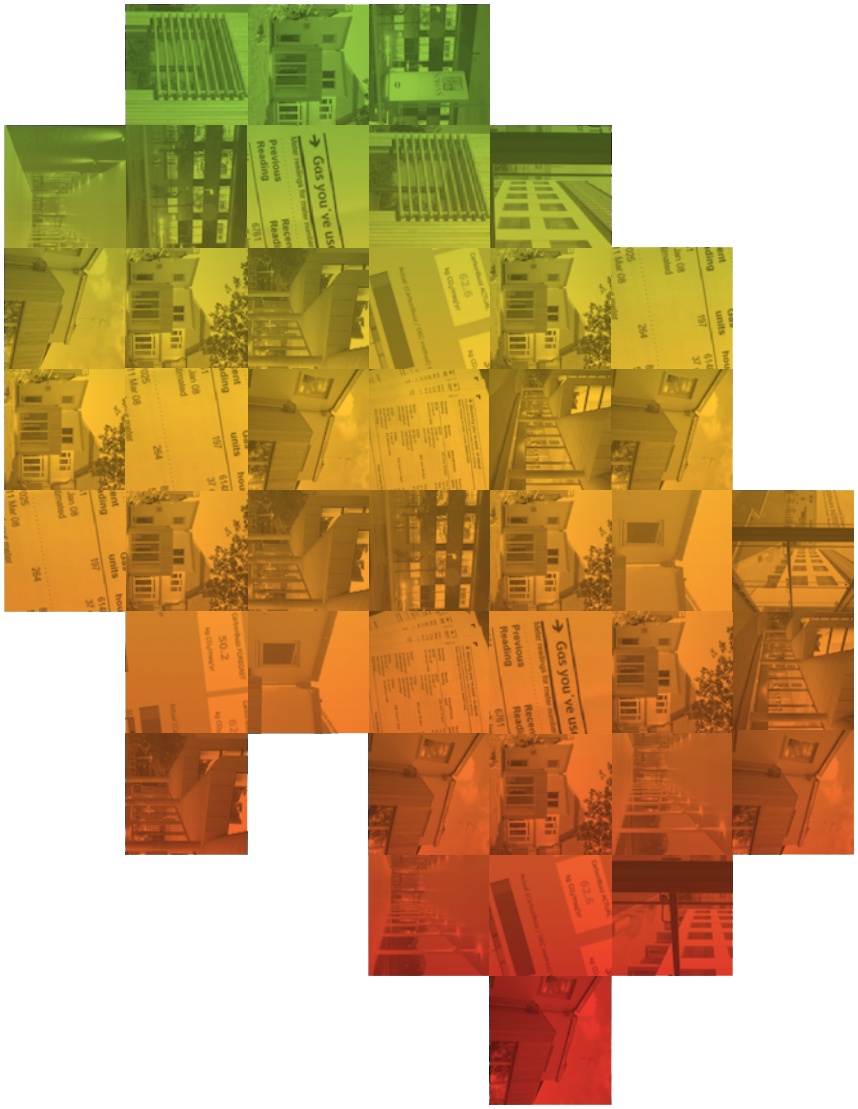


CarbonBuzz

an RIBA CIBSE platform

Project Partners

RIBA

CIBSE

Aedas

bre

UCL

FeildenCleggBradleyStudios

XCO2 ENERGY

FABER MAUNSELL | AECOM

UrbanBuzz
Building sustainable communities

Practices Partners

dmm

Hamiltons

BDP.

hok

SHEPPARDROBSON

make

Mott MacDonald

atelier ten

note from partners

CarbonBuzz emerged from a realisation that the construction industry suffers from a poor awareness of the link between CO_2 emissions and the energy use of buildings.

The project partners sought a means to support the industry in its drive to manage the energy use and CO_2 emissions from buildings and help architects and engineers to close the gap between designed energy use and actual energy use. This industry wide initiative is a significant collaboration between the Royal Institute of British Architects and the Chartered Institution of Building Services Engineers.

CarbonBuzz provides a platform to share and publish building energy use data, on an anonymous basis, in order to increase the evidence base for low energy design solutions. It is an ongoing research initiative, but is already in a position to become an important component of the building design process.

a work in progress

The Royal Institute of British Architects (RIBA) and the Chartered Institution of Building Services Engineers (CIBSE) invite you to join CarbonBuzz to manage the energy use and CO_2 emissions of your projects online. Practices choosing to publish data through this site will be able to gain 'carbon conscious' accreditation.

The CarbonBuzz platform provides an opportunity for practices to share project data and best practice with a view to informing low carbon design and influencing future policy and regulation. It presents a visual template for communicating energy use during design and post completion.

Anyone can use CarbonBuzz. Architects and engineers can use it to manage their project energy use and emissions from design through to completion and beyond. The front page of the site presents the user with up-to-date feedback on data gathered through CarbonBuzz. It highlights differences between design forecast and actual values for each sector.

CarbonBuzz Home Page

Your feedback will be used to improve functionality. It will also engage users and stake holders in on-going issues related to the CO_2 emissions of buildings.

Average design vs actual CO_2 emissions per sector

Projects published by architects will be viewable online

using CarbonBuzz

Raising Awareness Online

Championed by Aedas Architects and using the CIBSE Energy Benchmarks with software from the BRE, CarbonBuzz provides a platform to benchmark and track project energy use from design to operation. It enables designers to compare forecast and actual energy use for their projects against the benchmarks and data for projects entered by participating practices anonymously.

The aim of the platform is to raise awareness of the measurement of CO_2 emissions from buildings and show the difference between forecast and real energy use. It is also hoped that it will help the industry address the sources of this discrepancy. It presents a template that encourages participating practices to share emissions and energy use data for all their buildings, both during design and once a building is occupied.

CarbonBuzz Database

CarbonBuzz is the first platform that compares designed energy use with actual energy use side by side. Project data entered by practices is sourced from existing M&E documentation, Part L reports and Post Occupancy Evaluations (POEs). Any data that could identify a project would remain private and cannot be attributed to individual projects or practices.

In this way, the site will build a contemporary and comprehensive database of forecast and actual building energy use for the UK. It will become an invaluable resource to participating practices allowing them to compare their projects against CIBSE benchmarks.

Overview of use and benefits of CarbonBuzz

Register

Register to manage and benchmark your projects' emissions.

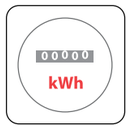
View sector-by-sector monitor

View case studies published by fellow CarbonBuzz users.

Project details

Add project details to establish benchmark category.

Log key building features that affect the building's energy use.



Energy details

Enter design data from engineering forecasts and actual data from Post Occupancy Evaluation/energy bills.

Anonymous database

Compare performance against the database average and CIBSE's benchmarks and analyse differences.

Compare your projects' actual CO_2 emissions with its design forecast.

Published projects

Agree with clients to publish data through CarbonBuzz to gain RIBA Carbon Conscious Practice accreditation.

CarbonBuzz outcomes

Anonymised and published data will inform future benchmarking, raise industry awareness and assist public research into current trends in building energy use.

design vs actual

Post-occupancy evaluation is an important method for designers and consultants to gain insight into the relationship between design and actual performance. The industry experience is that forecast design energy usage is usually less than the actual figure achieved.

CarbonBuzz will help designers to better understand this discrepancy and bridge it. Its use will focus their attention on the assessment of energy uses that are not reported as part of the Part L or EPC assessment such as appliance loads, occupancy level, operating hours and possible special uses. Energy use of lifts, display lighting, refrigeration and similar occupier defined activity are similarly omitted.from the regulatory assessments. All of these will have a major impact on a buildings' actual energy use.

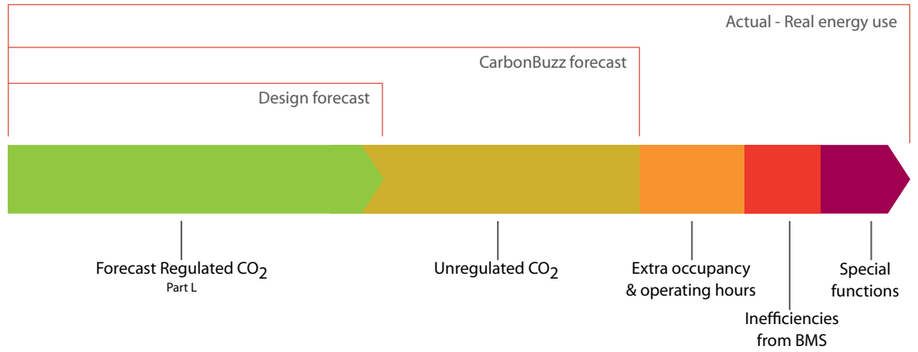
It also helps designers to align forecast and actual energy use data irrespective of whether the project has been assessed through the Part L, EPC or DEC systems allowing 'like for like' comparisons from design to completion.

CarbonBuzz will also help the construction industry deliver buildings that perform to design expectation by collecting data on how buildings perform in use. It will identify the causes of possible discrepancies between designed energy use and actual performance, and draw attention to the importance of submetering for easier building pathology.

Design data from Part L

Actual data from bills etc.

Design forecast vs real energy use



Regulated Energy Use includes: fixed building services, heating, hot water, cooling, ventilation, lighting

Unregulated Energy Use includes: plugload, server rooms, security, external lighting, lifts etc.

Special functions include: trading floors, server rooms, cafeteria etc.

CarbonBuzz methodology

CarbonBuzz builds on established Display Energy Certification (DEC) methodology, which is based on the real energy use of buildings rather than a forecast asset rating (EPC). DECs are mandatory for many public buildings. Forward looking organisations are already considering the adoption of DECs on a voluntary basis.

CarbonBuzz is the first to apply the DEC methodology to both design and actual values. By inviting users to submit data for unregulated energy use, the platform allows for simple comparison of the design estimate and actual metered consumption within existing CIBSE benchmarks.

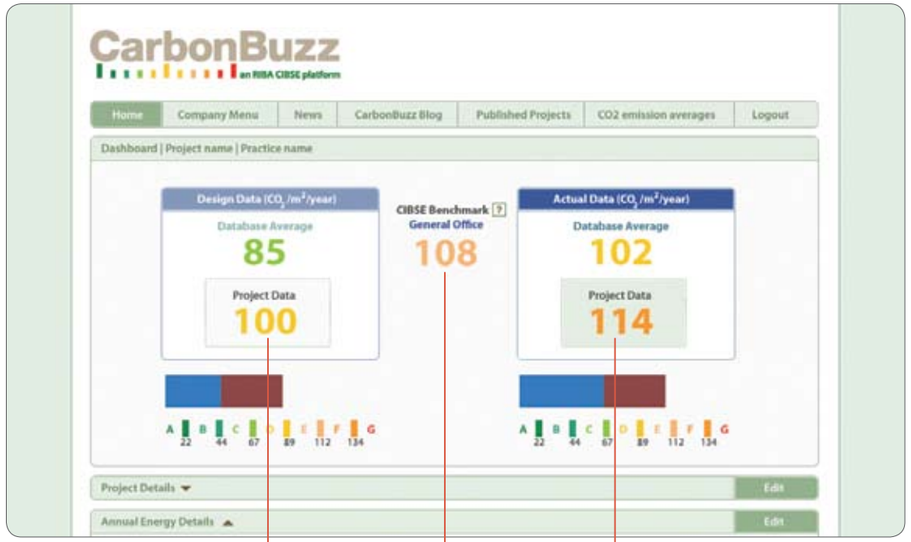
The platform is designed to enable participating practices to enter user inputs for electricity and fuel consumption in kWh/m^2/yr and then converts them into a CO_2 emission profile.

The conversion is based on specific or default carbon emission factors. Renewable energy generation can also be input and is subtracted from consumption figures to quantify the project's overall emissions.

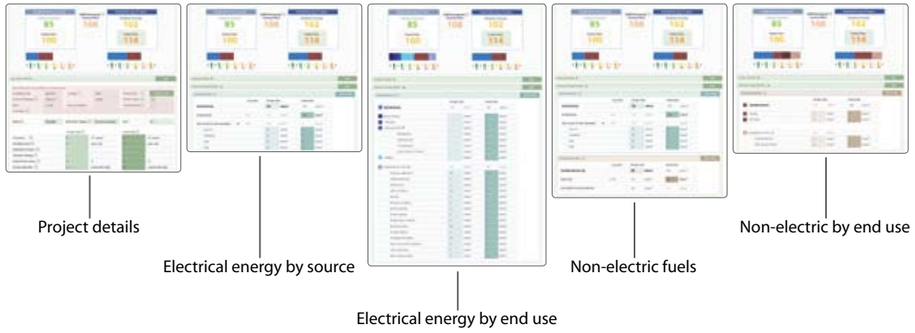
CarbonBuzz makes use of CIBSE TM46, which provides the backbone of DEC certification and contains energy consumption benchmarks for 29 different building use categories. The benchmarks are expressed in kWh/m^2/yr and are converted into kgCO_2/m^2/yr.

Each project report will display figures in kgCO_2/m^2/yr. CIBSE benchmark, CarbonBuzz forecast, CarbonBuzz Actual, Project Forecast and Project Actual figures are all displayed in an easy to read format. This allows for comparison against average emissions for contemporary designed and built equivalents in addition to the notional emissions for the CIBSE benchmark.

Dashboard showing CarbonBuzz design vs actual values against CIBSE benchmarks



Data entry pages feature design vs actual energy values side by side



entering project data

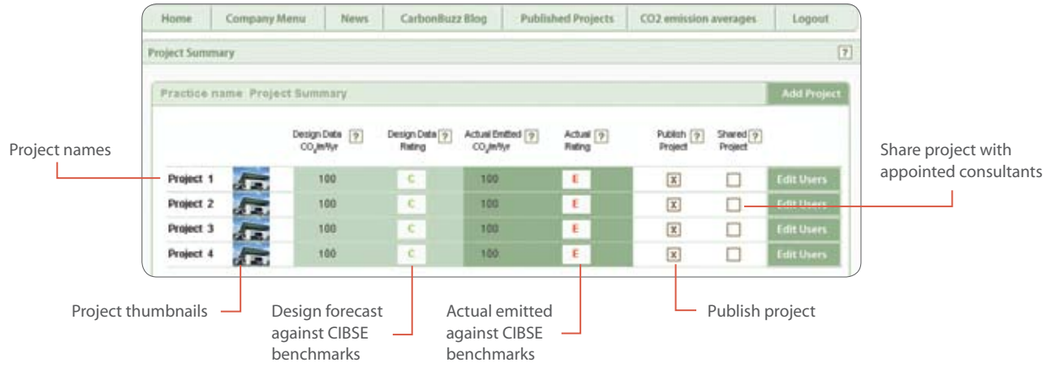
CarbonBuzz makes use of an interactive and user friendly template to help with the entry and management of carbon emission data for submitted projects.

Each participating practice is also provided with a secure login name and password. It is not possible to view other practices project data. Only the official auditors, appointed by CIBSE and RIBA, currently at University College London, The Bartlett School of Graduate Studies are able to access all project data to ensure consistency and make any required corrections.

Although CarbonBuzz values do not currently take location, occupancy, hours of operation or low carbon systems into account it is possible to enter this for each project. This data will be used to develop future search tools and enable research into a range of different questions.

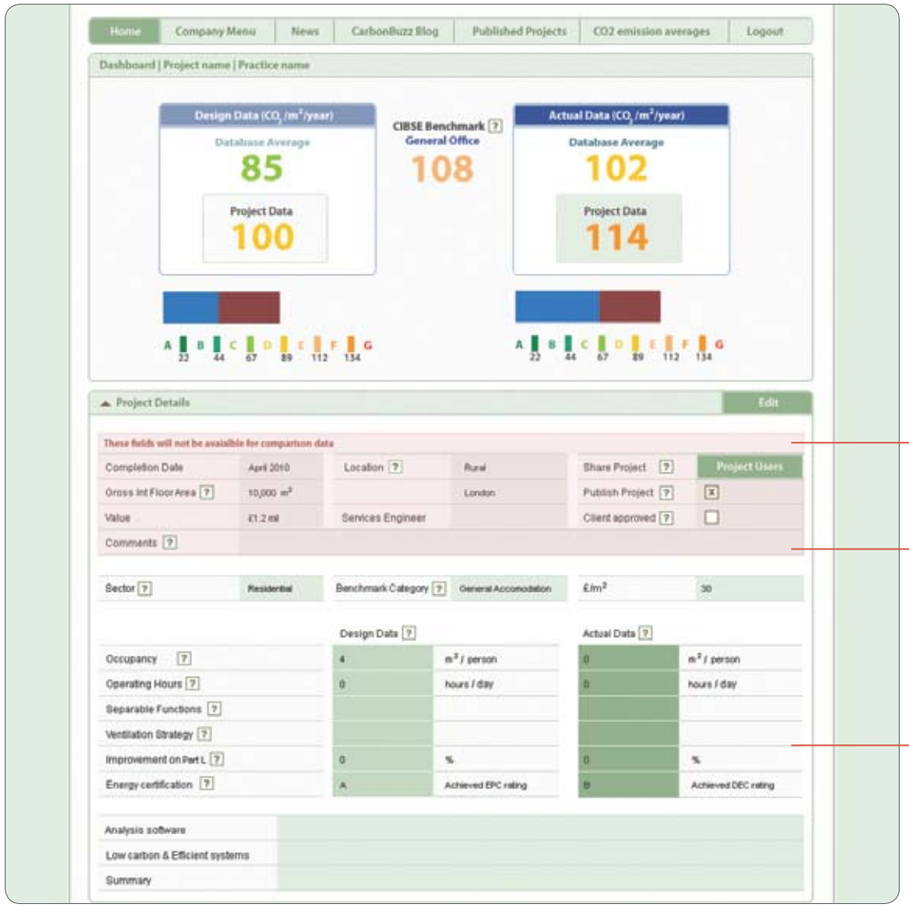
When are low energy buildings beautiful? How much savings do low carbon technologies deliver for schools? How big a factor is occupancy? These and other questions can be answered through the analysis of 'identity free' project data.

Project summary - users can manage multiple projects online



project details

Project details as viewed online



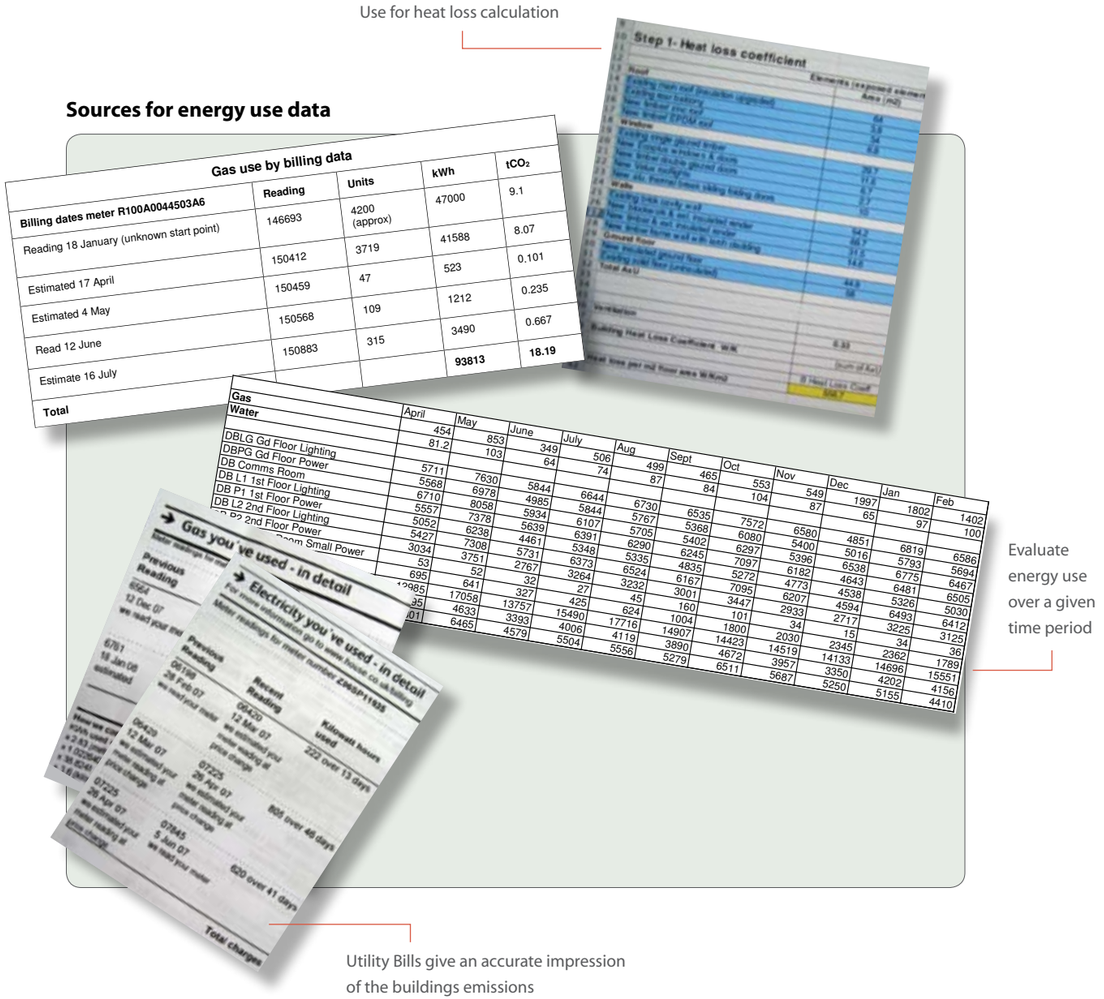
sources of data

At the heart of CarbonBuzz is the ability to benchmark project emissions benchmarked during both design forecast and post occupancy.

Design forecast emissions are calculated during the design phases and can be updated throughout the project. The database currently holds only one set of data. These emissions are calculated through the use of thermal modeling techniques or steady state calculations by the M&E engineers. They are normally outlined in the M&E report from stage C onwards and as part of the Part L assessment. Case studies demonstrate the data source and entry.

Actual emissions are obtained through meter readings or utility bills after the building has been occupied for a period of time such that its use is considered stable. This would normally be at least one full year to enable an account to be made of the impact of variation in occupancy patterns and the change of the seasons. CarbonBuzz will provide a standard template for architects and engineers to discuss the energy use of their buildings and share design information online.

It is important to remember that CarbonBuzz is a voluntary benchmarking platform and not a certification process.



calculating emissions

CarbonBuzz uses the Part L emissions factors to convert energy use data to a carbon emissions profile for the project.

Each emission factor is defined according to the amount of carbon emitted, in kg, for each kWh of energy produced or consumed. The factors work as multipliers and permit an equivalent comparison of emissions from different types and sources of energy.

Different electricity grids will have different carbon factors associated with them. The UK national electricity grid is currently rated at **0.55 kgCO_2/kWh** as indicated in DEC methodology. Other local grids will have a different factor that can be input as required.

Fuel types will also vary in their emissions. Gas heating has an emission factor of **0.194 kgCO_2/kWh** and Biomass heating a factor of **0.025 kgCO_2/kWh**. Some fuel types have emission factors which are dependent on their source, such as biodiesel. These specific figures can also be input by the user as required.

Fuel conversion factors in kgCO_2/kWh

National Grid Electricity	0.55	Biogas	0.025
Gas Heating	0.194	Coal	0.291
Biomass Heating	0.025	Anthracite	0.317
Natural Gas	0.194	Smokeless Fuel *	0.392
LPG	0.234	Dual Fuel Appliances **	0.187
Oil	0.265	Waste Heat ***	N/A

* Including Coke

** Mineral and Wood

*** From industrial processes and power stations >10MWe, with power efficiency > 35%

kWh

Energy entry pages - Electrical energy

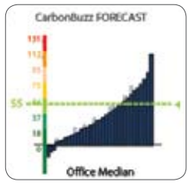
Annual electrical energy by source

Annual electrical energy by end use

Enter unregulated energy figures to obtain a more accurate forecast against CIBSE benchmarks

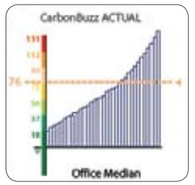
emissions profile

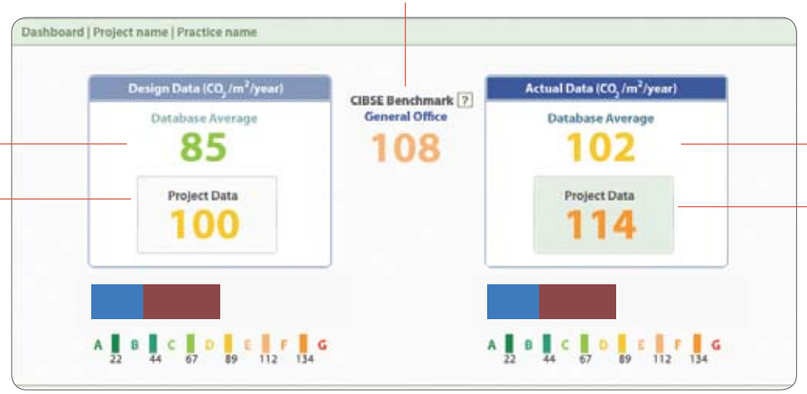
Clicking on this figure allows you to see the spread of project design forecast figures within a benchmark category

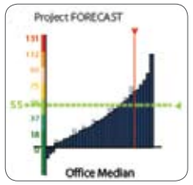


Clicking on this database profile allows you to see the CIBSE benchmark for a category

Clicking on this figure allows you to see the spread of project actual energy use figures within a benchmark category

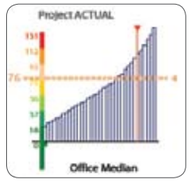






Clicking here displays your project forecast highlighted within a range of projects in the same benchmark category

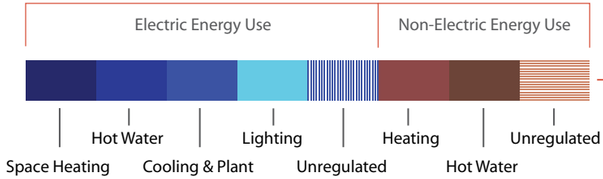
Clicking here displays your actual energy use highlighted within a range of projects in the same benchmark category



By fuel

Bar chart shows the total energy use in a building, converted into CO_2 and split into electrical (blue) and non-electric (brown) segments. Renewable energy is also displayed as if provided by conventional fuels, but is deducted from the total figure by sliding the scale forward

By end use



Barchart allows the display of end uses, both in electric and non-electric energy use

publish projects to attain a RIBA Carbon Conscious Accreditation

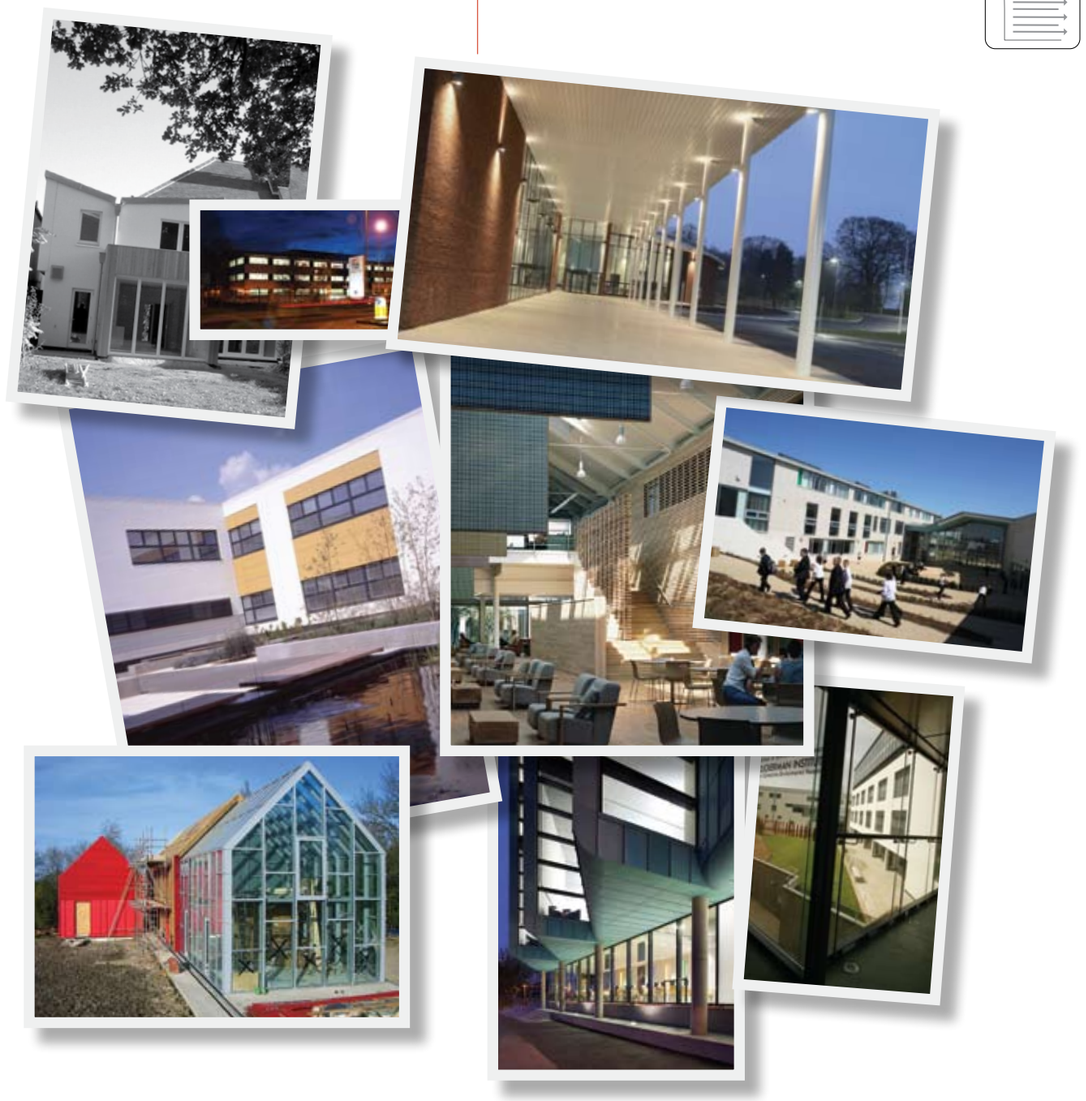
Carbon Buzz operates using 'identity free' data but recognises the usefulness of even more tangible published data.

The initiative wishes to encourage participating practices to consider the value of publishing data on a 'full disclosure' basis. There is a severe lack of attributable and accessible building energy use data in the UK. This means that the industry is missing out on valuable knowledge and evidence about the effectiveness of design measures to reduce CO_2 emissions.

RIBA Carbon Conscious Accreditation

From 2010, participating RIBA Chartered Practices that elect to publish projects with both design and in-use data will be formally recognised by the Royal Institute of British Architects with 'RIBA Carbon Conscious Practice' accreditation.

Case studies from pilot practices



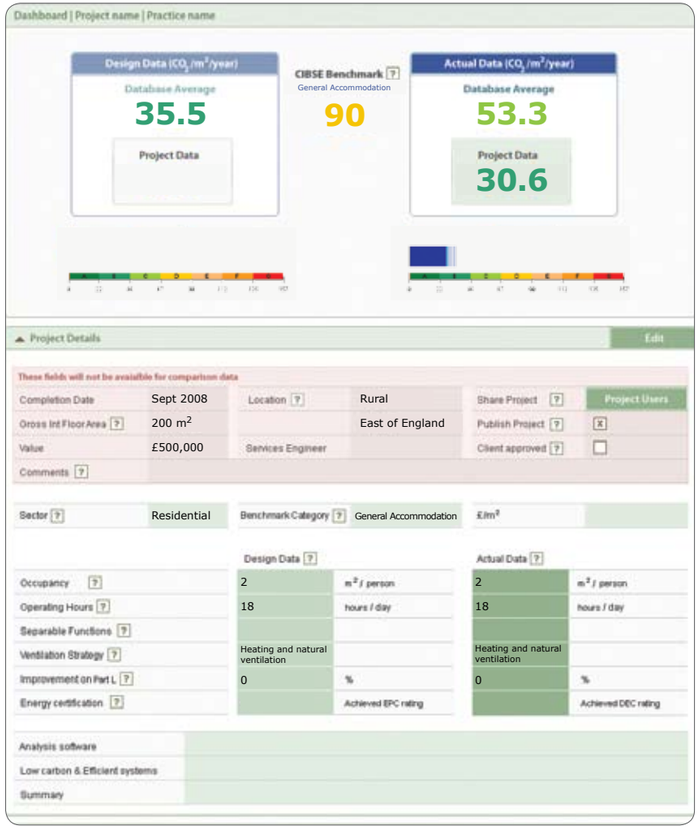
case study 01

Architectural Practice: **dRMM**

Project: **The Sliding House**
Sector: **Residential**
Completion Date: **September 2008**
Gross Internal Floor Area: **200m²**
Value: **£500,000**
Location: **Rural, East of England**

This is a ground breaking design in glass and steel with a moveable roof and geothermal heat pump and high levels of insulation. The design issues tackled a number of questions including; Will the moveable roof give the best of all worlds - solar gain during daylight and insulation at night? How will the geothermal heat pump cope with wide variations in temperature between glass and timber sections? Is the air-gap between house and roof sufficiently sealed to get value from the insulation in the roof? Results from full occupation will be forthcoming over the next 12 months, but CarbonBuzz has provided a helpful framework for evaluation.

Annual energy details from CarbonBuzz



case study 02

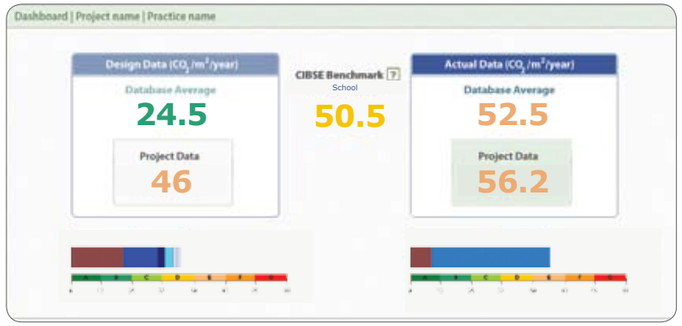
Architectural Practice: **Aedas**

Aedas

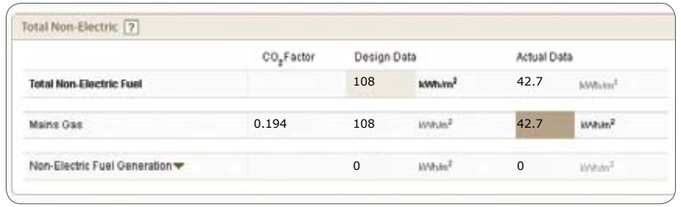
Project: **Stockley Academy**
Sector: **Education**
Completion Date: **September 2006**
Gross Internal Floor Area: **12,800m²**
Value: **£21,474,836**
Location: **Urban, London**

Stockley Academy had been occupied for two years in January 2008, at the time of the post occupancy evaluation. Energy bills for the year commencing December 2007 were used to calculate actual carbon emissions. These were higher than those forecast at the design stage, primarily due to a higher than predicted unregulated energy use. A large number of computers per classroom and issues with the building management systems were identified as the main causes.

Dashboard with completed project emissions results



Non-Electrical Energy Details



case study 03

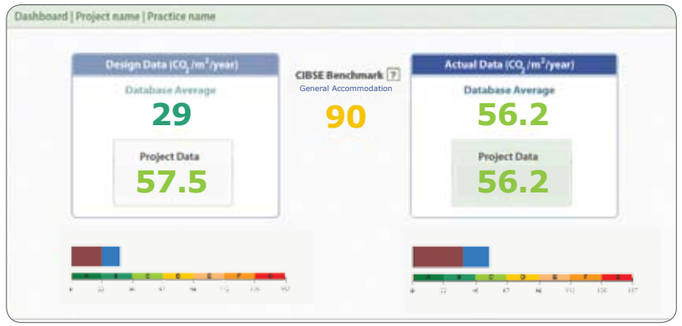
Architectural Practice: **C+N**

charlick nicholson architects

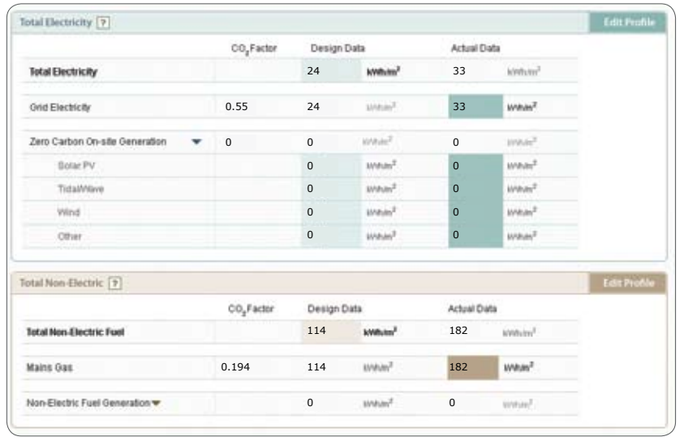
Project: **House extension, Church Vale**
Sector: **Residential**
Completion Date: **November 2006**
Gross Internal Floor Area: **199m²**
Value: **£175,000**
Location: **Urban, London**

This project involved a two storey side and rear extension to a 1930's semi-detached house in North London. The design aimed to upgrade the energy efficiency of the whole dwelling by specifying high levels of insulation throughout the new construction and specific measures including an external insulated render system, underfloor heating, a new boiler and heating system and energy-efficient airtight windows and doors.

Dashboard with completed project emissions results



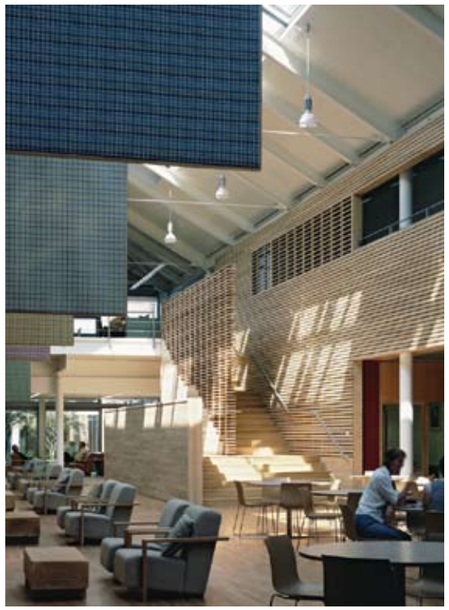
Annual Energy Details as viewed online



case study 04

Architectural Practice: **FCBStudios**

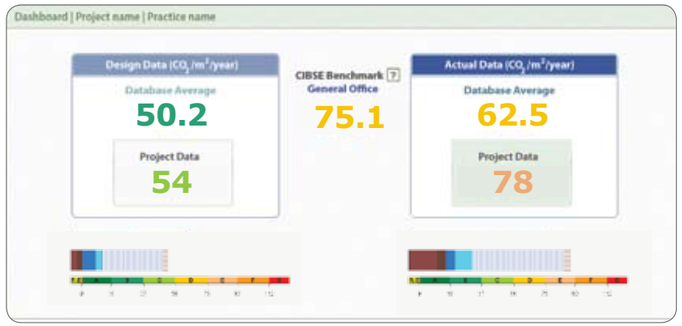
FeildenCleggBradleyStudios



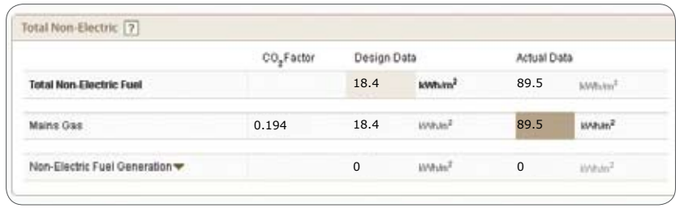
Project: **Heelis, The National Trust HQ**
Sector: **Office**
Completion Date: **June 2005**
Gross Internal Floor Area: **7,100m²**
Value: **£14.5m**
Location: **Urban, Swindon**

The new central office for the National Trust is a two storey building housing 470 staff in the centre of Swindon. A series of photovoltaic panels and 'snouts' in the open roof space provide for natural ventilation. Natural light penetrates through the double height spaces to the floorplate below. A post occupancy evaluation was carried out in 2006. It revealed that heating energy was considerable above the estimate due to unnecessary opening of the automatic windows. Energy use and CO_2 emissions have now been reduced dramatically.

Dashboard with completed project emissions results



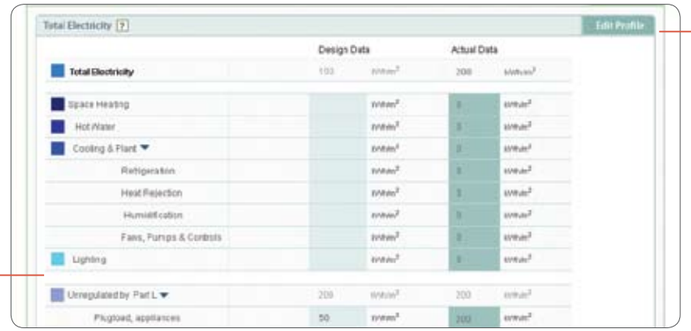
Non-electrical energy details



Electric energy details

Annual electrical energy by end use

Enter unregulated energy figures to obtain a more accurate forecast against CIBSE benchmarks



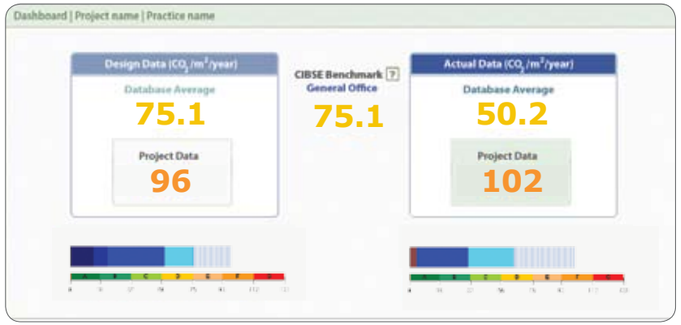
case study 05

Architectural Practice: **Simons Group**

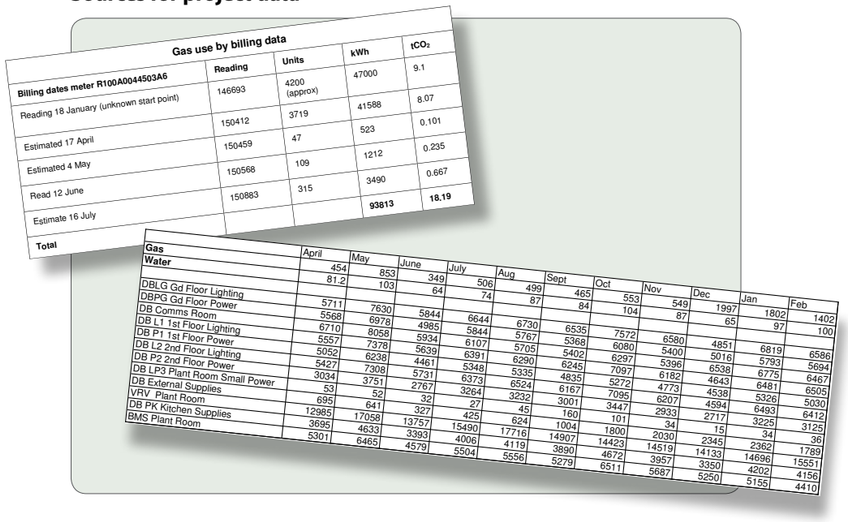
Project: **Simons Group HQ Offices**
Sector: **Office**
Completion Date: **July 2006**
Gross Internal Floor Area: **4586m²**
Value: **£5m**
Location: **Urban, East Midlands**

Simons Group's HQ offices are designed to meet the landlord requirement for a low energy commercial office space. The building has been refurbished from a two story 1970's office building on the edge of Lincoln. Reactive lighting controls and internal blinds, without task lighting, have been well received. The performance of the new wall and roof fabric is 25% better than existing Building Regulations requirements and gas heating requirements have proved very low.

Dashboard with completed project emissions results



Sources for project data



Gas use by billing data

Billing dates meter R100A0044503A6	Reading	Units	kWh	tCO₂
Reading 18 January (unknown start point)	146693	4200 (approx)	47000	9.1
Estimated 17 April	150412	3719	41588	8.07
Estimated 4 May	150459	47	523	0.101
Read 12 June	150568	109	1212	0.235
Estimate 16 July	150883	315	3490	0.667
Total			93813	18.19

Gas / Water	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
	454	853	349	506	499	465	553	549	1997	1802	1402
	812	103	64	74	87	84	104	87	65	97	100
DBLG Gd Floor Lighting	5711	7630	5844	6644							
DBPG Gd Floor Power	5568	6978	4985	5844	6730	6535	7572	6580	4851	6819	
DB Comms Room	6710	8058	5934	6107	5767	5368	6080	5400	5016	5793	6586
DB L1 1st Floor Lighting	5557	7378	5639	6391	5705	5402	6297	5396	6538	6775	5694
DB P1 1st Floor Power	5052	6238	4461	5348	6290	6245	7097	6182	4643	6481	6467
DB L2 2nd Floor Lighting	5427	7308	5731	5335	6524	6167	7095	6207	4538	5326	6505
DB P2 2nd Floor Power	3034	3751	2767	6373	3232	4835	5272	4773	4594	6493	5030
DB LP3 Plant Room Small Power	53	52	32	3264	27	3001	3447	2933	2717	3225	6412
DB External Supplies	695	641	327	425	45	160	101	34	15	34	3125
VRV Plant Room	12985	17058	13757	15490	624	1004	1800	2030	2345	2362	36
DB PK Kitchen Supplies	3695	4633	3393	4006	17716	14907	14423	14519	14133	14696	1789
BMS Plant Room	5301	6465	4579	5504	4119	3890	4672	3957	3350	4202	15551
					5556	5279	6511	5687	5250	5155	4156
											4410

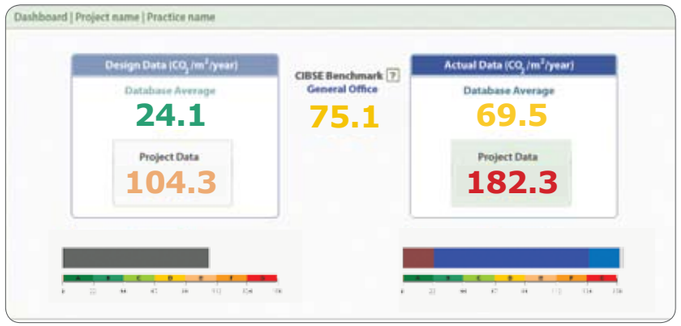
case study 06

Architectural Practice: **RMJM**

Project: **University of Sheffield**
Sector: **Education**
Completion Date: **April 2007**
Gross Internal Floor Area: **8995m²**
Value: **£21,474,836**
Location: **Urban, Yorkshire and Humberside**

The Information Commons building is situated in the heart of the University of Sheffield's urban campus and provides a 24/7 integrated learning environment for undergraduate and postgraduate students. Sustainability is a key issue for the project. The design team has adopted a number of strategies to ensure energy efficiency throughout, always bearing in mind the 24-hour nature of the facility. These include a highly insulated external envelope, the use of exposed thermal mass within the structure of the building and flexible zoned heating and cooling units, minimising glare and optimising use of daylight through the 'north light fins'.

Dashboard with completed project emissions results



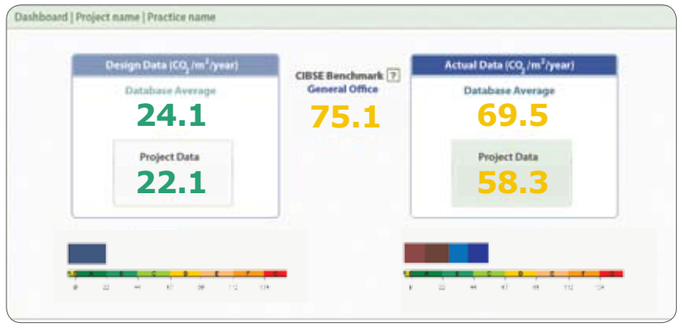
case study 07

Architectural Practice: **RMJM**

Project: **ZICER**
Sector: **Education**
Completion Date: **March 2003**
Gross Internal Floor Area: **2,860m²**
Value: **£6,130,000**
Location: **Rural, Yorkshire and Humberside**

The Zuckerman Institute for Connective Environmental Research (ZICER) is part of the University of East Anglia's internationally-acclaimed School of Environmental Sciences. The state-of-the-art building houses a virtual reality and experimental laboratories, open plan office research space, exhibition and seminar space on the top floor which is clad with a photovoltaic (PV) cell array. The building is designed to surpass the many innovative low-energy buildings on campus with a target energy use not to exceed 100kW/m² per annum.

Dashboard with completed project emissions results



case study 08

Hamiltons

Architectural Practice: **Hamiltons**

Project: **Mid-Bedfordshire Local Government Offices**
Sector: **Office**
Completion Date: **May 2006**
Gross Internal Floor Area: **6,000m²**
Value: **£11,000,000**
Location: **Rural, South East**

These new council offices are arranged around a double-height public space with meeting rooms providing a buffer between the public space and the three fingers of office space. The design employs traditional materials used in a contemporary manner and relies on natural light and ventilation to create a friendly modern environment. The building has been occupied for a few years and is currently used more intensively than envisaged. The occupiers are currently actively working to reduce energy consumption and achieve levels closer to the design specification. They currently use a green electricity supplier.

Annual energy details from CarbonBuzz

case study 09

penoyre & prasad

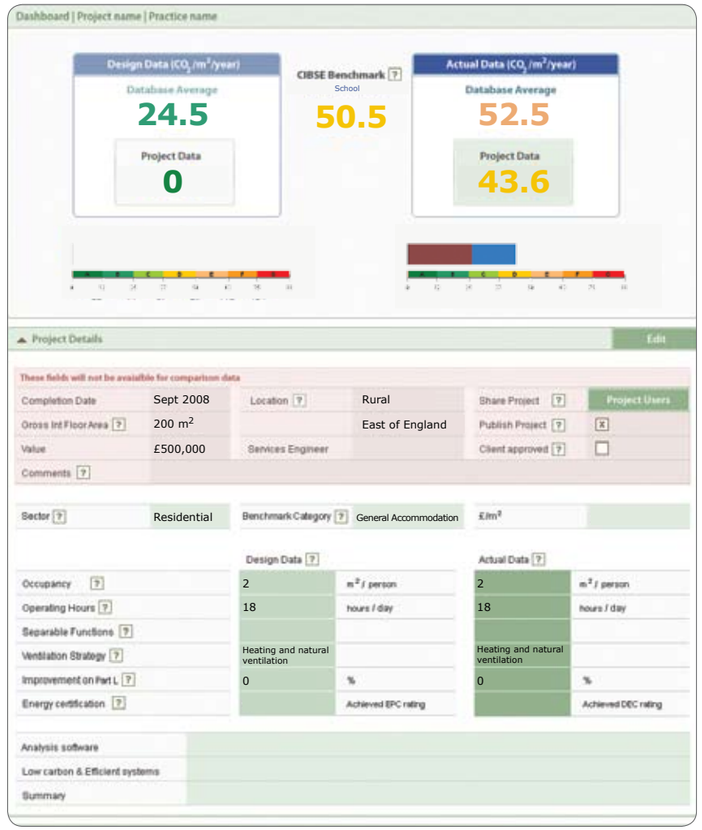
Architectural Practice: **Penoyre & Prasad**

Project: **Ousdale School New Building**
Sector: **Education**
Completion Date: **April 2007**
Gross Internal Floor Area: **8,342m²**
Value: **£15,000,000**
Location: **Urban, East Midlands**

Environmental sustainability is central to the design of this new teaching centre. The north south orientation of both parts of the building reduces heat gain from low angle sun, while high ceilings and windows ensure good spread of daylighting in classrooms. Insulation levels higher than Building Regulations 2002 requirements ensure a minimal need for heating. Natural ventilation with airshafts in majority of teaching spaces combine with exposed thermal mass and night-time cooling. CO_2 sensors also link to BMS help ensure good air quality throughout the year. The achieved performance reflects the effectiveness of these measures.

The building was designed to pre-2002 legislation, therefore no forecast figures are available.

Annual energy details from CarbonBuzz



Piloting Practices

dRMM
Hamiltons
BDP
HOK
Sheppard Robson
Make
Mott MacDonald
Atelier Ten

Extended Pilot Practices / Organisations

Bioregional
Buro Happold
Broadway Malyan
CarbonLite Programme
Centre for Alternative Technology
Charlick & Nicholson Architects
Hilson Moran
Hopkins Architects Ltd
Max Fordham
Oxford Brookes University
Penoyre & Prasad LLP
Ramboll Whitbybird
RMJM
Scott Brownrigg
Simons Design

CarbonBuzz Contributors

Aedas R&D Sustainability Group
Judit Kimpian / Eleanor Davies

Building Research Establishment
Ranjit Bassi / Soni Muthoni

Chartered Institution of Building Services Engineers
Hywel Davies

Faber Maunsell
Paul Woods

Feilden Clegg Bradley Studios
Bill Gething

Royal Institute of British Architects
Keith Snook / Anna Gagliano / Luis Belmonte

University College London, The Bartlett School
of Graduate Studies
Harry Bruhns / Dejan Mumovic / Tadj Oreszczyn

Usable Buildings Trust
Bill Bordass

XCO_2 Energy
Ricardo Moreira

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