

Green Deal Snapshot Analysis

DECC Internal Analysis with additional advice from AEA and the Carbon Trust

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This document clarifies the methodology that DECC undertook, with the assistance of Carbon Trust and AEA, to examine how the Green Deal might be applied to a number of different hypothetical premises within different sectors of the economy. The spreadsheet to which this document refers can be found at:

http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx.

The spreadsheet is a relatively straightforward tool which has been developed with the prime purpose of analysing the likelihood of the success of energy efficiency measures undertaken as part of the green deal for a cross section of non-domestic building sectors and for a range of Green Deal assessment and financing options. It is not a robust software tool, rather it has been developed primarily to facilitate the development of green deal snapshots.

Looking at the spreadsheet in detail, going from left to right the worksheets are named as follows:

- Cover page
- Notes: contains any specific information relevant to the calculations which is not covered elsewhere
- Sample choice sheet: summarises all the information which was used in choice of the spreadsheets, and lists the 20 chosen snapshots
- Specification of snapshots: this provides the specification for each of the 20 spreadsheets
- Snapshot savings calculations: for each measure for each snapshot, energy saving, cost and carbon saving, and paybacks are calculated
- Generic measures inputs: for each measure used in the snapshot calculations, a description is provided along with referenced energy savings and price data
- Measures and price data: contains electricity and fuel cost information, and equipment price data
- Detailed supporting calculations: gives a step by step breakdown for any complex calculation required by for the snapshot savings table
- Sector energy use: provides a breakdown of overall non-domestic buildings sector as used for the sample choice sheet
- Energy use benchmarks: provides energy breakdown information for each of the sectors
- Salix persistence values: this information is imported into the snapshot savings table
- Calculation table: used to calculate detailed outputs
- Sheet 2: as above
- Sheet 1 : as above

Snapshot selection (Sample choice sheet)

One of the key aims of the project was to develop a picture of the non-domestic buildings sector in terms of the applicability of the Green Deal. It was recognised at the start of the work that a snapshot approach meant that the results could not strictly be representative of the sector as a whole, but in the available time the snapshot approach was the best available approach. A figure of 20 snapshots was decided upon.

To determine snapshot selection, information on the current make-up of the non-domestic sector was compiled based on:

- The typical breakdown of the non-domestic sector as per industry accepted CIBSE grouping
- The total 'unconstrained' energy consumption by each of the above groups – where unconstrained energy consumption is that which is not already covered under regulation; in this case it is the consumption not regulated through either EU ETS1, CCA2 or CRC3
- Numbers of facilities – this figure was based upon experience, and based upon recent (2010) work carried out for another client.
- Sector size distribution and age of building stock – this information was taken from previous work, however the data was not broken down into the sector groups, therefore the same split was applied to all groups, with the exception of the Industrial sector – this information came from a Carbon Trust report.

Based on the above a preliminary selection of 20 snapshots were made. These were then discussed with DECC and refined and the following selections was finalised.

¹ European Emissions Trading Scheme – covers fossil fuels used by energy intensive industries

² Climate Change Agreements – covers primary energy use by energy intensive industries

³ Carbon Reduction Commitment – aimed at capturing consumption of industry with what would be considered middle level intensity

| Non Industrial Building Sectors | Placing of Snapshots Building size | | |
|---------------------------------|------------------------------------|--------|-------|
| | Small/micro | Medium | Large |
| Commercial offices | 1 | 2 | 1 |
| Communication and transport | | | |
| Education | | 2 | |
| Government | | | |
| Health | 1 | | 1 |
| Hotel and catering | 2 | 1 | 1 |
| Other | | | |
| Retail | 1 | 2 | 1 |
| Sport and leisure | | 1 | |
| Warehouses | | 1 | |
| Agriculture | | | |
| Industrial | 1 | 1 | |

Specification of snapshots

This is contained within the worksheet of the same name and expands upon the samples chosen, providing the scope and values for a 'typical' building within this sector. This includes:

- Facility size – including typical floor area, perimeter and building height
- Building age and type – the 'type' is based upon the standard four buildings classification from CIBSE, those being naturally ventilated cellular or open plan, air conditioned standard or prestige.
- Roof type. All of the above are based upon experience of a representative building for this sector, and as discussed in point (viii) are subjective.
- Occupancy information – including both density and hours of operation, both of which impact on consumption. As occupancy is given a score of either low, medium or high, there should be some definition given to what is meant by this (m³ per person is usually referred to).
- An uplift factor was then calculated for the total hours of operation for both electricity and gas consumption, based on the difference between the calculated hours and the CIBSE reference hours for the benchmark data used for consumption levels (CIBSE TM46).

- Energy consumption, split between electricity and fossil fuel consumption (assumed natural gas).
- Indicative energy bill – based on the consumption calculations and the typical prices by DECC.
- Typical building fabric and services – these are qualitative fields rather than quantitative, and therefore are subjective. They are based upon experience within the non-domestic sector. They have been chosen as typical of the particular type of building and in order to demonstrate the possible range of measures.
- There is scope to expand this section further by splitting the consumption into key energy using categories – there are a number of detailed category splits within typical building groups in CIBSE Guide F which could be applied. This includes splits for offices, hotels, banks, sports centres, hospitals and industry. Further to this there is also details on a generic split by the four main building services type, which could be applied to those groups which do not have their own specific split. At present, one standard split by energy category use has been applied to most of the groups.

It should be noted that the descriptions for each building in terms of fabric and equipment have been chosen as typical for that building but do not represent the 'average' state for that type of building. The follow on from this is that the overall energy savings for the buildings defined here are likely to be greater than that which could be expected from an average building.

Snapshot savings calculations

Choice of measures

For each snapshot a choice of energy savings measures were made based on:

- relevance to the current state of building fabric and equipment for that building
- ability to make a significant energy saving and hence payback
- fit with the green deal
- need to consider a portfolio of savings measures

Draught-proofing was not included because although it has the potential for considerable savings with a low payback, savings are difficult to quantify and the measure itself would be relatively short-lived.

Overview of calculations

For each snapshot, typically 5 measures were chosen for analysis. For each measure:

- the energy use relevant to that measure was calculated (it could be 100%, for example where all gas is consumed within an boiler and the measure was to upgrade the boiler, or it could be less, for example for lighting or HVAC)
- the improvement in energy use was calculated (either within the 'snapshot savings calcs' sheet or within the 'detailed supporting calcs' sheet.
- the revised energy use was calculated
- the energy, cost and carbon savings calculated
- the capital and operating costs calculated or brought in from the 'measures and prices data' sheet
- the simple payback and cost of carbon saving calculated

The data generated is then exported to the output calculations sheets.

Choice of measures for Bundles

Three bundles are considered with general definitions as follows:

Bundle 1 – contains all measures with a payback less than 5 years (and where there is a choice between lighting measures takes the cheaper less robust option)

Bundle 2 – contains mostly measures with a payback less than 5 years but will also take measures with a higher payback providing the overall payback of the bundle is around 5 years or less. (Where there is a choice between lighting measures it takes the more robust but expensive option)

Overall Bundle – contains all the measures except where there is a choice between lighting measures where it takes the more robust but expensive option.

Bundle calculations

The calculations for the bundles have taken into account interactions between savings measures. For example, the introduction of wall insulation reduces the heating requirement for a building and reduces the load on the heating boiler. If this boiler is to be upgraded then the saving will be less than if there were no wall insulation added. The cost of the boiler will also potentially reduce as its required rating will be less.

Supporting information for calculations

Generic measures

The generic measures input sheet is a reference point for the measures data used in the snapshot calculations. For each measure there is:

- A description of the measure
- Efficiency/energy saving data
- Cost data
- References for energy savings and cost data and/or basis for calculation

Because of the nature of this study (imaginary rather than real buildings) the energy savings potential and costs can only be indicative because the buildings are not fully defined, but where possible the data has been grounded in information from case studies or energy efficiency guides.

There are two areas for future work to refine the spreadsheet:

- Expand the range of potential measures
- Firm up on energy savings and cost data

Sector energy use

This sheet provides a breakdown of the overall non-domestic buildings sector in terms of energy use and takes this data from a report to DECC on 'assessing the carbon dioxide emissions and cost-effective carbon savings potential for organisations not covered by EU ETS, CCAs or CRC' which is referenced in full in the spreadsheet .

Energy use benchmarks

This sheet lists the benchmark data used in the spreadsheet. The data comes mainly from CIBSE Part F benchmark document.

Salix persistence values

This sheet provides information on the useful life of the proposed energy savings used in the spreadsheet.

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