

# THE FEDERAL ENVIRONMENT AGENCY (UBA) BUILDING IN DESSAU IN PRACTICAL OPERATION

Is the operation of the building delivering what  
planning promised?





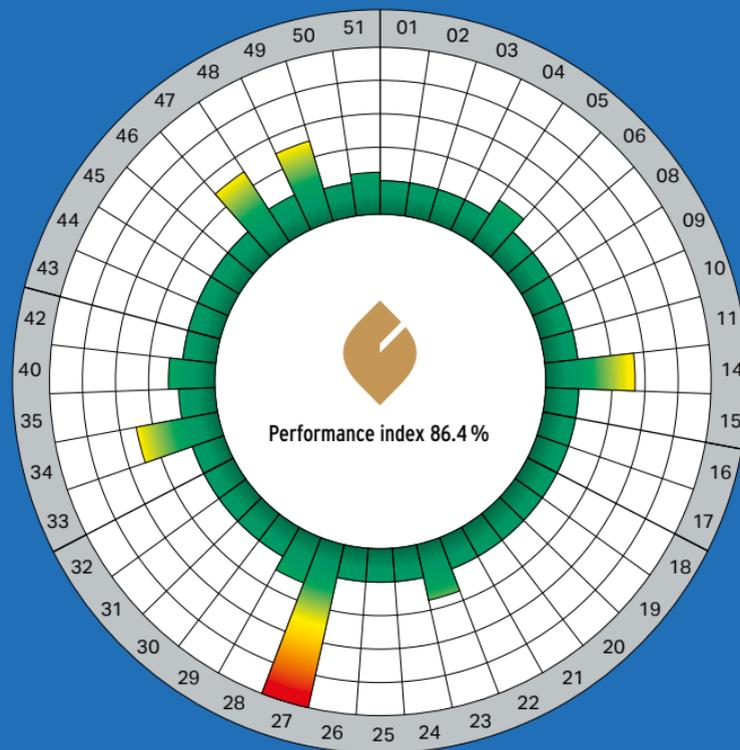
## DGNB CERTIFICATE IN GOLD (1.3)

The DGNB quality seal for sustainable building was created in late 2008 by the German Building Ministry and the German Sustainable Building Council. It covers all relevant fields of sustainable building with an assessment system which evaluates environmental, economic, socio-cultural, functional, technical and process-design aspects on the basis of 51 criteria. There was no assessment system at the time the building was planned, but subsequent certification to the DGNB system resulted in a gold rating with a mark of 1.3.

Criterion 27, efficient use of floor area, comprises the determination of a net floor area to gross floor area ratio. The UBA building has a NFA:GFA ratio of 0.428, due to the fact that the gross floor area includes the Forum and the Atrium.

### PROPERTY EVALUATION

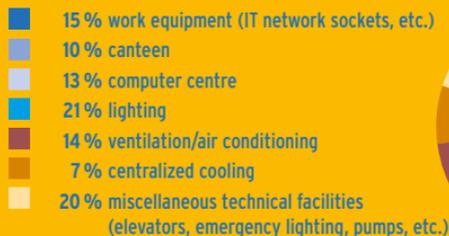
Environmental quality 01-15 | Economic quality 16-17 | Socio-cultural and functional quality 18-13 | Technical quality 33-42 | Process quality 43-51



## ENERGY CONSUMPTION

Total energy consumption fell steadily, by 25%, between 2006 – the first full year of operation – and 2012, despite an increase in the number of staff. Of the 2,451 MWh of energy purchased from external suppliers and self-generated in 2012, 44% was electricity and 56% was heat. Heat consumption fell between 2006 and 2012 by slightly more than 25%. Electricity consumption fell by about 18% during the same period whilst the amount of self-generated electricity grew at the same time. The reference values here are the quantities supplied plus the quantities self-generated.

### Distribution of energy consumption



## CONSUMPTION OF HEAT AND ELECTRICITY AT UBA'S OFFICE BUILDING IN DESSAU-ROSSLAU



## COMPARISON WITH OTHER BUILDINGS

Comparison with Federal buildings, conducted in 2008 by the German Federal Office for Building and Regional Planning (BBR), shows the UBA building to be at the forefront in terms of energy performance.

Planning of the building took place in the period 1997/2001. At that time the energy performance requirements of the German Thermal Insulation Ordinance (WSchVO 95) applied, and these were to be exceeded by 50 %. This target has been achieved.

It should be noted that the Federal Environment Agency has operating hours that are uncommon for public authorities. Its flexible working-time arrangements allow staff to work between 6 a.m. and 10 p.m. During that time the building is fully supplied with electricity and heat.

The table below lists the relevant comparison values under the German Energy Saving Ordinance (EnEV), the figures for Federal buildings and the actual figures for the Federal Environment Agency building:



Annual consumption by administrative buildings with major technical equipment, in kWh/m<sup>2</sup> of net floor area

	Heat	Electricity
Comparison value under EnEV 2007	120	60
Comparison value under EnEV 2009	85	40
Actual average consumption of federal buildings 2001 - 2007	92	57
Actual consumption of UBA building in 2013 (incl. renewable energy)	47	42
incl. auditorium, library, (adjusted for climatic conditions)		



## THE UBA BUILDING IN DESSAU IN KEY FIGURES

Number of staff: approx. 850 (as at 1 July 2013)

Usable floor area: approx. 17,674 m<sup>2</sup>

Net floor area: approx. 22,610 m<sup>2</sup>

Gross floor area: 39,787 m<sup>2</sup>

Investment: € 70 million

Occupation: May 2005



## OBJECTIVES

Planning of the UBA building took place between 1997 and 2001. The aim was to construct a model green building which

- has a flexible office concept with largely standardized office sizes and a high degree of transparency,
- provides exemplary accessibility for disabled staff and visitors,
- has a high energy performance,
- would be built using environmentally compatible materials to thus achieve a high level of indoor air quality,
- and overall is highly cost-effective (investment and operating costs).

As well as assuring quality during construction, the quality levels achieved during operation were to be made verifiable by means of monitoring. A building management system with 33,000 data points controls and regulates the complex building services with a view to optimizing their operation.

## RENEWABLE ENERGY: SOLAR THERMAL, PHOTOVOLTAIC AND GEOTHERMAL

Energy produced from renewable sources had a share of just under 5% at the time operation started and accounted for about 9 to 10% in 2011 and 2012. The production of renewable energy varies substantially from year to year; in the years 2009 – 2012, it ranged from about 200 to 300 MWh/year. Energy production from renewable sources was affected by a number of particular circumstances:

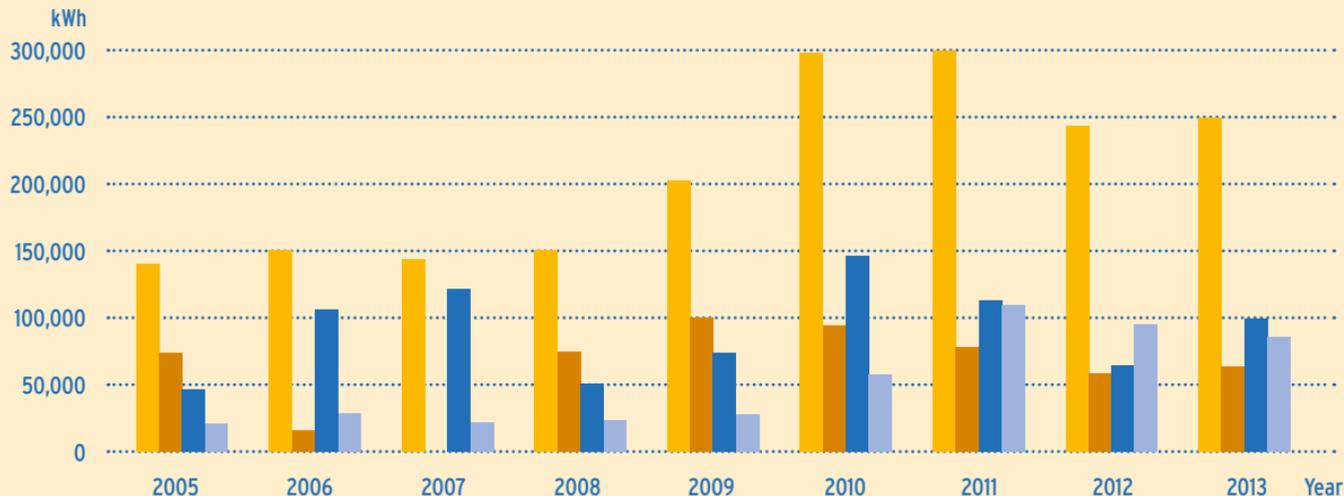
- In the second half of 2012, the adsorption chiller had to be replaced with an absorption chiller, after all measures taken to optimize the system and achieve the target value (COP > 0.7) stated by the manufacturer had proved unsuccessful. Also, in the first half of 2012, the recooling system failed as a result of a rapid temperature drop.
- The operation of the geothermal heat exchanger (GHE) system was aligned towards efficiency. This led to a reduction of

operating hours and, consequently, to a reduced yield. Annual yields from the GHE have varied between 50 and 150 MWh in recent years. Especially in times of increasing temperature fluctuations and seasonal extremes (hotter summers, colder winters), the GHE is proving to be an adequate system, however.

- In August 2010, the PV system was expanded by 68 kWp. Thanks to this addition to the existing 32 kWp array on the shed roof, the yield of the PV system has increased significantly since 2010, to about 100 MWh per year. The variation in annual yield is smaller here than in the case of geothermal energy (approx. +/-15%).

Together with the optimization measures that have been taken, the plant designs have, overall, proved their worth. An increase in the renewable energy yield by 1 to 2 percentage points over the next three years is realistic.

## RENEWABLE ENERGY PRODUCED AT UBA SITE



	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total, in kWh	140,814	150,783	143,478	149,927	202,074	297,188	299,217	242,669	247,721
Solar thermal	73,936	15,525*	0*	74,622	99,457	94,149	77,086	57,316	63,423
GHE system	45,823	105,696	121,093	51,040	73,684	145,755	112,547	64,159	98,906
PV system	21,055	29,562	22,385	24,265	28,933	57,284**	109,584	94,732	85,393

\* Solar thermal yield was reduced or zero in 2005 and 2006 due to a defective collector array \*\* PV yield increased in 2010 due to an expansion of the PV system

## COSTS FOR OPERATING THE UBA BUILDING

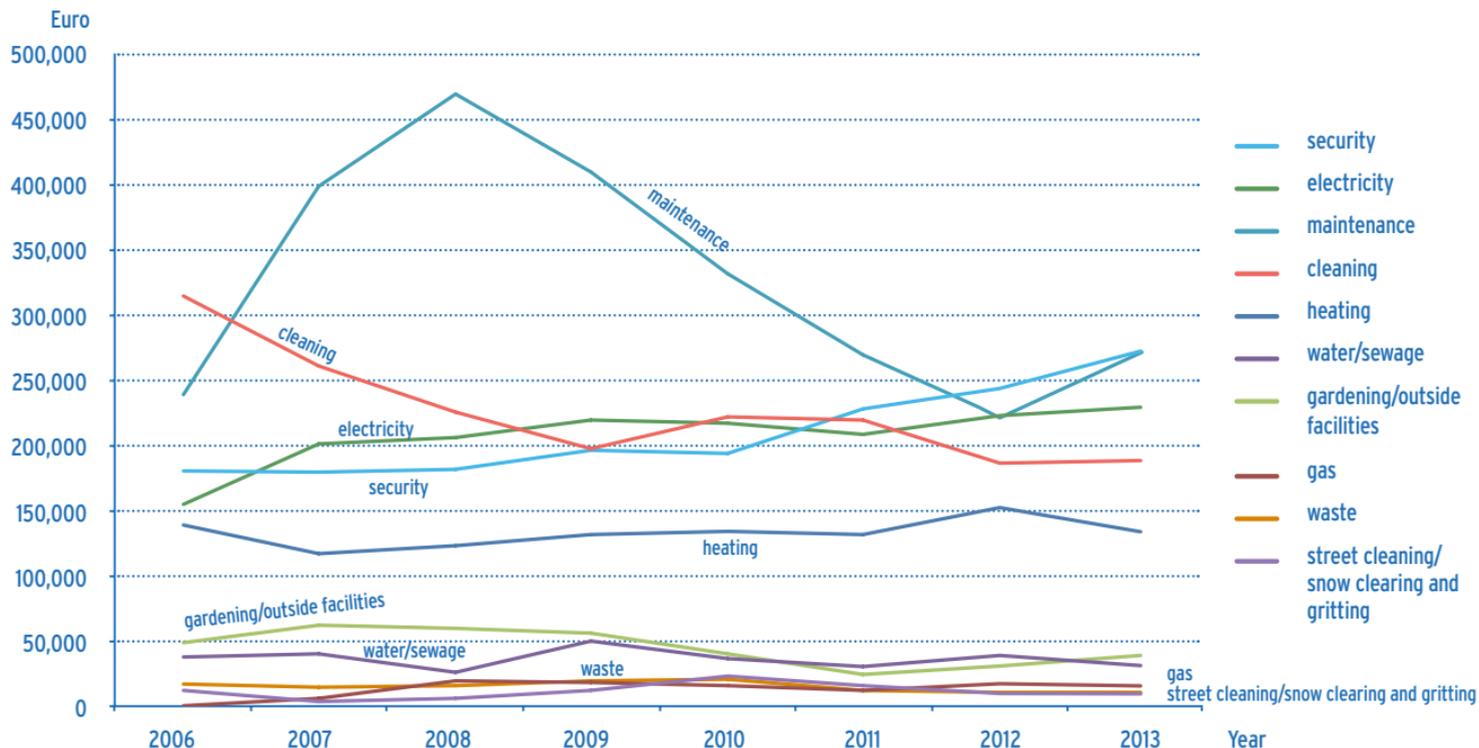
In 2008 annual costs for running all buildings at the site amounted to a total of € 1.37 million. These costs have been decreasing since then, despite an increase in the costs for electricity, heating, cleaning, maintenance and security, and stood at € 1.22 million ( $€ 31.65/m^2_{GFA} \cdot a$ ) in 2013.

Maintenance costs are part of the running costs. They accounted for 34% of running costs in 2008 and have been decreasing constantly since then. In 2013 they came to only 22.9%, or  $€ 6.74/m^2_{GFA} \cdot a$ .

The reason that running costs were initially higher is essentially that those years reflect the building's start-up phase and are not a sound indicator of the medium to long-term costs and consumption levels of the building. Maintenance contracts from the planning and guarantee phases are relatively expensive and can be concluded at a lower price when re-tendered. Irrespective of this, the range of services covered can be adjusted to actual needs.



## DEVELOPMENT OF RUNNING COSTS FOR THE AGENCY BUILDING IN DESSAU\*

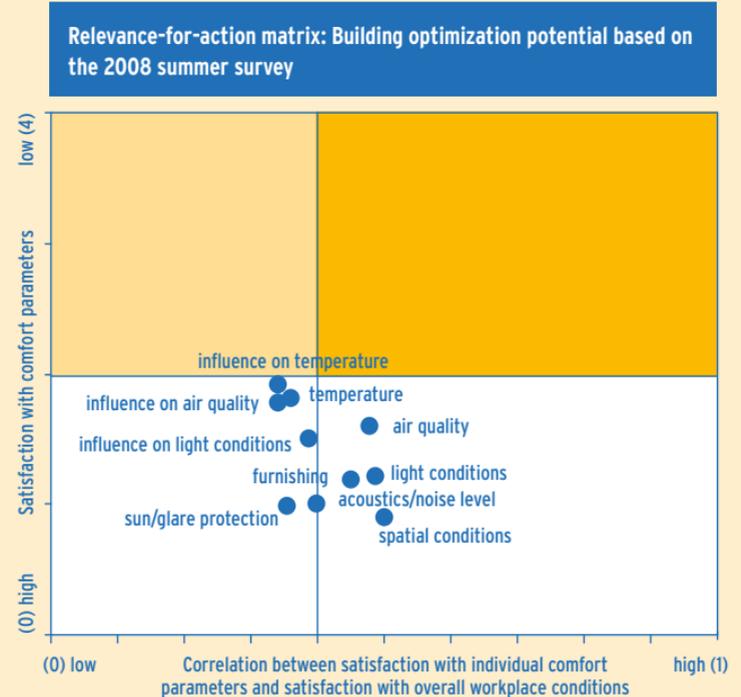


\*includes running costs for office building, canteen, auditorium, library, Wörlitzer Bahnhof (old building) and rented space

## USER SATISFACTION

User satisfaction surveys are an important source of information for building operation. They show a positive rating of overall workplace conditions and the user-friendliness of the building. One particular strength of the building is its spatial conditions, such as the size of the offices, their design and furnishing.

Users' assessment of conditions which they cannot influence as much, like air quality and temperature, is relatively more critical, albeit generally positive. For example, in summer some users occupying offices on the two upper floors facing south and southeast complain about room temperatures being too high whilst at the same time staff with ground-floor offices facing northwest would like their offices to be warmer. User satisfaction here reflects the location of rooms within a building, its technical equipment, and also individual user preferences and behaviour. Measures to optimize building operation are therefore focused on these areas.



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The forum (entrance hall) is open to visitors during the building's opening hours:

Mon to Fri 6:00 am to 10:00 pm

Sat 6:00 am to 4:00 pm

Sun/hols 8:30 am to 4:00 pm

The visitors room (information material) and the library in the forum are open:

Mon to Weds 9:00 am to 3:30 pm

Thu 9:00 am to 5:00 pm

Fri 9:00 am to 2:00 pm

Visitors who would like to learn more about the architectural and ecological design of the new building and visit the atrium can join a guided tour. For more information about this, ask at our visitors centre or visit our website ([www.umweltbundesamt.de](http://www.umweltbundesamt.de)).

Photo credits: Thomas Lewandowsky, Jan Bitter, Steffen Mainka

Text: Federal Environment Agency, Z5