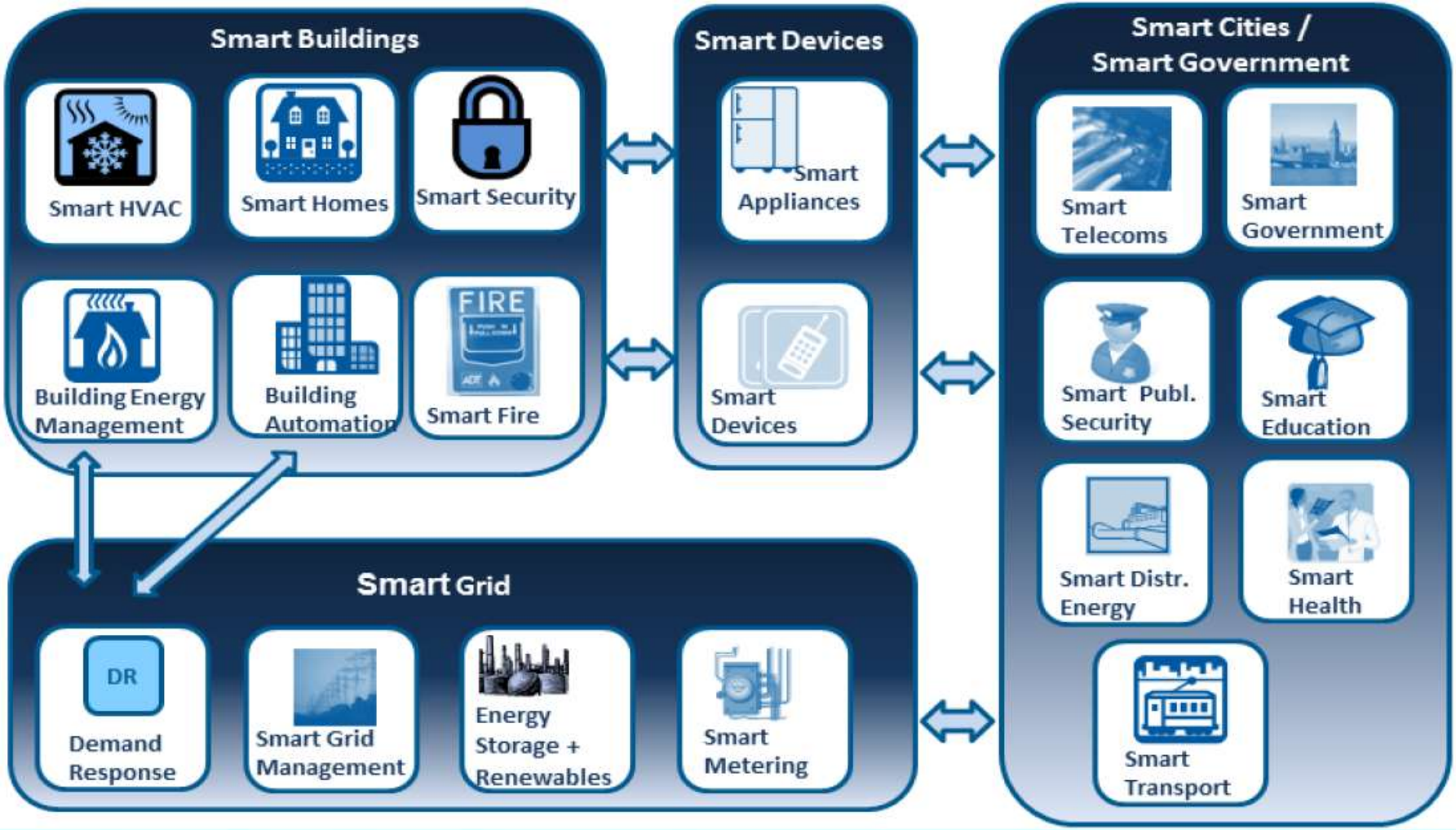


Image credit: BSRIA publication "Smart Evolution 2015: Technical and Social Convergence", October 2015.

Smart and Intelligent Buildings

What does it actually mean to be a “Smart Building" or “Intelligent Building”?

"Smart" is used to describe advanced actuators, sensors and related devices.

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

An "Intelligent System" is used to describe a combination of ”Smart Devices and Systems”, with software coordinating the “Smart Items”.

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

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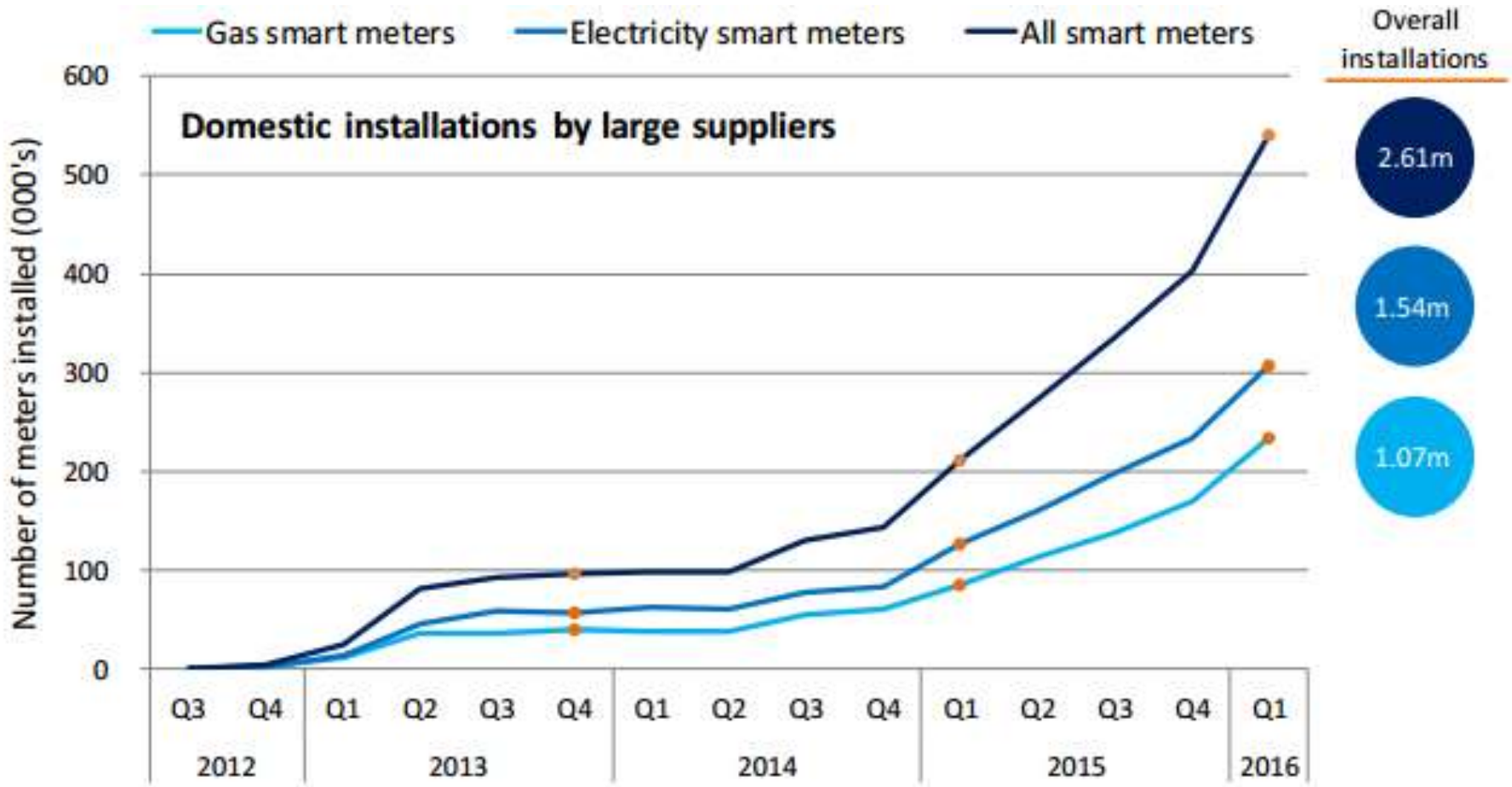
Domestic Installations of Smart Meters



Meters operated as at 31 March 2016	Smart Meters	Smart-Type Meters	Traditional Meters	All Meters
Gas	1,165,000	334,000	20,084,600	21,583,500
Electricity	1,583,200	567,100	23,965,600	26,116,000
Gas and Electricity	2,748,200	901,100	44,050,200	47,699,500

Smart Meters?

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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

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.

UK GREEN BUILDING COUNCIL Gold Level Member
CIBSE
AECOM
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Nest Home Learning Smart Controller

Hive Smart Controller

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 SPECIFICATIO
Light output 810 lm (for
Light distribution Unavail
Colour temperature 2,700
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 temperatures 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 SPECIFICATIO
Light output 1055 lm (no
Light distribution 330 de

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

Kosnic 8W

Kosnic 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 SPECIFICATI
Light output 806 lm (non
Light distribution Unavail
Colour temperature 3,00
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 offers households 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 temperatures 2,700K
Edison or bayonet Both
Price £19.99

78

Verbatim 10.5W

Verbatim 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 fin-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 SPECIFICATI
Light output 820 lm (non
Light distribution 130 de
Colour temperatures 3,0
Edison or bayonet Both
Price £19.99

67

Ledon 12W

Ledon has produced a 12W (800 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 (600 lm) that is a 48W incandescent equivalent. The 10W was named "Best Buy" product in the May issue of *Which?* magazine.

TECHNICAL SPECIFICATIONS
Light output 800 lm (non-dimmable)
Light distribution 164 degrees
Colour temperatures 2,800K
Edison or bayonet Edison
Price £32.99

The New LED Lamp Market ...120 Lumens per Watt!!

Back to listings

				
	Osram Edison Screw Cap (E27) 7W GLS LED Light Bulb	**Diall Edison Screw Cap (E27) 4W GLS LED Filament Light Bulb**	**Diall ES(E27) Fluorescent Globe Light Bulb**	**Osram Edison Screw Cap (E27) 10W GLS LED Light Bulb**
Price	£8	£8	£5	£10

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

Product code: 5397007180084

(0)

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

Kingspan OPTIM-R Vacuum Insulation Panel

OPTIM-R: optimum performance rigid vacuum insulation panel

PROPERTIES	
THERMAL CONDUCTIVITY (INSULANT THICKNESS)	0.007 W/m.K (aged design value)
COMPRESSIVE STRENGTH AT 10% COMPRESSION	≥ 150 kPa
PRODUCT THICKNESS	20 - 60 mm
PRODUCT LENGTH	300 - 1200 mm
PRODUCT WIDTH	300 - 600 mm

Spacetherm Insulation Blanket

Spacetherm - an ultra - thin insulation for thermal upgrades, saving valuable space without altering the exterior fabric of the building.

Spacetherm can be supplied on its own and cut to size or laminated to a number of facings to suit your individual requirements.

Its remarkable performance is achieved through the use of flexible aerogel blankets.

The insulation used in Spacetherm is material derived from silica gel.

Ultra low thermal conductivity of 0.015 W/mK

Available cut to any size or shape

Available bonded to multiple finishing boards

Maximum thermal performance in limited space

50 year continued thermal performance

Hydrophobic nature resists water absorption

Built to deliver a better world

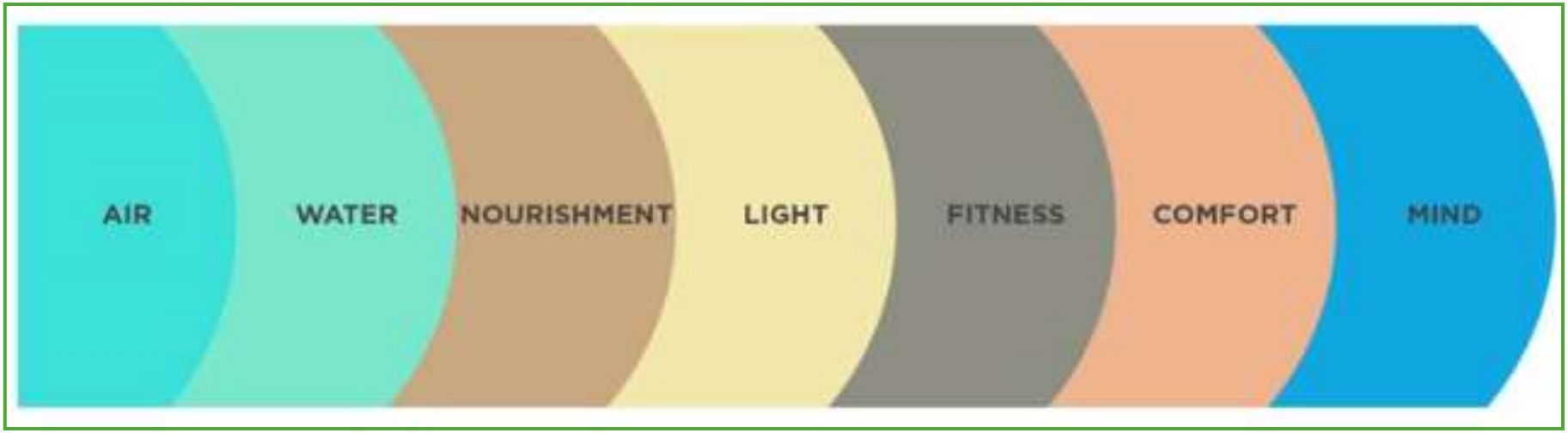
The WELL Building Standard

- Focuses on people in the building
- Introduces a model for design and construction and operations
- Codifies best practices
- Performance Verification: System for certifying features of the built environment that impact heath and well-being

We spend over 90% of our time indoors. This has a profound impact on our health, happiness, productivity + wellbeing.

Built to deliver a better world

The Well Building Standard and the Seven Concepts



Key Areas Building Services Engineers Need to Influence

AIR

The WELL Building Standard for Air establishes requirements to optimize and achieve performance thresholds for indoor air quality (IAQ). Strategies include removal of airborne contaminants, pollution prevention, and air purification.

LIGHT

The WELL Building Standard for Light establishes requirements to help reinforce the body's circadian rhythm. Requirements for window performance and design, light output and lighting controls, as well as task-appropriate illumination levels are included to improve energy, mood, and productivity.

COMFORT

The WELL Building Standard for Comfort establishes requirements to create an indoor environment that minimizes distractions while promoting productivity. Strategies include environmental quality thresholds, controllability, and policy implementations that cover thermal, acoustic, ergonomic, and olfactory parameters to address known sources of discomfort.

WATER

The WELL Building Standard for Water establishes requirements to optimize and achieve performance thresholds for water quality while promoting accessibility. Strategies include filtration and treatment as well as strategic placement for improved water access in buildings.

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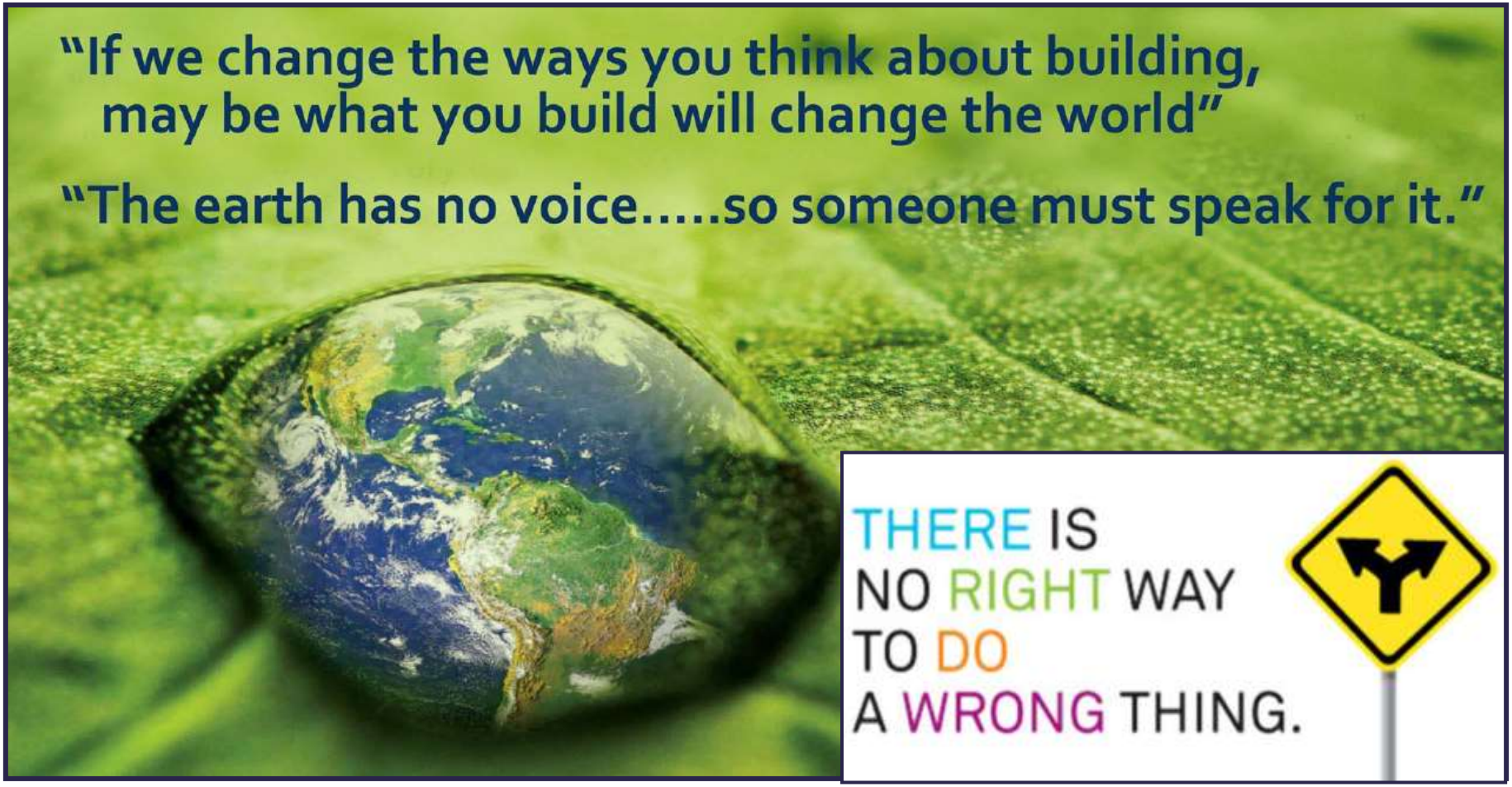
THANK YOU FOR LISTENING



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