London
planning for climate change

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LondonClimateChangeAgency™

Mayor of London

responsible for:

- Greater London Authority
- Transport for London
- Metropolitan Police
- London Fire & Emergency Planning Authority
- London Development Agency

London Climate Change Agency

- Practical delivery agency implementing climate change projects in:
  - Energy
  - Water
  - Waste
  - Transport

Municipal company 100% owned by London Development Agency

Setting up a Climate Change Agency for London

‘What Allan Jones has achieved in Woking is nothing short of revolutionary and I am delighted that he has agreed to take up the challenge of replicating what he achieved in Woking on London’s world-city sized stage.’

Ken Livingstone - Mayor of London

October 2004

Woking experience

- During his time at Woking, a 100,000 people town, Allan Jones helped achieved:
  - Between 1991/92 and 2003/4 Woking Borough Council achieved a 77.4% saving in Carbon Dioxide Emissions and reduced CO2 equivalent emissions for the whole of the borough by 17.23% through the Councils own action.
  - Decentralised private wire energy systems CHP + renewable
  - 10% of Britain's solar energy photovoltaics
  - 1st fuel cell CHP system in the UK.

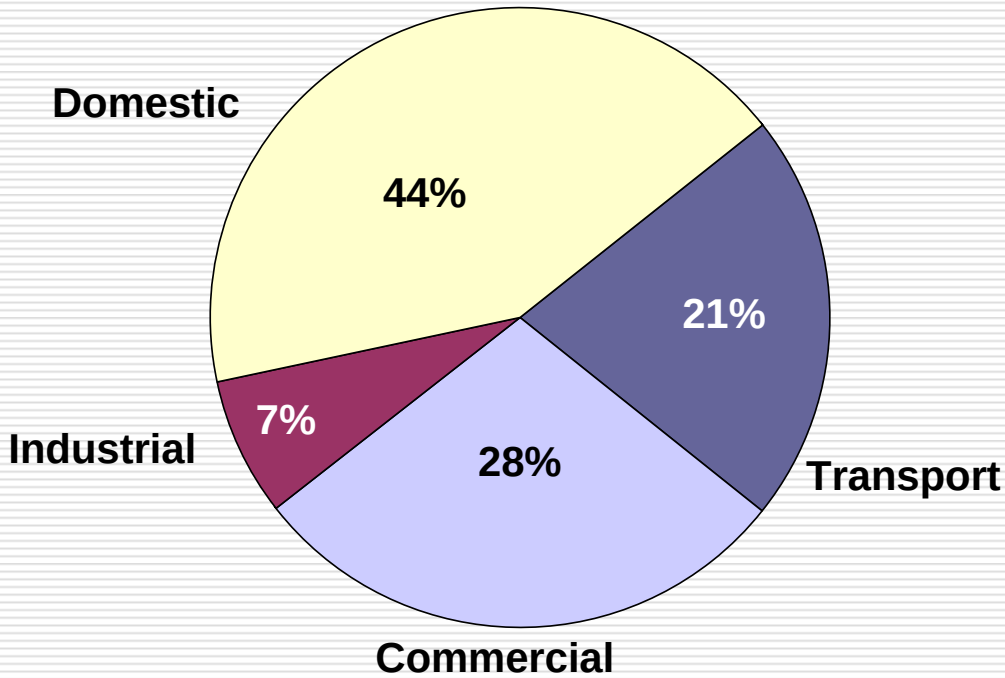
LONDON ...

LONDON

London's emissions

Carbon Dioxide Emissions from London

100% = 42m tonnes p.a. - **7% of UK emissions**



London & climate change: The Mayor Ken Livingstone's view

- "Climate change has now become a problem the world cannot ignore. Large, major-energy consuming cities like London have both a responsibility to reduce their carbon emissions, and, by virtue of a high density of population, the greatest opportunity to take advantage of new energy systems and renewable energy."

- "We have a responsibility to Londoners to plan for the consequences of climate change that are already happening."

Drivers for addressing climate change in London

- Top down
  - LEADERSHIP
- Bottom up
  - Public and private PARTNERSHIPS

Drivers: Leadership

- Ken Livingstone, Mayor
  - "In London we will provide the strong political leadership to make this happen, as we led the world in tackling traffic congestion."

- Nicky Gavron, deputy Mayor
  - "The London Climate Change Agency, the brainchild of deputy Mayor Nicky Gavron, will play a key role in making London the most sustainable city in the world." Ken Livingstone

Drivers: Partnerships for adaptation

- London Climate Change Partnership
  - help ensure that London is prepared for its changing climate
- South West Climate Change Impacts Partnership
  - to investigate, inform and advise on the impacts of climate change in SW England, to influence the strategies and plans of key partners and stakeholders
- London Climate Change Agency
  - Ensure climate adaptation is part of London developments
- London Functional Bodies
  - Ensure adaptation is included in planning and functional bodies activities

Drivers: partnerships for mitigation

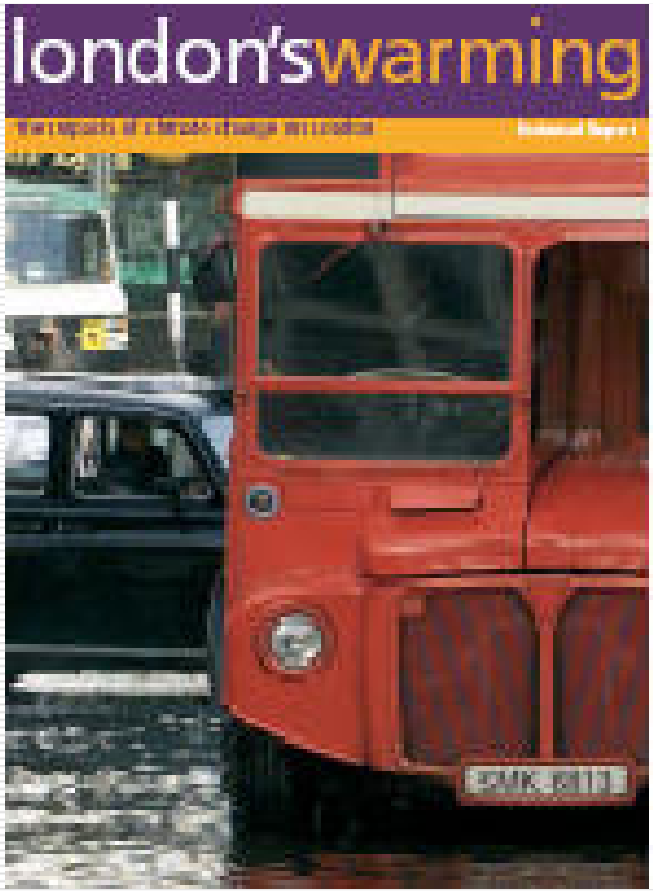
- London Climate Change Agency and London ESCO
  - Implementation agency for low carbon systems
  - design, finance, build, own and operate services for low and zero-carbon energy projects
- London Energy Partnership
  - respond to the challenges of climate change, security of energy supply and fuel poverty
- London Hydrogen Partnership
  - to work towards a hydrogen economy for London and the UK
- London Functional Bodies
  - Show leadership and demonstrate best practice in reducing CO2 emissions in London activities

Key parameters influencing London climate change strategy

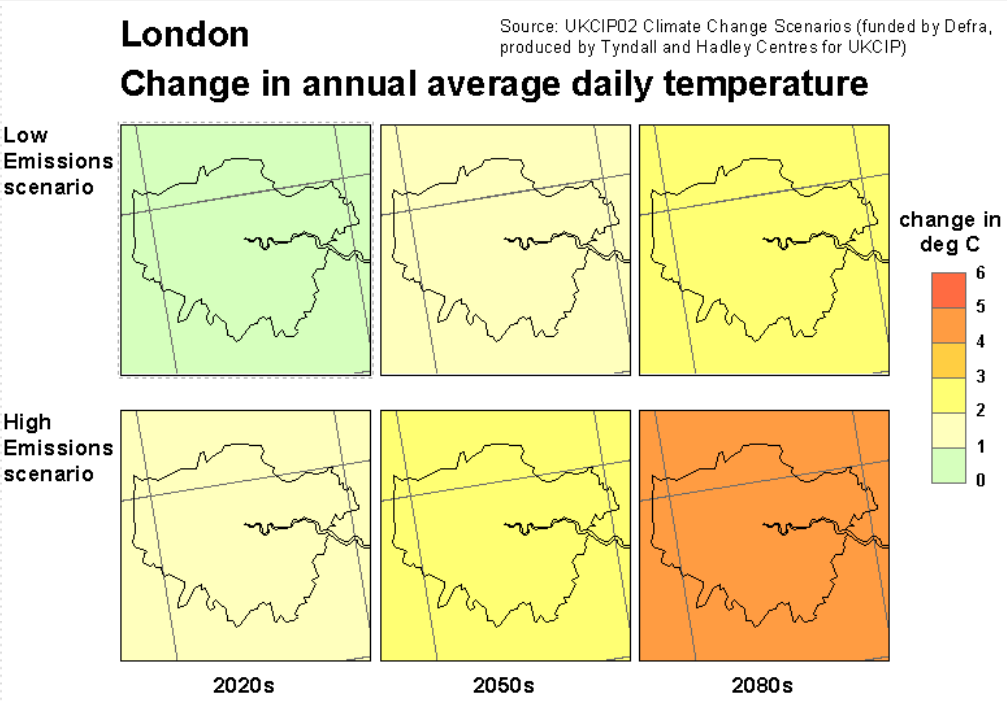
- Impacts and risk analysis
- Potential of climate change mitigation and adaptation for economic development
- London an exemplary sustainable world city

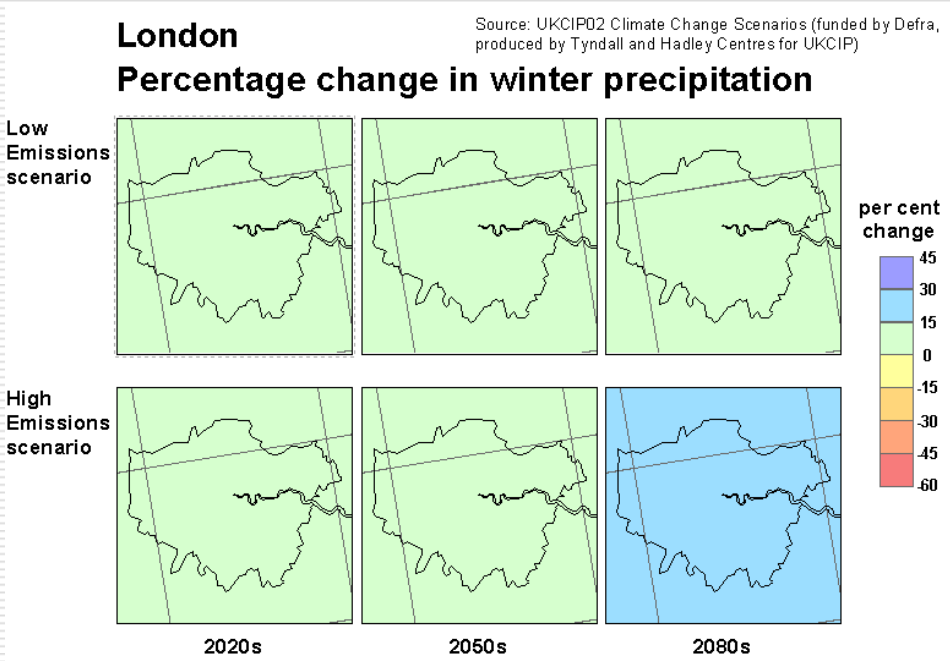
Impacts and risks analysis

- "London Warming, the impacts of climate change on London", 2002
- "Climate Change and London's Transport Systems", 2005
- "Adapting to climate change: checklist for developers", 2005



UK CIP regional scenarios: London





UK CIP: UK Climate impact programme

Climate change & variability risks

- Warmer, wetter winters
  - By 2050 20% more winter rainfall and 3.5C increase in summer temperature
- More intense downpours of rain
- Hotter drier summers with more frequent and extreme temperatures
- Intensification of heat island effect Will lead to increased demand for energy for cooling
  - Especially at night during summer 5-6C future increase (South East Climate Change Partnership Nov 2005).
- Sea level increase and tidal surges. London lies on flood plain of River Thames and its tributaries
- Business & Finance: insurance and financial markets

Source: London Warming, 2003

Economic development potential

- ‘The potential sustainable energy market generated as a direct result of deploying technologies as set out in the Mayor’s Energy Strategy could be worth around £3.35 billion by 2010 and employ between 5,000 and 7,500 people’.
  - From London Development Agency’s Study of the Sustainable Energy Sector: “Green Alchemy Turning Green to Gold: Powering London’s Future”, 2003
- Risk management of climate change impacts seen as significant opportunity for London businesses

London
exemplary sustainable world city

- Risks and opportunities for Tourism from higher temperatures in summer
- Interlinking international world capital means wider financial services sector is likely to be impacted by domestic and global extreme climate events
- Leadership as potential to attract world class business

Implementation of London's climate change strategy

- London adaptation approach
- London climate change mitigation strategy
- Practical examples in 2 sectors
  - Transport
  - Decentralised low carbon energy systems

London & adaptation to climate change

- GLA
  - Supplementary Planning Guidance - Sustainable design and construction
- London climate change partnership
  - Impacts of climate change
  - Transport
  - A checklist for development
- UK Environment Agency:
  - Thames Estuary 2100 study on-going
- UK Climate Impact programme

London climate change strategy

- London plan
- Alterations to London Plan (under consultation)
  - Adaptation measures for new and existing developments
  - 20% CO2 emission reduction by 2015, 60% by 2050
  - Decentralised energy systems
  - Improve efficiency of existing transport capacity
- Energy Strategy
- Supplementary Planning Guidance - Sustainable design and construction

London climate change strategy

- Energy Strategy CO_2 and Sustainable Energy Targets
  - 100% Increase in CHP Capacity by 2010
  - at least 27MW_p Photovoltaics by 2010
  - 6 large Wind Turbines by 2010
  - 500 small Wind Turbines by 2020
  - Anaerobic Digestion CHP Plants by 2010
  - Biomass CHP Plants by 2010
  - at least one zero-carbon development in every London borough by 2010

- At least triple these technology capacities by 2020.

London's transport

- Adaptation
  - Risks
  - Measures for adaptation
- Mitigation
  - Technological and behavioural change
  - Hydrogen Fuel Cell Buses
  - Congestion Charge & Low Emission Zone

Climate change risks to transport infrastructure

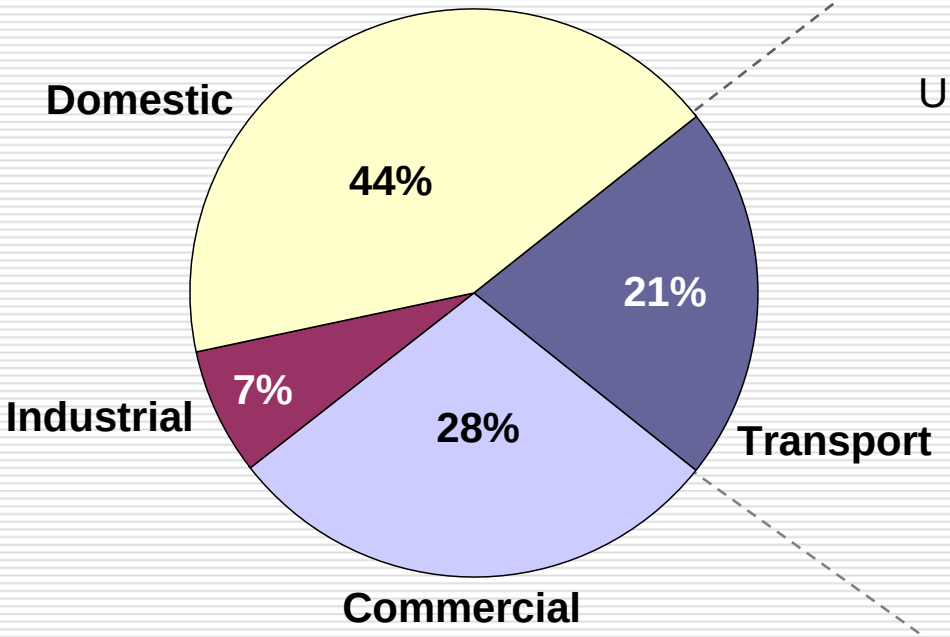
- Flooding of infrastructure from flash floods and tidal and river flooding
  - 1992 – 2003: 1200 flooding incidents and 200 station closures. Half due to flash flooding
  - September 1999 – March 2004: flooding of underground cost ~ £14.6 million in passenger delays
- Damage to rail, road and underground infrastructure from hot weather
  - In 2003 summer 165,000 delay minutes nationally as a result of heat compared to 30,000 in summer 2004 where temperature cooler; number of buckled rail approximately 130 and the economic costs of delay in 2003 in four of rail sectors around London was at least £0.75m
- Passenger comfort on underground from hot weather
- How will weather affect public choice of what transport they will use?

Adaptation measures

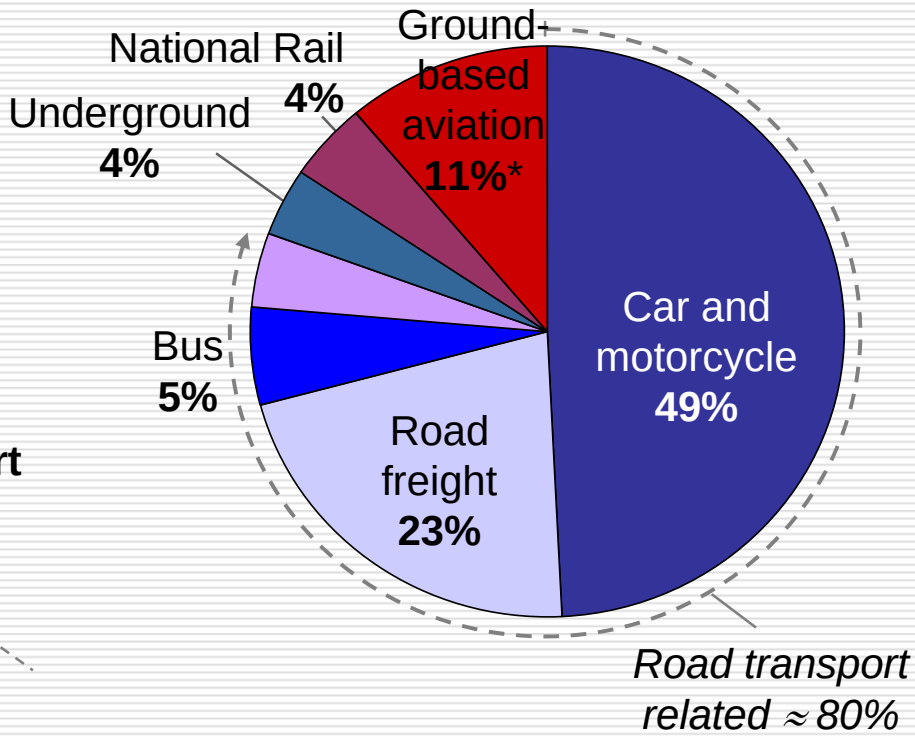
- Flooding
  - Areas prone to recurrent risk of flooding mapped.
  - Mitigation measures in place at stations in those areas e.g. physical barriers, consideration of Sustainable Drainage Systems (SuDS) and other research work into scope of flooding and how to contain it
- Network rail taking measures to improve safety that would also increase resilience to higher temperatures and help avoid the heat-wave related problems experienced in 2003.
- London Underground Cooling
  - £178 m to address problems posed by heat and climate change
  - On-going study looking at trigeneration
- National Rail created senior post within its Civil Engineering team whose portfolio includes climate change research

London transport's emissions

Carbon Dioxide Emissions from London
100% = 42m tonnes p.a. (7% of UK emissions)



London Transport Emissions
100% = 9m tonnes p.a.

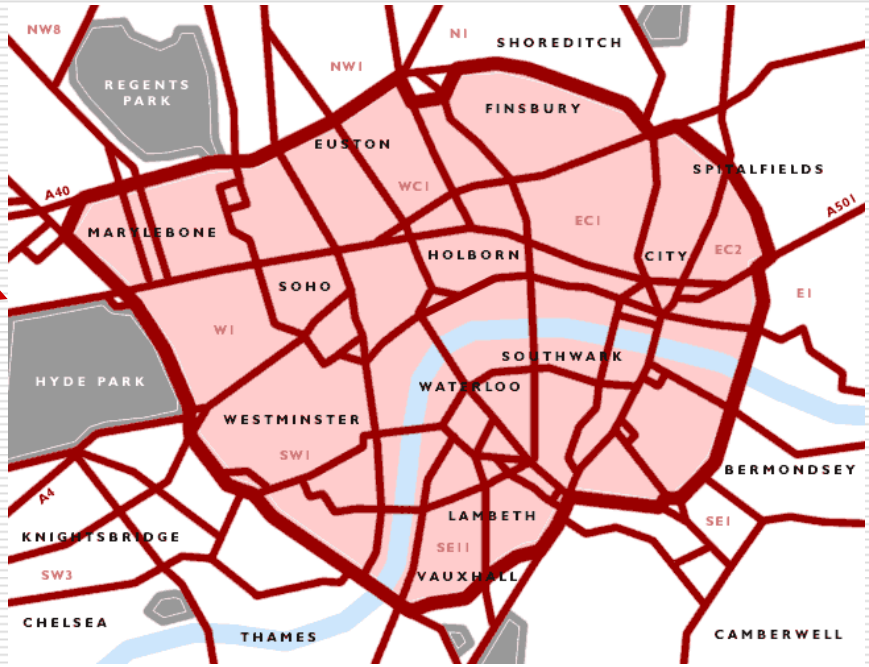


Transport accounts for roughly 20% of London's CO2 emissions, mostly from road transport

Transport mitigation: technological & behavioural change

- Travel Demand Management
  - Choice of transport mode, support walking and cycling
- Road user charging to reduce traffic and congestion
  - Congestion charge
- Driver behaviour
  - training train drivers to maximise fuel efficiency via smooth acceleration and braking etc… can reduce fuel usage by 5-20%

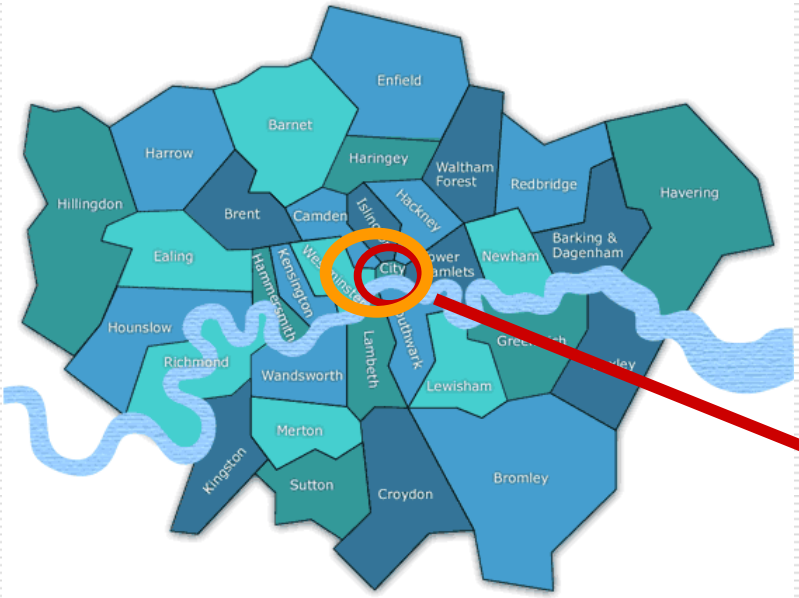
Congestion charge

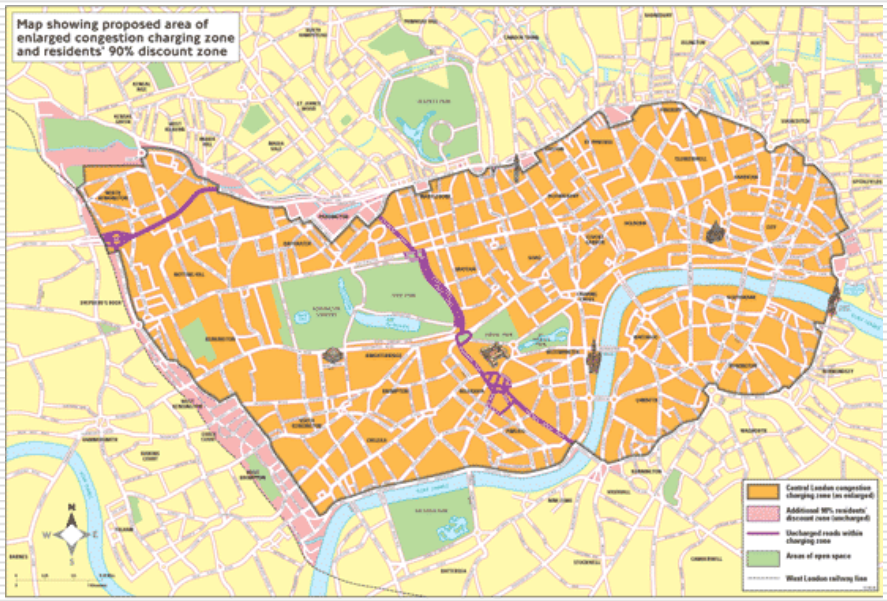


Congestion charge

- Introduction of Congestion charge in 2003.
  - Traffic down by 18% and congestion 30%
  - Emissions of CO2 down by 19%
  - Emissions of PM10 and NOx on major roads within charge area down by 16%
- 300 extra buses brought into service in 2003/2004. Bus usage during 2003/2004 increased by 1.1% to 1.7 billion passenger journeys

Congestion charge: western extension





Transport mitigation: technological & behavioural change

- Underground traction and buses represent majority of TfL's emissions
  - Regenerative braking : typically saves 20-25 % of train's electricity requirements, used by 40 % of underground train fleet, now specified on all new rolling stock
  - Potential for London Array project (offshore wind farm) to supply all of LU's electricity needs
- Low carbon vehicles :
  - Newer and more fuel efficient engines for buses: 90 % of TfL's fleet meet Euro II or III standards compared to 78% in 2002
  - Use of hybrid diesel buses: currently 3 hybrid vehicles in service
  - Hydrogen buses and taxis
  - Biofuels and low biofuel blends


Fuel Cell Bus
EvoBus Mercedes-Benz
'Citaro' for London
hydrogen
fuel
FUEL CELL

Hydrogen fuel for transport

- On-going planned projects
  - CUTE programme: currently 3 H buses in service
  - Hydrogen fleet to be increased to 70 vehicles by 2010 including 10 buses
  - TfL set aside £1.4m to support LHP hydrogen programme
- Potential
  - 8,000 TfL Vehicles + LFEPA & MPA Vehicles
  - 20,000 Taxis

Energy systems in urban environment

- GLA family's renewable projects
- The London Climate Change Agency
  - Decentralised energy systems
  - Renewable hydrogen energy system

GLA family projects

- Renewable energy and fuel cell technology
  - CEME – Photovoltaic Roof
  - Vauxhall Cross – Photovoltaic System
  - Richmond Fire Station – Photovoltaic Roof
  - Hayes Fire Station building integrated micro wind turbine
  - Bus Shelters – Off Grid Photovoltaics
  - Trafalgar Square Xmas Tree Lighting – Fuel Cell


The Arts and Entertainment Weekly

2012 London Olympics sustainable games and legacy

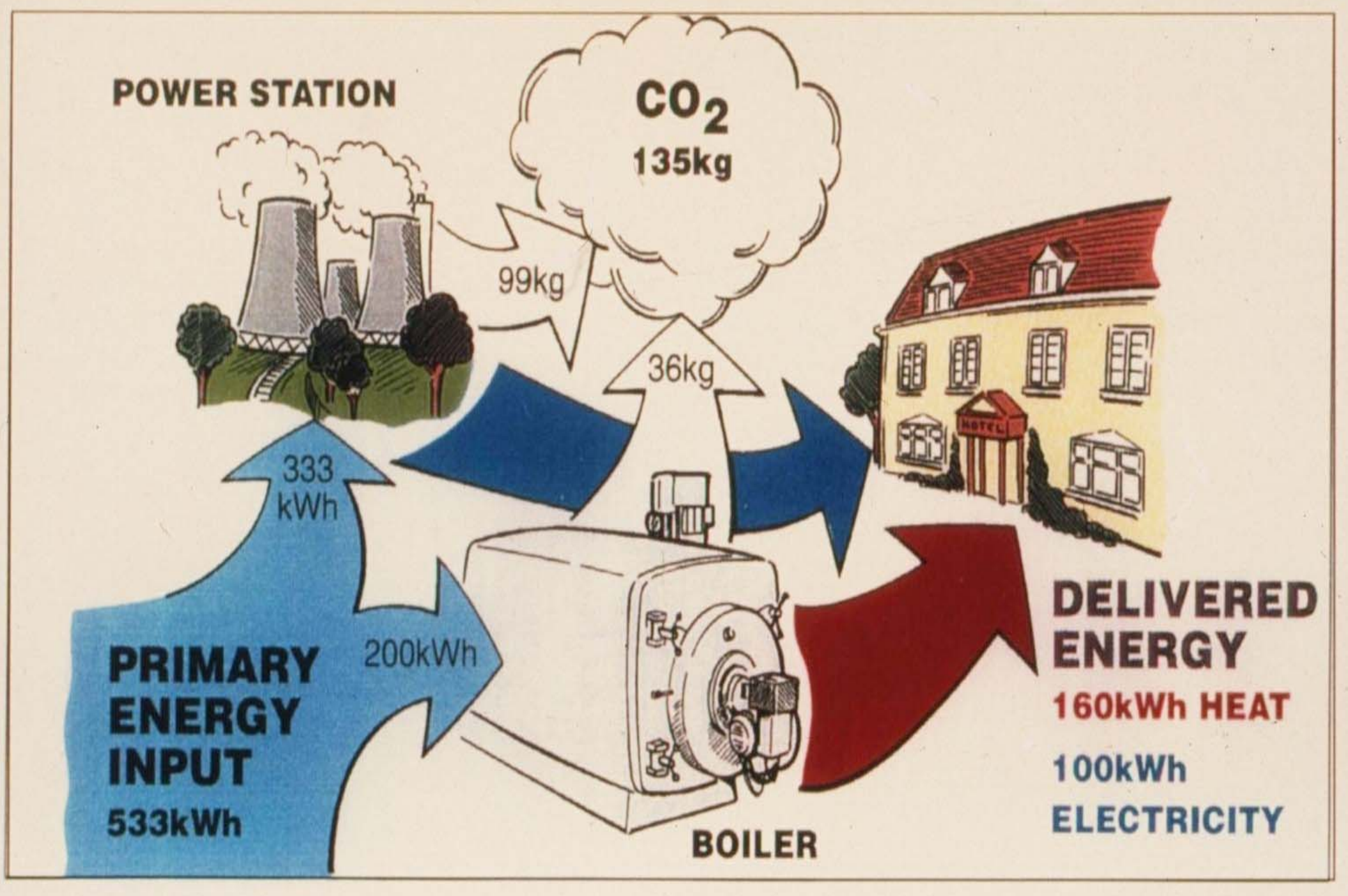
- Low Carbon Games –
  - 100% Renewable Energy
  - Zero Emission Transport
- Zero Waste Games
- Regeneration of the Lower Lea Valley
- Delivery of One Planet Olympics
- Legacy – New Urban Park, the biggest in Europe for 150 years

LCCA low carbon energy systems

- Decentralised energy systems
- Private Wire CHP (Cogeneration & Trigeneration)
- Renewable Energy (including waste)
- Fuel Cells & Hydrogen Systems

- Public/Private Joint Venture London ESCO Projects

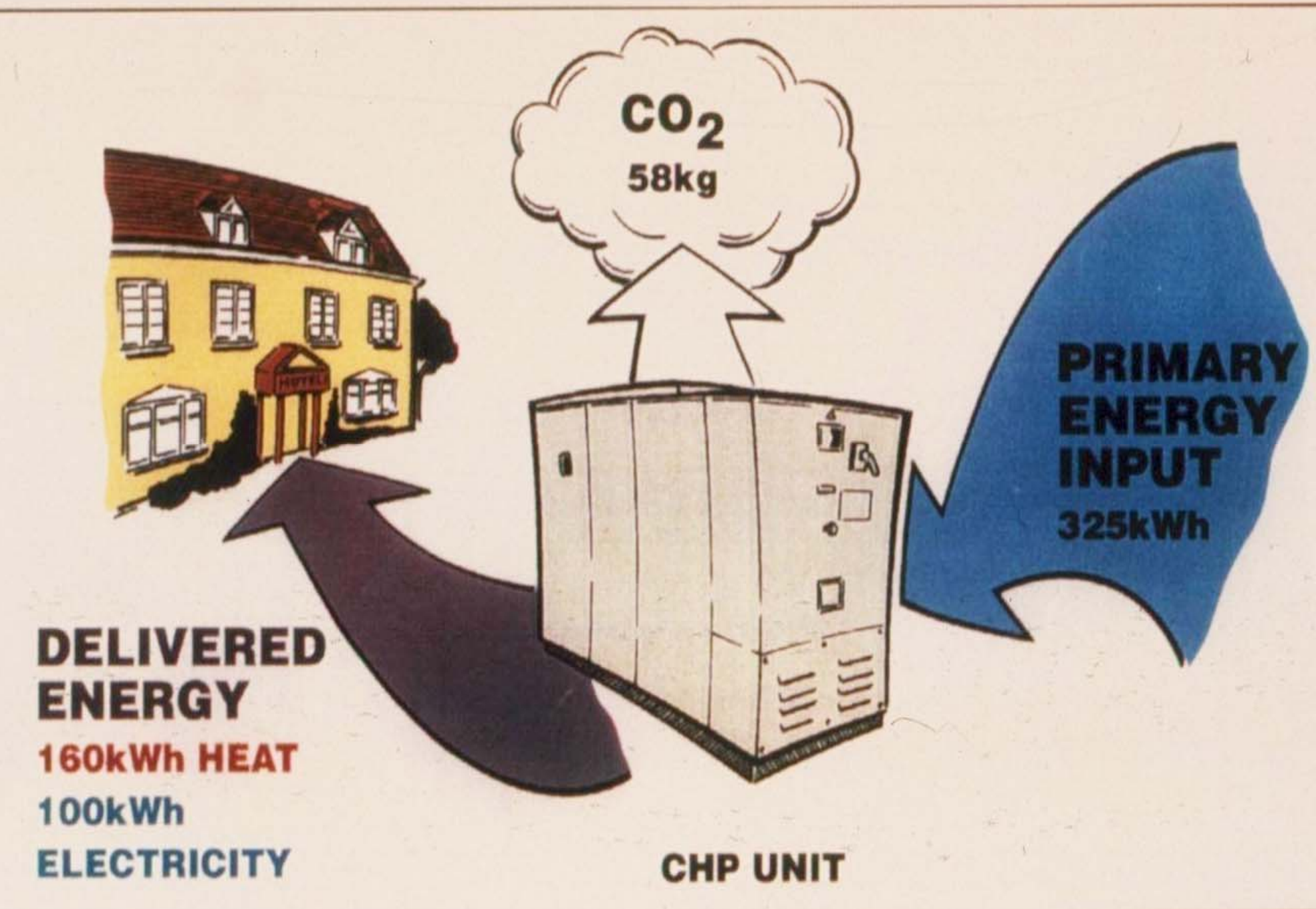
- Planning Powers
- New Technology Inward Investment Projects


POWER STATION
CO_2
135kg
99kg
36kg
333
kWh
200kWh
PRIMARY
ENERGY
INPUT
533kWh
BOILER
DELIVERED
ENERGY
160kWh HEAT
100kWh
ELECTRICITY
HOTEL

Centralised power generation

- Annual Thermal Efficiencies of UK Power Stations [1]
  - Coal 36%
  - Gas 46%
  - Nuclear 38%
- Annual Grid Losses [2] :
  - Transmission 2%
  - Distribution 7%

- **(1). DTI Digest of UK Energy Statistics**
- **(2). Ofgem**


CO_2
58kg
PRIMARY
ENERGY
INPUT
325kWh
DELIVERED
ENERGY
160kWh HEAT
100kWh
ELECTRICITY
CHP UNIT

Decentralised energy generation

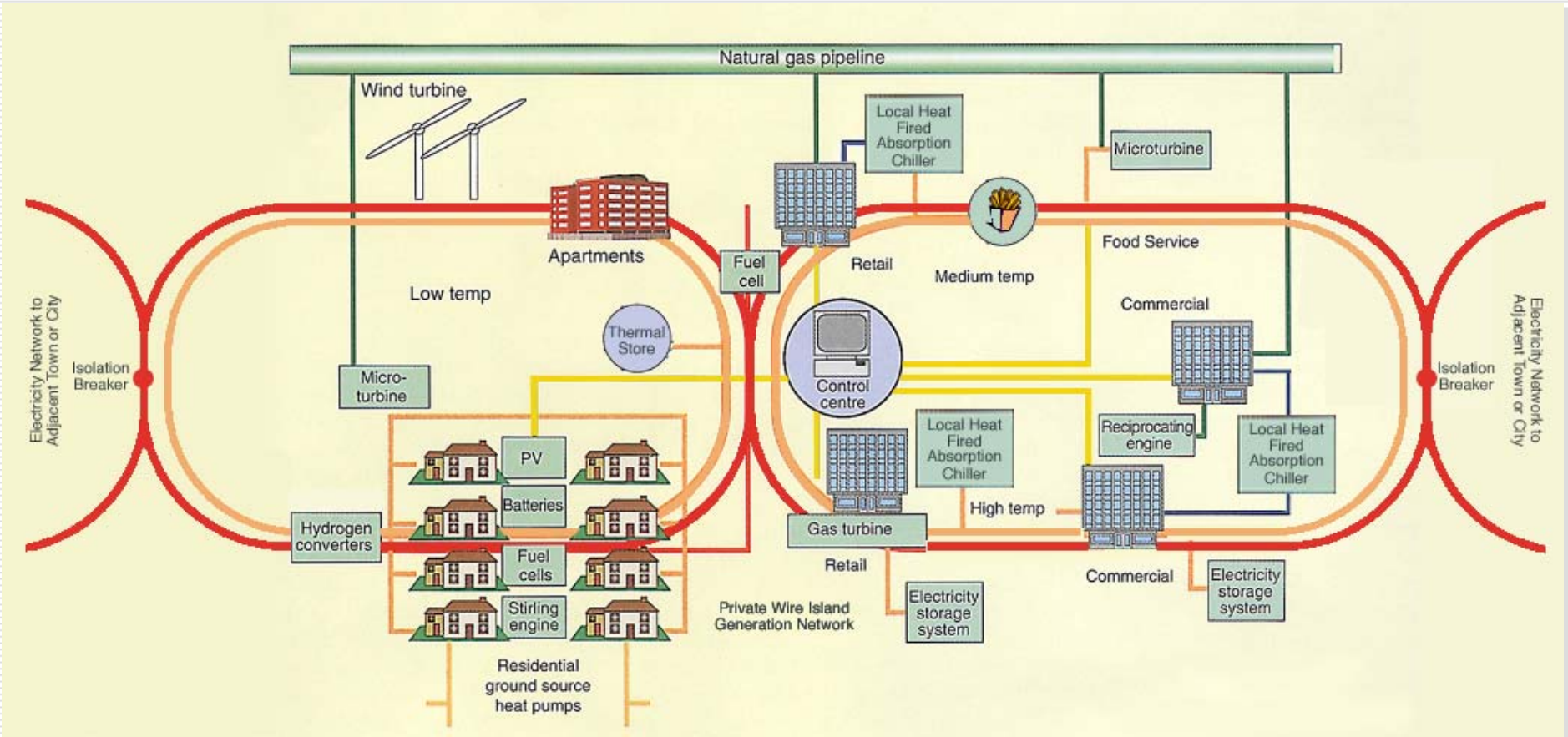
- Powering London into the 21st Century (1):

- High DE Scenario from 2005 to 2025:

  - 33% Reduction in CO2 Emissions.
  - 35.5% of London's Energy Demand.
  - 15% Reduction in Natural Gas Consumption.
  - Fuel Flexibility (inc. Renewables).
  - Local Security of Supply.

(1). Greenpeace Powering London into the 21st Century – March 2006.

Local decentralised energy system



LCCA flagship & core projects

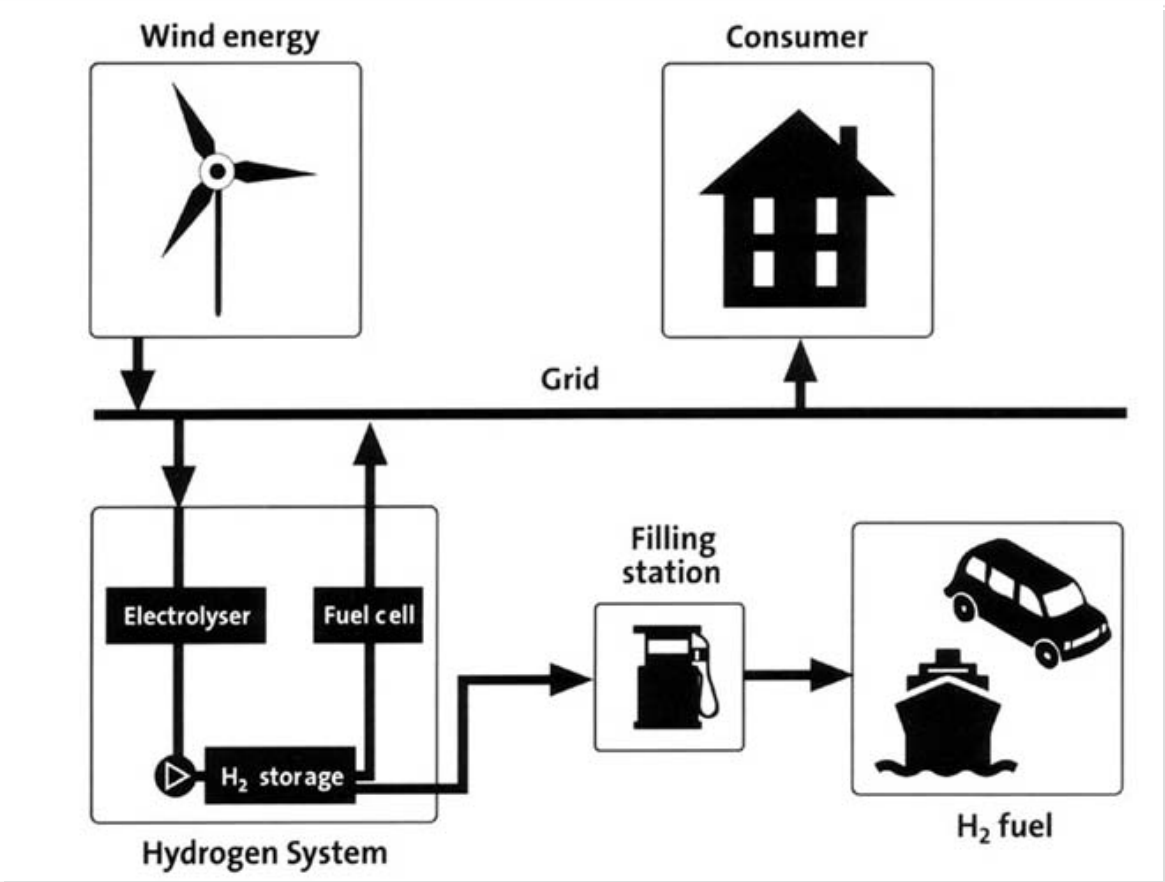
- 1MWp of Photovoltaics and micro wind
- 2 Fuel Cell CHP Systems
- Waste Recycling/Fuel Cell CHP Project

- Energy Efficiency Revolving Funds
- Better Buildings Partnership
- London ESCO Projects
  - Large scale energy services to London developments
- LCCA Special Purpose Vehicle Company Projects

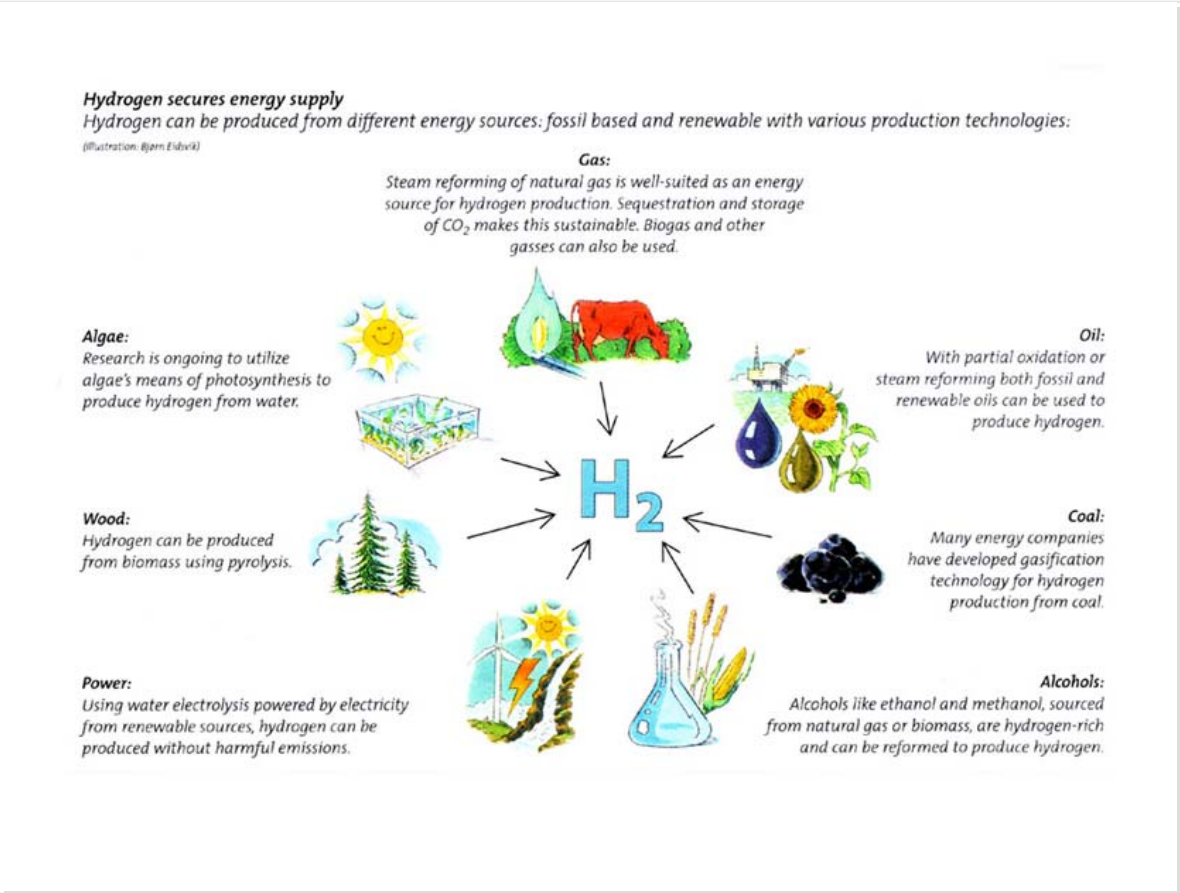
LCCA large scale renewable energy projects

- Current
  - Ford Dagenham, London's First Wind Park - 3.6MW
- Near Future
  - London Array - 1000MW Off Shore Wind Farm
  - Marine Current Turbines 1MW each
- Future Potential
  - Municipal Waste
  - Commercial Waste
  - Sewage Waste
  - Biomass Waste
  - Energy Crops

Renewable hydrogen energy economy



Renewable hydrogen energy economy



Renewable hydrogen energy economy

- Hydrogen will be the energy carrier of the future deriving its energy from renewable sources.
- Fuel cells and the Hydrogen Economy derived from renewable fuels is the only technology / fuel that can meet the UK's future electricity, thermal and transport energy needs.
- The barriers to this are not technical but regulatory and vested interest.

Thanks for your attention

Questions?

Contacts

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LINKS

- http://www.london.gov.uk/
- http://www.ukcip.org.uk/