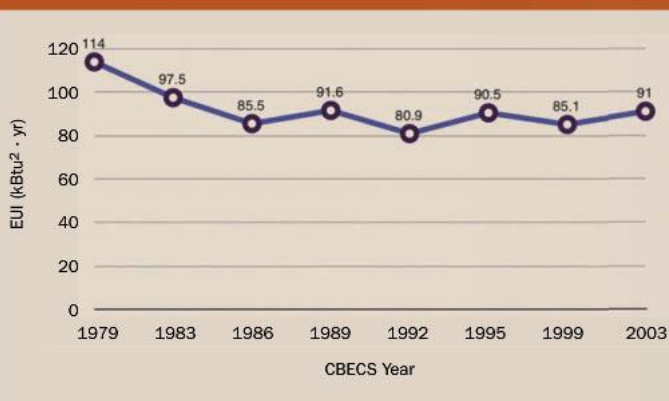


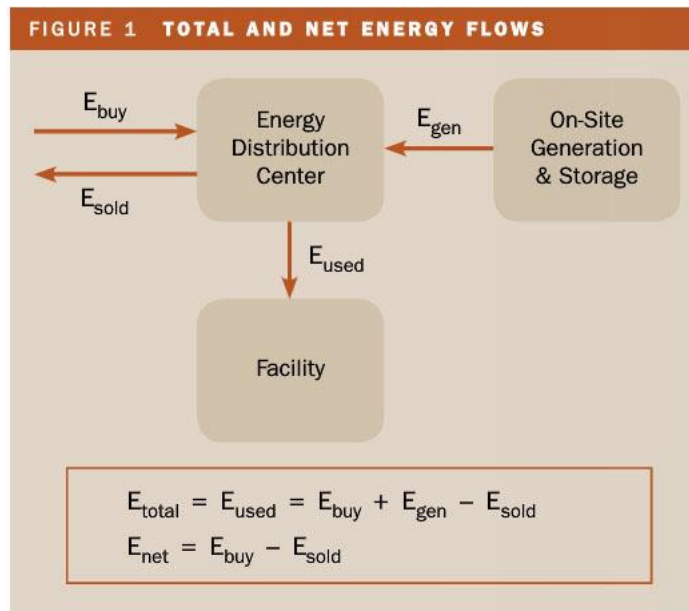
THE COMMON DEFINITION
OF BUILDING EUI IS:

$$\frac{\text{Annual Building Energy Use (kBtus or MJ)}}{\text{Building Area (ft}^2 \text{ or m}^2\text{)}} = \text{EUI}$$

FIGURE 2 U.S. COMMERCIAL BUILDING TOTAL SITE ENERGY INTENSITY TREND



Energy Information Administration
Commercial Buildings Energy Consumption Survey



From ASHRAE Standard 105-2007

Key Terms: “Scopes” 1, 2, and 3

- **Scope 1:** Direct GHG emissions - Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
- **Scope 2:** Electricity indirect GHG emissions - Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company.
- **Scope 3:** Other indirect GHG emissions Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

“The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard,”
World Business Council for Sustainable Development and World Resources Institute, 2004.

How Will Buildings Measure Emissions?



Scope 1



Scope 2

CASE STUDY
ADA COUNTY COURTHOUSE AND ADMINISTRATION BUILDING

The courthouse's energy performance has improved most years since it opened in 2002. The savings have allowed Ada County to recoup the incremental costs of the courthouse's sustainable and energy-efficient systems in two years.

Building management has used the ENERGY STAR application as a framework to evaluate energy performance each year. The courthouse's rating has improved from 70 in 2003 to 85 in 2009. The courthouse received LEED Silver certification for Existing Buildings in 2005.

Ada County's administrative offices previously operated out of a 60-year-old courthouse building and two other leased buildings. When the chillers failed at times in the former courthouse, indoor temperatures could vary by as much as 10°F in various areas of the building. Building management had to manually maintain the heating or cooling load.

In addition to facility and security problems with the old courthouse, the county's growth also helped spur the decision to consolidate all departments into a single highly efficient building. A public/private

BUILDING AT A GLANCE

Name: Ada County Courthouse and Administration Building

Location: Boise, Idaho

Owner: Ada County

Project: 130,000 sq ft

Indicators: Courtrooms, trials, hearing area, offices, meeting rooms, parking

Employees/Visitors: 500 employees, more than 50,000 visitors per month

Green Spaces: 100,000 sq ft (includes parking)

Total Cost: \$45 million

Cost Per Square Foot: \$136

Completion/Construction/Opening: January 2002

Occupancy: 100%

Certification: LEED Silver, LEED EB Gold, LEED 2009, LEED Green Building, ENERGY STAR

Maintaining Efficiency

BY DAVE LOGAN AND SELERA O'NEAL

The Ada County Courthouse and Administration Building demonstrates that even a new building that is designed for efficiency and sustainability can improve its performance through constant monitoring, adjustments, maintenance and annual evaluation of systems.

The Ada County Courthouse and Administration Building is shown with sustainable, green and energy-efficient spaces as well as courtyards, offices and a central space. A 100-foot atrium area (shown in main entrance) provides an outdoor break space for the courtyards.

ADA Architecture
Summer 2010 HIGH PERFORMING BUILDINGS



LCA Architects

| 2009 ENERGY USE | | | | | | | | | | |
|-----------------|------------------|------------------|--------------------|------------------|---------------------|-----------------|--------------------------|--------------------------|------------------|------------------|
| | Electricity kWh | Electricity Cost | Natural Gas Therms | Natural Gas Cost | Geothermal Gallons* | Geothermal Cost | 2009 Heating Degree Days | 2009 Cooling Degree Days | 2002-08 Avg. HDD | 2002-08 Avg. CDD |
| Jan | 393,848 | \$17,828 | 521 | \$542 | 2,184 | \$8,064 | 1037 | 0 | 1007 | 0 |
| Feb | 363,231 | \$17,997 | 387 | \$408 | 1,792 | \$6,620 | 779 | 0 | 812 | 0 |
| Mar | 409,402 | \$20,129 | 418 | \$443 | 1,427 | \$5,323 | 716 | 0 | 624 | 0 |
| Apr | 419,814 | \$20,117 | 436 | \$472 | 936 | \$3,659 | 430 | 7 | 426 | 1 |
| May | 447,331 | \$21,311 | 498 | \$539 | 833 | \$3,260 | 187 | 87 | 199 | 50 |
| Jun | 460,743 | \$29,114 | 518 | \$560 | 1,054 | \$4,120 | 24 | 114 | 55 | 175 |
| Jul | 507,434 | \$31,681 | 615 | \$663 | 863 | \$3,373 | 0 | 428 | 0 | 446 |
| Aug | 459,462 | \$28,850 | 581 | \$627 | 223 | \$889 | 14 | 338 | 5 | 323 |
| Sep | 433,340 | \$24,346 | 554 | \$584 | 169 | \$673 | 40 | 214 | 88 | 96 |
| Oct | 389,011 | \$21,998 | 475 | \$421 | 492 | \$1,941 | 505 | 0 | 370 | 10 |
| Nov | 361,645 | \$20,316 | 986 | \$801 | 910 | \$3,523 | 701 | 0 | 734 | 0 |
| Dec | 396,944 | \$21,455 | 2,952 | \$2,320 | 1,398 | \$5,174 | 1,179 | 0 | 958 | 0 |
| Total | 5,042,205 | \$275,142 | 8,941 | \$8,380 | 12,281 | \$46,619 | 5,612 | 1,188 | | |

*in thousands

ENERGY AT A GLANCE

Energy Use Intensity (Site) 64 kBtu/ft²

Natural Gas 3 kBtu/ft²

Electricity 48 kBtu/ft²

Geothermal 13 kBtu/ft²

Annual Source Energy 176 kBtu/ft²

Annual Energy Cost Index (ECI)

\$0.93/ft²·yr

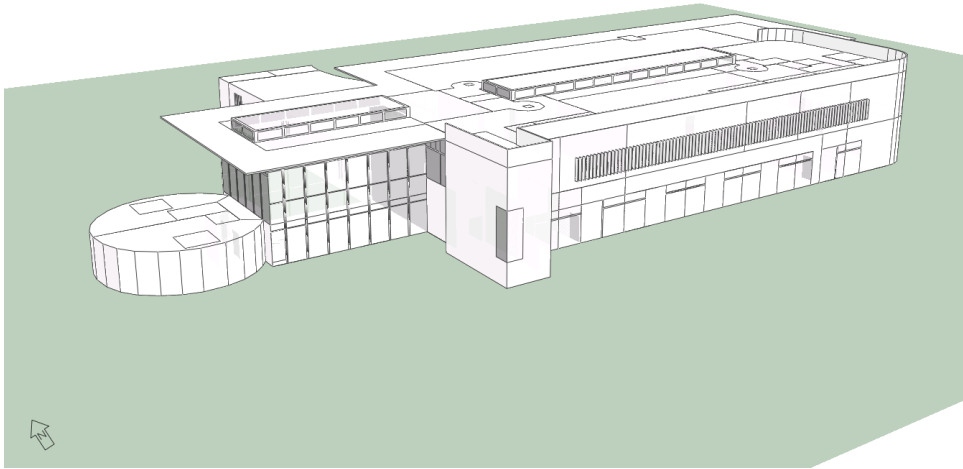
Peak Load 1450 kW (2009)

Base Load 935 kW (2009)

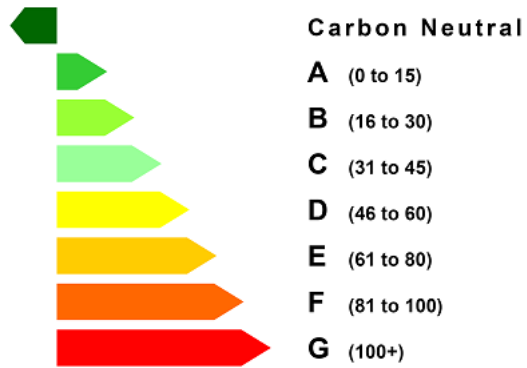
Load Factor 47.6% (2009)

ENERGY STAR Rating 84 (2009),
85 (2008), 85 (2007), 83 (2006),
75 (2005), 76 (2004)









Energy Performance Certificate for buildings other than dwellings

| Building Energy Performance | | Scotland |
|---|---|--|
| Calculated asset rating using IES v1E> v6.0.0 [ApacheSim] | Building type Libraries/museums/galleries | Current rating |
| | | Excellent |
| Carbon Neutral | | B+ |
| A (0 to 15) | | |
| B (16 to 30) | | |
| C (31 to 45) | | |
| D (46 to 60) | | |
| E (61 to 80) | | |
| F (81 to 100) | | |
| G (100+) | | Very Poor |
| Carbon Dioxide Emissions | | 16 |
| The number refers to the calculated carbon dioxide emissions in terms of kg per m ² of floor area per year | | |
| Approximate current energy use per m ² of floor area: | | 135 kWh/m ² |
| Main heating fuel: Biomass | | Building Services: Heating with Nat. Vent. |
| Renewable energy source: | | Electricity: Grid supplied |
| Carbon Dioxide is a greenhouse gas which contributes to climate change. Less Carbon Dioxide emissions from buildings helps the environment. | | |
| Benchmarks | | |
| A building of this type built to building regulations standards current at the date of issue of this certificate would have a rating: | | |
| 33 | | C+ |
| Where the accompanying recommendations for the cost effective improvement of energy performance are applied, this building would have a rating: | | |
| 0 | | ?? |
| Recommendations for the cost-effective improvement (lower cost measures) of the energy performance | | |
| 1. Improve insulation on HWS storage. | | |

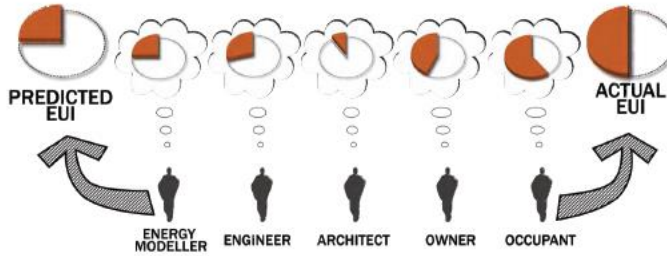
Energy Performance Certificate for buildings other than dwellings

| Building Energy Performance | | Scotland |
|---|---|--|
| Calculated asset rating using IES v1E> v6.0.0 [ApacheSim] | Building type Libraries/museums/galleries | Current rating |
| | | Excellent |
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| E (61 to 80) | | |
| F (81 to 100) | | |
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| Benchmarks | | |
| A building of this type built to building regulations standards current at the date of issue of this certificate would have a rating: | | |
| 33 | | C+ |
| Where the accompanying recommendations for the cost effective improvement of energy performance are applied, this building would have a rating: | | |
| 0 | | ?? |
| Recommendations for the cost-effective improvement (lower cost measures) of the energy performance | | |
| 1. Improve insulation on HWS storage. | | |
| Address: John Hope Gateway, Arboretum Place, Edinburgh, EH3 5LR 2834.735 | | |
| Conditioned area (m ²): | | |
| Name of protocol organisation: Not accredited, (123456) | | |
| Date of issue of certificate: 09 Jul 2015 (Valid for a period not exceeding 10 years) | | |
| This certificate is a requirement of EU Directive 2002/91/EC on the energy performance of buildings. | | |
| NB THIS CERTIFICATE MUST BE AFFIXED TO THE BUILDING AND NOT REMOVED UNLESS REPLACED WITH AN UPDATED VERSION AND FOR PUBLIC BUILDINGS DISPLAYED IN A PROMINENT PLACE | | |



ENERGY USE

PREDICTED vs. ACTUAL



SERA ARCHITECTS, INC. © 2013



FIGURE 4: Many different actors during the design, construction and operational process contribute to a building's energy use intensity (EUI) with varying expectations.
 Courtesy: SERA Architects

Public building CO2 footprints revealed (8 pictures)

guardian.co.uk



Thumbnail view

Environment
 Energy efficiency ·
 Carbon emissions ·
 Green building

UK news

More on this story

Nearly half of FTSE-250 companies keep their carbon footprints hidden

Halls of shame: UK's biggest CO2 offenders



6 / 8

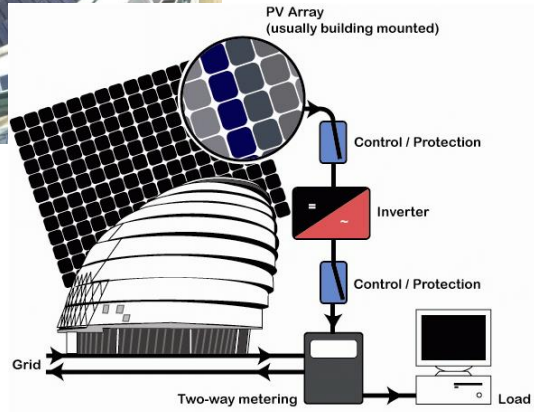
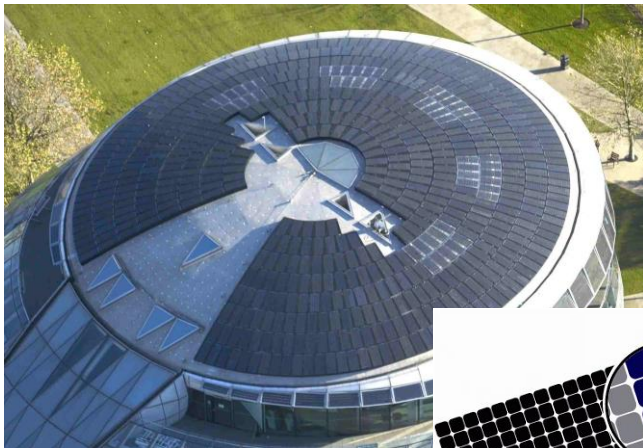
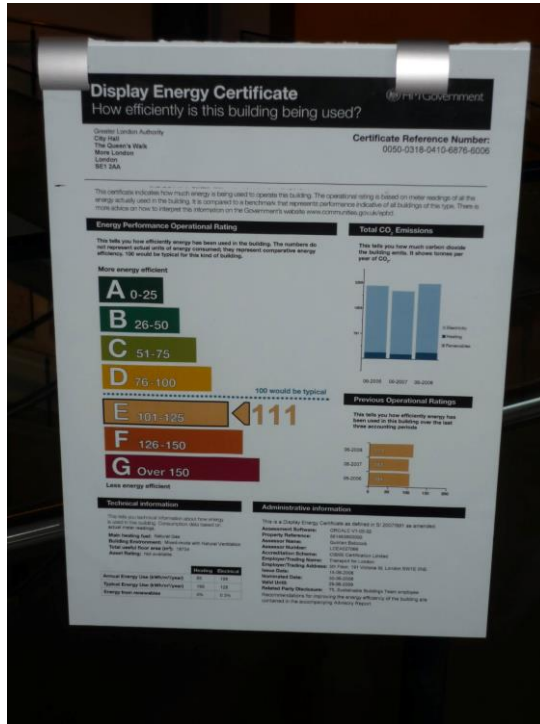
City Hall, London

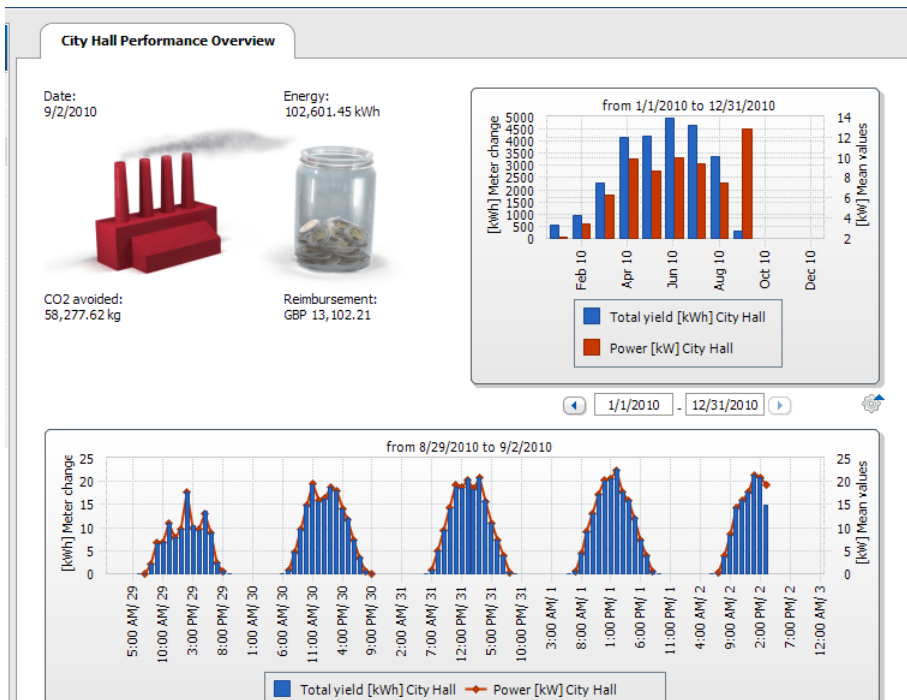
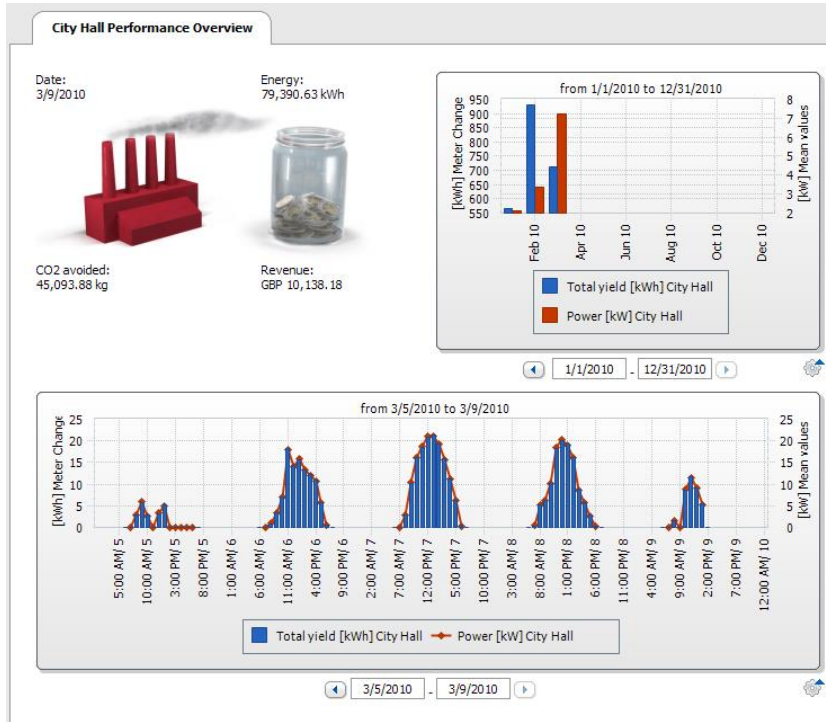
Energy efficiency rating: E

Annual CO2 emissions: 2,255 tonnes of carbon

New buildings also fared badly, raising questions about the validity of sustainability claims made by architects and developers. London's City Hall, built in 2002, was described by its architect Foster & Partners as a "virtually non-polluting public building" yet has scored an E

Photograph: David Levene





Reveal.

THE HIGH PERFORMANCE ENERGY LABEL

Bullitt Center, Seattle, WA
 Owner: The Bullitt Foundation
 Architects: Miller Hull
 MEP Engineer: RAE Consulting Engineers
 Zero Tool Building Type: Commercial Office
 Climate Zone: Marine Square Feet: 50,798

EUI: 12 | **zEPI: -9**
 Energy Use Intensity - kbtu/sf/year | Zero Energy Performance Index

85%
Reduction in energy use as % of baseline efficiency only

109%
Reduction in use as % of baseline efficiency + renewables

2030 Challenge Target

- Efficiency
- On site renewables
- Off site renewables
- Baseline: Zero Tool

- ILFI NZEB Certified
- Meets the 2030 Challenge

Valid date: 01/01/2017-01/01/2019

INTERNATIONAL LIVING FUTURE INSTITUTE™ living-future.org
 NEW BUILDINGS INSTITUTE newbuildings.org



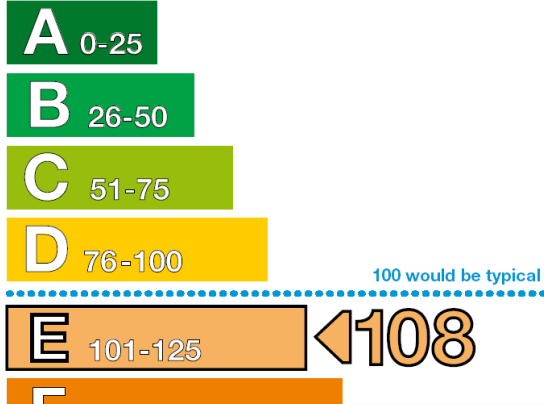
BULLITT CENTER PERFORMANCE
kWh



Energy Performance Operational Rating

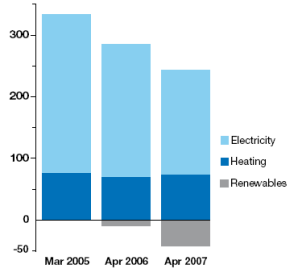
This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

More energy efficient



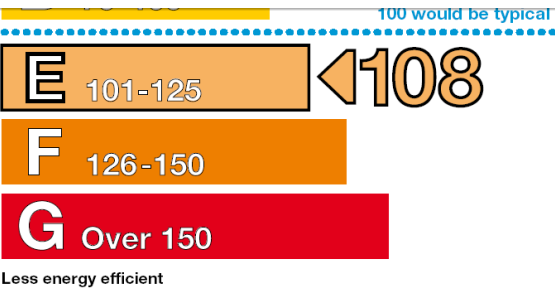
Total CO₂ Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO₂.



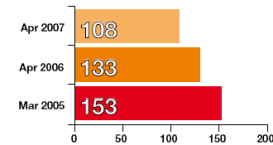
Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods



Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods



Technical information

This tells you technical information about how energy is used in this building. Consumption data based on actual readings.

Main heating fuel: Gas
 Building Environment: Air Conditioned
 Total useful floor area (m²): 2927
 Asset Rating: 92

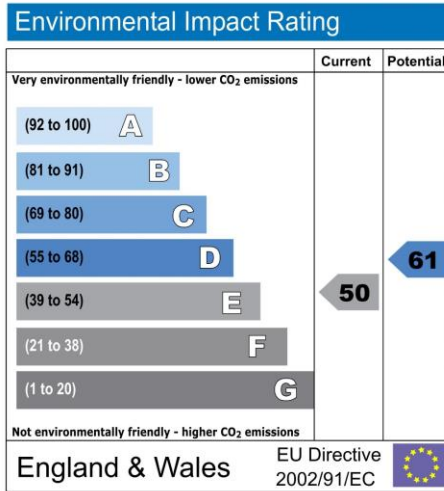
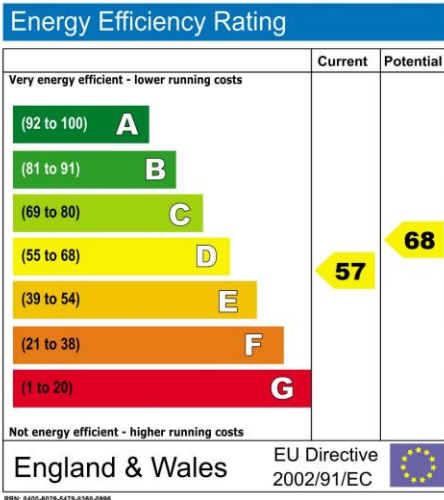
| | Heating | Electrical |
|---|---------|------------|
| Annual Energy Use (kWh/m ² /year) | 126 | 129 |
| Typical Energy Use (kWh/m ² /year) | 120 | 95 |
| Energy from renewables | 0% | 20% |

Administrative information

This is a Display Energy Certificate as defined in SI2007:991 as amended.

Assessment Software: OR v1
 Property Reference: 891123776612
 Assessor Name: John Smith
 Assessor Number: ABC12345
 Accreditation Scheme: ABC Accreditation Ltd
 Employer/Trading Name: EnergyWatch Ltd
 Employer/Trading Address: Alpha House, New Way, Birmingham, B2 1AA
 Issue Date: 12 May 2007
 Nominated Date: 01 Apr 2007
 Valid Until: 31 Mar 2008
 Related Party Disclosure: EnergyWatch are contracted as energy managers
 Recommendations for improving the energy efficiency of the building are contained in Report Reference Number 1234-1234-1234-1234

**Note: Buildings don't use energy, people do.
 It's useful to measure in kWh/occupant/year too.**



Energy Performance Certificate

SAP

asture Lodge Farm
lain Road
near Bennington
EWARK
S23 5EA

Dwelling type: Detached house
Date of assessment: 07 January 2011
Date of certificate: 15 January 2011
Reference number: 8501-4638-8226-2306-2993
Type of assessment: RDSAP, existing dwelling
Total floor area: 293 m²

his home's performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

| Band | Score Range | Current | Potential |
|------|-------------|-----------|-----------|
| A | 92 to 100 | | |
| B | 81 to 91 | | |
| C | 69 to 80 | | |
| D | 55 to 68 | | |
| E | 39 to 54 | | |
| F | 21 to 38 | | |
| G | 1 to 20 | | |
| | | 46 | 63 |

Environmental Impact (CO₂) Rating

| Band | Score Range | Current | Potential |
|------|-------------|-----------|-----------|
| A | 92 plus | | |
| B | 81-91 | | |
| C | 69-80 | | |
| D | 55-68 | | |
| E | 39-54 | | |
| F | 21-38 | | |
| G | 1-20 | | |
| | | 40 | 49 |

England & Wales EU Directive 2002/91/EC

his energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Estimated energy use, carbon dioxide (CO₂) emissions and fuel costs of this home

| | Current | Potential |
|--------------------------|---------------------------------|---------------------------------|
| Energy use | 266 kWh/m ² per year | 210 kWh/m ² per year |
| Carbon dioxide emissions | 16 tonnes per year | 13 tonnes per year |
| Lighting | £327 per year | £164 per year |
| Heating | £2121 per year | £1766 per year |
| Hot water | £370 per year | £288 per year |

the figures in the table above have been provided to enable prospective buyers and tenants to compare the fuel costs and carbon emissions of one home with another. To enable this comparison the figures have been calculated using standardised running conditions (heating periods, room temperatures, etc.) that are the same for all homes, consequently they are unlikely to match an occupier's actual fuel bills and carbon emissions in practice. The figures do not include the impacts of the fuels used for cooking or running appliances, such as TV, fridge etc.; nor do they reflect the costs associated with service, maintenance or safety inspections. Always check the certificate date because fuel prices can change over time and energy saving recommendations will evolve.

to see how this home can achieve its potential rating please see the recommended measures.

Energy Performance Certificate! High Rise

SAP

1 High Road
HAYAFAX
DOX 'TOK

Dwelling type: Detached House
Date of assessment: 14 March 2013
Date of certificate: 15 March 2013
Reference number: 9000-0000-0000-0000-0000
Type of assessment: SAP, new dwelling
Total floor area: 167.6 m²

This home's performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

| Band | Score Range | Current | Potential |
|------|-------------|-----------|-----------|
| A | 92 plus | | |
| B | 81-91 | | |
| C | 69-80 | | |
| D | 55-68 | | |
| E | 39-54 | | |
| F | 21-38 | | |
| G | 1-20 | | |
| | | 81 | 83 |

Environmental Impact (CO₂) Rating

| Band | Score Range | Current | Potential |
|------|-------------|-----------|-----------|
| A | 92 plus | | |
| B | 81-91 | | |
| C | 69-80 | | |
| D | 55-68 | | |
| E | 39-54 | | |
| F | 21-38 | | |
| G | 1-20 | | |
| | | 80 | 81 |

England & Wales EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Estimated energy use, carbon dioxide (CO₂) emissions and fuel costs of this home

| | Current | Potential |
|--------------------------|---------------------------------|---------------------------------|
| Energy use | 117 kWh/m ² per year | 110 kWh/m ² per year |
| Carbon dioxide emissions | 3.2 tonnes per year | 3.1 tonnes per year |
| Lighting | £156 per year | £92 per year |
| Heating | £433 per year | £444 per year |
| Hot water | £145 per year | £145 per year |

Based on standardised assumptions about occupancy, heating patterns and geographical location, the above table provides an indication of how much it will cost to provide lighting, heating and hot water to this home. The fuel costs only take into account the cost of fuel and not any associated service, maintenance or safety inspection. This certificate has been provided for comparative purposes only and enables one home to be compared with another. Always check the date the certificate was issued, because fuel prices can increase over time and energy saving recommendations will evolve.

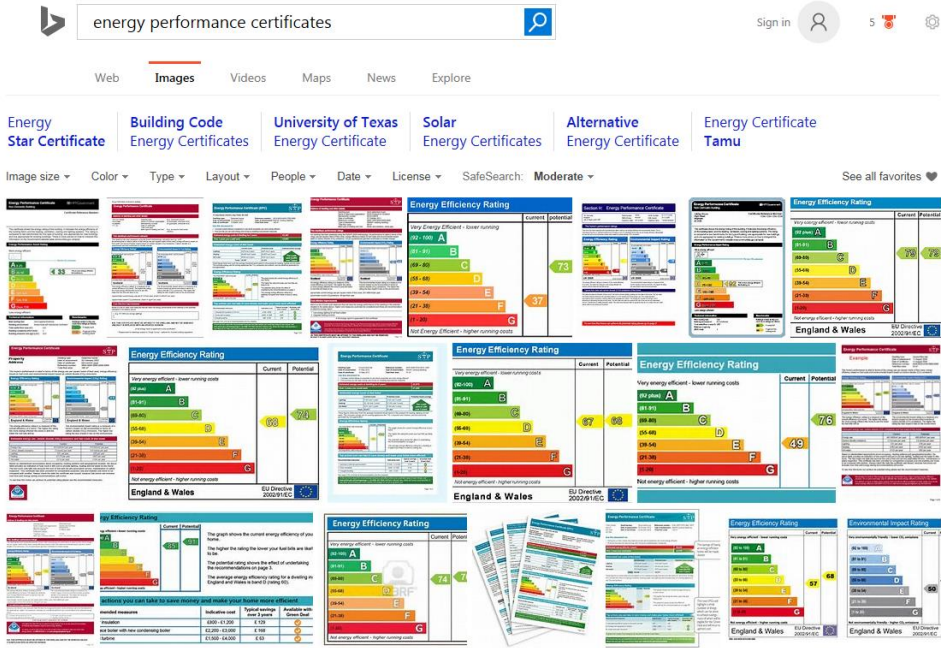
to see how this home can achieve its potential rating please see the recommended measures.

Remember to look for the energy saving recommended logo when buying energy-efficient products. It's quick and easy way to identify the most energy-efficient products on the market.

This EPC and recommendations report may be given to the Energy Saving Trust to provide you with information on improving your dwelling's energy performance.

Remember to look for the energy saving recommended logo when buying energy-efficient products. It's quick and easy way to identify the most energy-efficient products on the market.

For advice on how to take action and to find out about offers available to help make your home more energy efficient, call 0800 512 012 or visit www.energysavingtrust.org.uk



Building Metrics Labeling

Building: **Building One (339,400 sq.ft.)**
 Address: 305 S. 8th St., Boise, ID
 Scope: Scope One (262 sq ft.)

EUI 38
 kWh / sq ft

Energy use intensity, in a unit of measurement that describes a building's energy use, which is represented as kWh/sq.ft. 33
Commercial Building Energy Consumption Survey (CBECS)

76
 ENERGY STAR SCORE

A rating of 50 indicates average energy performance, while a rating of 75 or better indicates top performance. 33
www.energystar.gov

89
 0.5 MILE

ADVANTAGES WORTH 1/2 MILE DRIVING

- 20% less CO2
- 20% less fuel
- 20% less time
- 20% less wear and tear
- 20% less maintenance
- 20% less noise
- 20% less pollution
- 20% less traffic
- 20% less congestion
- 20% less accidents
- 20% less injuries
- 20% less deaths

www.fuelECONOMY.COM

35
 PERCENT ENERGY SAVINGS

Lackland-Martin spent \$2 million implementing an energy efficient lighting and daylighting system. As a result, the company's lighting bill decreased by three-quarters, and productivity increased by 15%, while absenteeism decreased by 15%. Within one year, the decrease in absenteeism alone paid for the \$2 million lighting investment. 33
Rosen, J.J., 1999

The utility accounts included in the EUI calculation:
Boise Power and Light Company

Prepared by: — on February 8, 2014 at 15:16:52 EST
 simple and free to generate at www.fidboise.com/bml

All utility usage data, ENERGY STAR® score, and window/light information used in the metric calculations is input by the preparer of this BML sheet. Idaho Power Company and the Integrated Design Lab do not verify this information, and are not responsible for any inaccuracies. The ENERGY STAR score displayed on this sheet does not indicate the building is a certified ENERGY STAR building.

