Energy Efficiency in London

Defining the scale of the potential for reduction in carbon emissions

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Introduction

This document is aimed at decision-makers, and is designed to briefly review the potential of domestic energy efficiency installations for reducing London's carbon dioxide emissions, and so to reduce the causes of climate change. The information in this document is collected from a wide variety of government sources and other policy documents.

Section 1 deals with the potential for domestic energy efficiency installations in London, and the carbon dioxide emissions savings that would result from such installations.

The remainder of the document is designed to provide some context for these CO_2 emissions savings figures. Sections 2 and 3 bring together information designed to answer the following questions:

- What proportion of London's CO_2 emissions would be offset by accessing the potential for domestic insulation installations?
- How cost effective would a programme of domestic insulation installations be compared with installation of generation potential for Renewable Energy?

Summary

Domestic energy efficiency has the potential to cost-effectively reduce London's energy usage and therefore carbon dioxide emissions.

Section 1 of this document describes the size of the potential for 1.63 million major domestic energy efficiency installations (London has 3.01 million households in total), and estimates the carbon emission reduction potential of these households as 1.57 million tonnes of carbon dioxide each year.

Section 2 estimates that the installation of energy efficiency measures in these houses would result in an 8.7% reduction in domestic carbon emissions, or a 3.8% reduction of London's total CO_2 emissions.

Section 3 compares the cost of producing this scale of emissions reduction through domestic energy efficiency installations, and concludes that while energy efficiency is not capable of reducing carbon dioxide emissions to zero, given the present housing conditions domestic insulation installations are more than 12 times cheaper as a CO_2 reduction measure than renewable energy generation.

1. London's potential for carbon saving through installation of domestic energy efficiency measures

In this section, information published by Regional and National Government bodies has been used in order to calculate London's potential for reductions in CO_2 emissions through household insulation installations.

Only installations of loft insulation and cavity wall insulation have been considered, based on an assumption that other technologies are less effective, or have less potential to achieve significant market penetration. There is scope to consider the validity of this assumption in future research.

Insulation standards in London's households

Table 1 shows the proportion of London Households with the various possible standards of home insulation.

State of home insulation	Proportion of total households (%)
Roof insulation:	
Household has no access to loft	46
No loft insulation	6
Loft insulation inadequate (but present)	43
Adequate loft insulation	5
Wall insulation:	
Solid walls	54
Uninsulated cavity walls	41
Insulated cavity walls	5

Table 1: Insulation standards in Greater London's homes[1]

Energy/carbon savings per domestic insulation installation

Table 2 gives the carbon dioxide and energy savings associated with various insulation installations.

Insulation measure installed	Annual CO_2 emission saving (tonnes of CO_2)	Annual energy saving (kWh)
Loft insulation (new installation)	1.21	5,567
Loft insulation (top up of inadequate insulation)	0.30	1,365
Cavity wall insulation	0.78	3,581

Table 2: Annual energy and carbon emissions savings of typical domestic insulation installations[2]

[1] GfK Marketing Services, 1997. Cited in: "The London Assembly and Fuel Poverty", NEA, 2000
[2] Energy Saving Trust, 2004

According to the most recent census there are 3015997[3] households in the combined boroughs of inner and outer London. Using this figure in combination with the figures in tables 1 and 2, it is a straightforward process to estimate the potential for carbon and energy saving potential in London through the installation of domestic energy saving measures (see table 3).

Insulation measure installed	**Installation potential (millions of households)**	**Total potential annual CO_2 emission saving (millions of tonnes of CO_2)**	**Total potential annual energy saving (TWh)**
Loft insulation (new installation)	0.18	0.22	1.00
Loft insulation (top up of inadequate insulation)	1.30	0.39	1.77
Cavity wall insulation	0.15	0.96	4.42
Total		1.57	7.21

Table 3: London's potential for energy and carbon emissions savings through domestic insulation installations

[3] Census 2001 (www.statistics.gov.uk/census2001)

2. What proportion of London's CO_2 emissions /energy usage would be offset by accessing the area's potential for domestic insulation installations?

London carbon usage

As can be seen from Table 4, the total reduction in CO_2 emissions between 1991 and 1999 was due to reductions in CO_2 emitted by industry and the commercial sector. This is a reflection of the reduction in the amount of London-based industry combined with the reduced carbon emissions necessary to generate electricity[4].

The amount of CO_2 emitted by the domestic and transport sectors have actually increased over the time period, probably a reflection of the growth of London's population.

Sector	1991 CO_2 emissions (millions of tonnes of CO_2)	1999 CO_2 emissions (millions of tonnes of CO_2)
Transport	7.6	8.6
Domestic	16.99	18.0
Industrial	5.3	2.9
Commercial	14.6	11.9
TOTAL	**44.5**	**41.5**

Table 4: Sectoral CO_2 emissions from London 1991 and 1999[5]

Scale of the potential for CO2 emissions savings through domestic energy efficiency installations compared with London's total CO2 emissions

Section 1 concluded that London had potential to reduce its annual domestic CO2 emissions by 1.57 million tonnes of CO_2 through domestic energy efficiency installations. Using the more recent figures in Table 4 this would represent an 8.7% reduction in domestic carbon emissions, or a 3.8% reduction of London's total CO_2 emissions.

[4] The Mayor's Energy Strategy, Feb 2002
[5] Greater London Authority, 2002

3. How effective, and how cost-effective would a programme of domestic insulation installations be compared with installation of generation potential for Renewable Energy?

The Renewables Obligation

The Renewables Obligation (RO) is a statutory scheme administered by Ofgem in which obligations are placed upon electricity suppliers to purchase a percentage of their electricity from qualifying "new" renewable sources[6]. The target for 2002/03 was for 3% of electricity to be purchased from new renewable sources and this target increases annually to 10.4% by 2010. The system is administered by the distribution of Renewable Obligation Certificates (ROCs) to renewable energy generators. These are traded between the electricity suppliers to enable them to demonstrate that they can cover their RO target.

The price of the ROCs will tend to be equal to the difference between the long-run marginal cost of supplying renewables, and the wholesale electricity price[7]. It is therefore a good indication of the long term marginal cost of producing renewable electricity on a large scale compared with non-renewable electricity generation. The cost of ROCs is predicted to remain between £0.048 and £0.042 per kWh[8] over the next two years.

Using these figures we can produce an estimate of the cost of making CO_2 savings by generating renewable electricity to displace 'brown' electricity.

We acknowledge that the RO scheme goes some way towards covering the cost of renewable energy generation up to the annual target. However, energy efficiency measures equally cover their own costs within a few years of installation through reduced energy usage, and 30-55% of their cost is typically covered by grants issued by energy suppliers under the Energy Efficiency Commitment.

Cost of offsetting CO_2 through renewable energy generation

Estimates of the carbon intensity of generation vary, but assuming 0.43tCO_2/MWh[9], about 3.65TWh of renewable electricity would have to be generated per year to offset the 1.57 million tonnes of CO2 that would be offset by insulation insulations in London's Housing stock. Using the cost of ROCs as a proxy for the marginal cost of renewable energy generation, the additional cost of generating this amount of energy would be about £164M each year.

Cost of offsetting CO_2 through domestic energy efficiency improvement

Insulation installation costs for a typical three bedroomed semi detached home, are given in table 5 below.[10] (Subsidies can typically cover 5-55% of these costs and are available from Energy Suppliers through their Energy Efficiency Commitment.

[6] SPRU 2003
[7] SPRU 2003
[8] Spectron, figures based on market prices May 2004
[9] Guidelines for measuring and reporting of emissions in the UK emissions trading scheme.
[10] London Energy 2004

Measure	Cost
Loft insulation (full insulation)	£255
Loft insulation (top-up of partial insulation)	£220
Cavity wall insulation	£315

Table 5: Typical installation costs for home insulation measures, based on a three bedroom semi detached home.[11]

Given the costs in table 5, the cost of London's domestic insulation installation potential can be calculated as £379M. Given that the lifetime of the home insulation measures considered here is estimated as at least 30 years[12], domestic insulation installations are more than 12 times cheaper as a CO_2 reduction measure than renewable energy generation.

[11] London Energy 2004
[12] EST 2004