The building of the federal environment agency in Dessau

Example for sustainable building

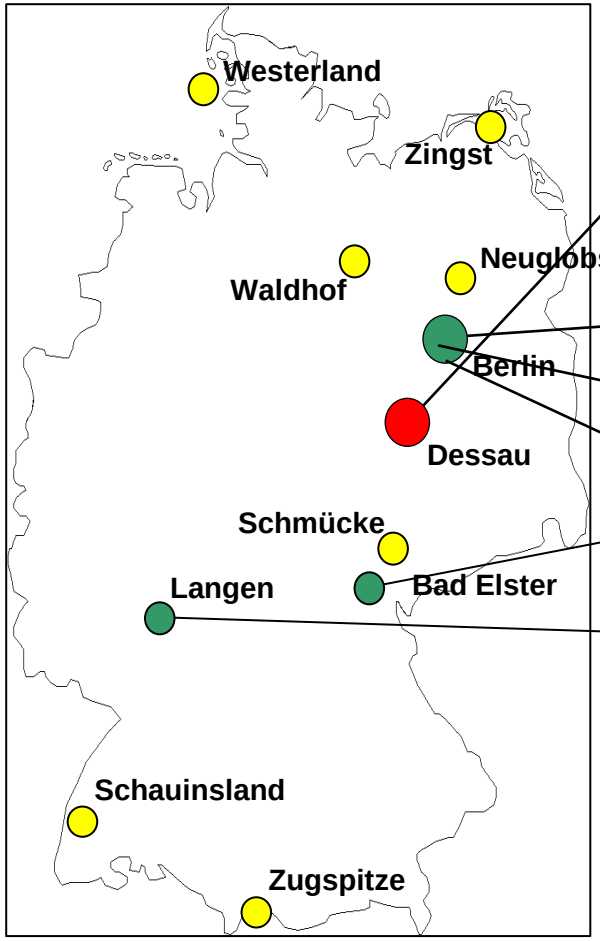
Contents:

- History and sites of the federal environment agency (FEA)
- General aims for the new office building in Dessau
- Energy-related aims and solutions
- Aims concerning building materials and indoor air quality
- Operating results

History

- FEA has been established in 1974 as federal institution.
- It has to counsel the federal government and the public in all environmental aspects or questions.
- FEA has about 1.500 employees in 6 different locations (legal seat in Dessau, 3 sites in Berlin, one in Hessen, one in Saxony and seven environmental monitoring sites).

Locations of the federal environment agency



Main location

Dessau-Roßlau, Wörlitzer Platz 1

Further locations:

Berlin-Grunewald, Bismarckplatz 1: German Emissions Trading Authority

Berlin-Dahlem, Corrensplatz 1: Environment and Human Health, Laboratories

Berlin-Marienfelde, Schichauweg 58: Water, Laboratories

Bad Elster, Heinrich-Heine-Str. 12: Drinking Water and Swimming Pool Water Hygiene

Langen, Paul-Ehrlich-Str. 29: Air quality, air monitoring

7 sites to mesure air quality:

Neuglobsow, Schauinsland, Schmücke, Sylt, Waldhof, Zingst, Zugspitze

Locations of the FEA in numbers

Surfaces of the properties	Berlin, Bismarck-platz	Berlin, Correns-platz, Bötticher Str. , Haus 23	Berlin, Schichauweg	Langen	Bad Elster	Dessau	Messstellen	Sum / average
Main / usable floor area (HNF) in m²	12.667	6.730	6.780	2.512	4.619	**17.674**	1.935	**59.647**
Gross floor area (BGF) in m²	23.438	11.571	11.095	5.582	9.623	**40.320**	3.290	**116.490**
BGF:HNF	1,85	1,72	1,64	2,22	2,08	**2,28**	1,70	**1,95**
Net floor area (NGF)*	21.661	11.508	11.594	4.296	7.898	**26.944**	3.309	**98.718**
Part of total NGF	21%	11%	11%	4%	8%	**30%**	3%	**100%**
Part of total BGF	20%	10%	10%	5%	8%	**35%**	3%	**100%**
Number of employees (05.2012)	261	109	84	41	69	**927**	20	**1511**

Foto: Busse, Mai 2005

Steps to relocate the FEA from Berlin to Dessau

5/1992	Political decision to relocate the federal environment agency to Sachsen-Anhalt
5/1996	Changing of the Law creating the FEA
11/1997 - 5/1998	Competition concerning the urban design of the project; unanimous decision to realise the conception of „sauerbruch hutton architects“
6-10/2000	Exposition EXPO 2000 Start of operation of the Wörlitzer station
1/2001	Approval of the conception Beginning of the preparation of the realisation of the project
4/2002	Laying the foundation and beginning of the works
7/2003	Topping out ceremony
5/2005	Completion of the building and relocation to Dessau

Main numbers of the FEA‘s office building

Number of employees:	ca. 900 (actual)
Gross volume (cubature):	195.000 m³
Gross floor area:	35.000 m²
Usable floor area:	ca. 17.700 m²
costs:	70,0 Mio. €

General objectives for the FEA‘s building in Dessau

- Exemplary implementation of a sustainable, environmental sound administrative building
  - integrative planning
  - Energy
  - Air hygiene and construction materials
- Flexible office concept, standardization, transparency
- Quality assurance and monitoring
- Exemplary design with regard to accessibility to people with disabilities
- Economic viability (investment and operating costs)

Cascade of objectives to reduce the energy demand

- site selection to support sustainable urban development (centrally located, re-use of a derelict former commercial-industrial site in the inner city)
- use existing buildings as far as possible
- minimise the surface-volume ratio of the building
- provide a high level of thermal insulation
- utilise solar gains as extensively as possible
- install technical equipment and installations as energy-efficient as possible
- utilise waste or waste water heat
- cover remaining demand with renewable energy sources as far as possible

Energy-related targets

- Annual heating requirement ≤ 30 kWh/(m²·a), 50% lower than required by the Thermal Insulation Ordinance of 1995; consumption 2009: 37 kWh/(m^2_{BGF}·a)
- Electricity requirement 20...25 kWh/(m²GFA·a); consumption 2009: 30 kWh/(m²BGF·a)
- Create acceptable climate conditions mainly without mechanical cooling
- Cover basic heat and electricity requirement via the local utility
- Cover > 15% from renewable energy sources (solar-based cooling, geothermal heat exchanger, photovoltaic system)
- Technical and economic monitoring

Measures to reduce the energy demand of the building

Quality of the thermal insulation (k-value)

- Foundation / Ceiling of cellar 0,251
- exterior wall 0,155
- windows 1,0
- roof 0,123

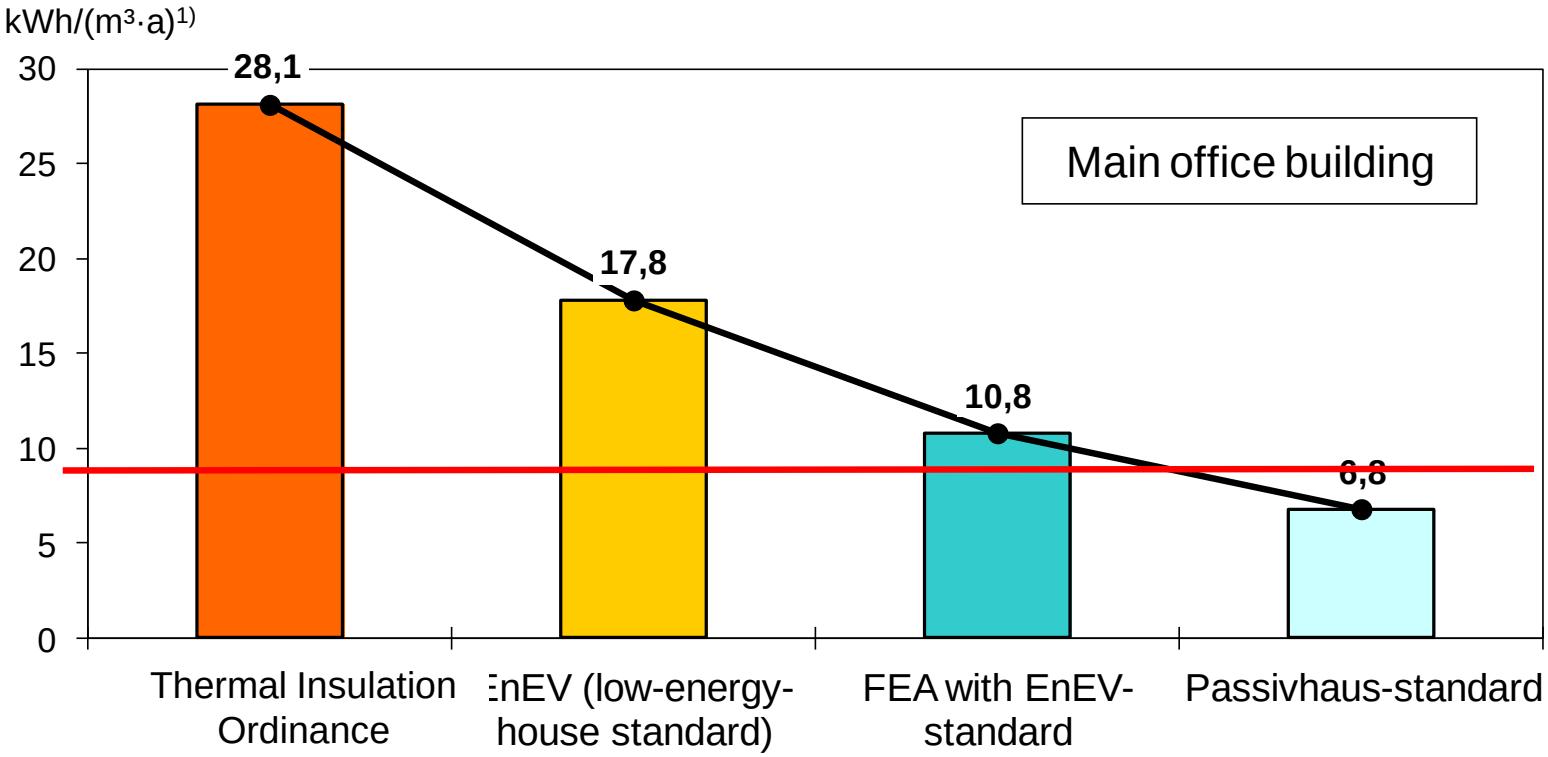
Air ventilation with high energy effiency (74%)

Geothermal heat exchanger (length: 5100 m; air flow rate: 76.000 m^3/h; expected energy gain: ca. 200 MWh/a); real 2009: 113 MWh/a

Photovoltaic array, expected electricity supply: 25 MWh/a; real 2009: 29 MWh/a

Solar panels for the provision of cold, expected energy supply: 140 MWh/a; real 2009: 100 MWh/a

Annual primary energy demand
- Projections -

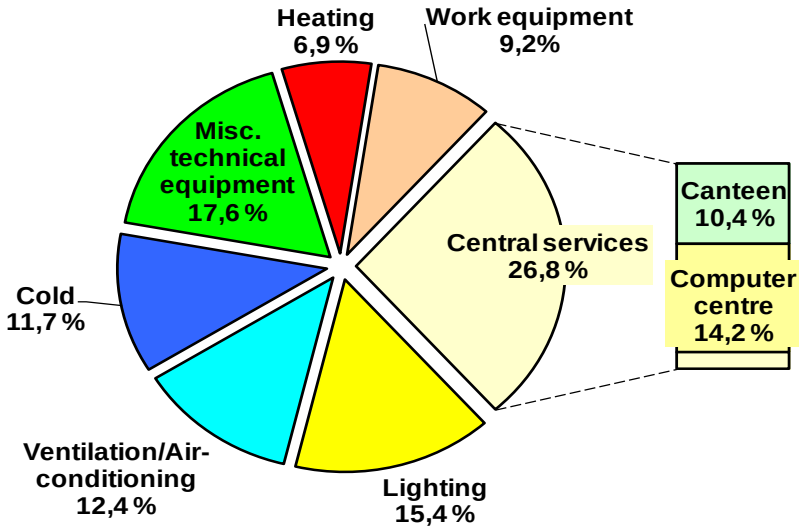


1) primary energy

Stand 09/2005

Electricity requirement - Projections -

- Target: < 30 kWh/(m^2_{BGF}·a)
- Planing status: ca. 35kWh/(m^2_{BGF}·a)
- First estimate: ca. 38 kWh/(m^2_{BGF}·a)
- Main measures:
  - Optimised use of daylight
  - Use of energy-efficient lighting sources and lighting control as a function of light intensity and movement
  - Use of energy-efficient work equipment
  - Installation of an efficient mechanical cooling system low in pressure losses
  - Provision of cooling mainly via an adsorption cooling machine



Electricity requirement

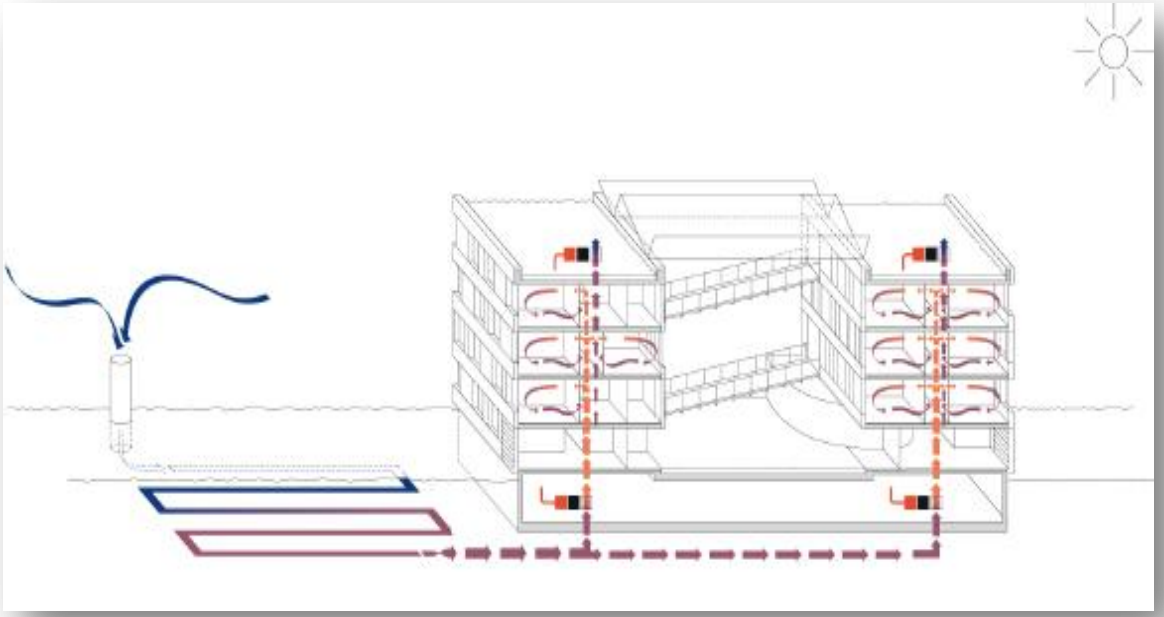
Air ventilation concept

concept

Central mechanic air ventilation system with heat recovery;
Pre-cooling and pre-heating by geothermal energy; heat recovery system for the data center to heat forum and atrium“

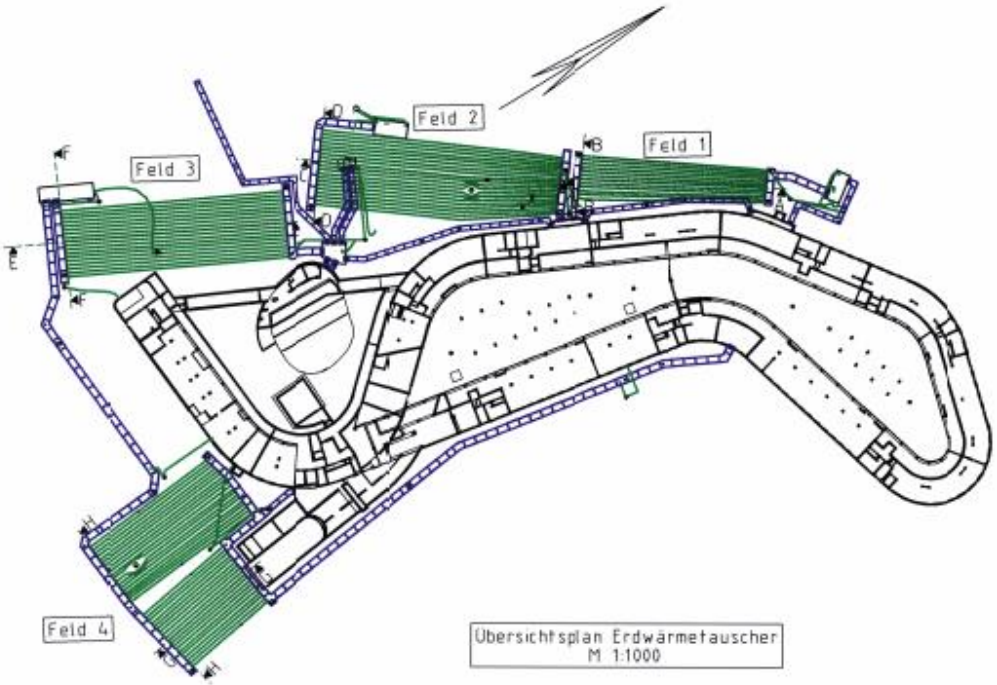
Technical data:

qv = 76.000 m³/h
Qel = 25 kW



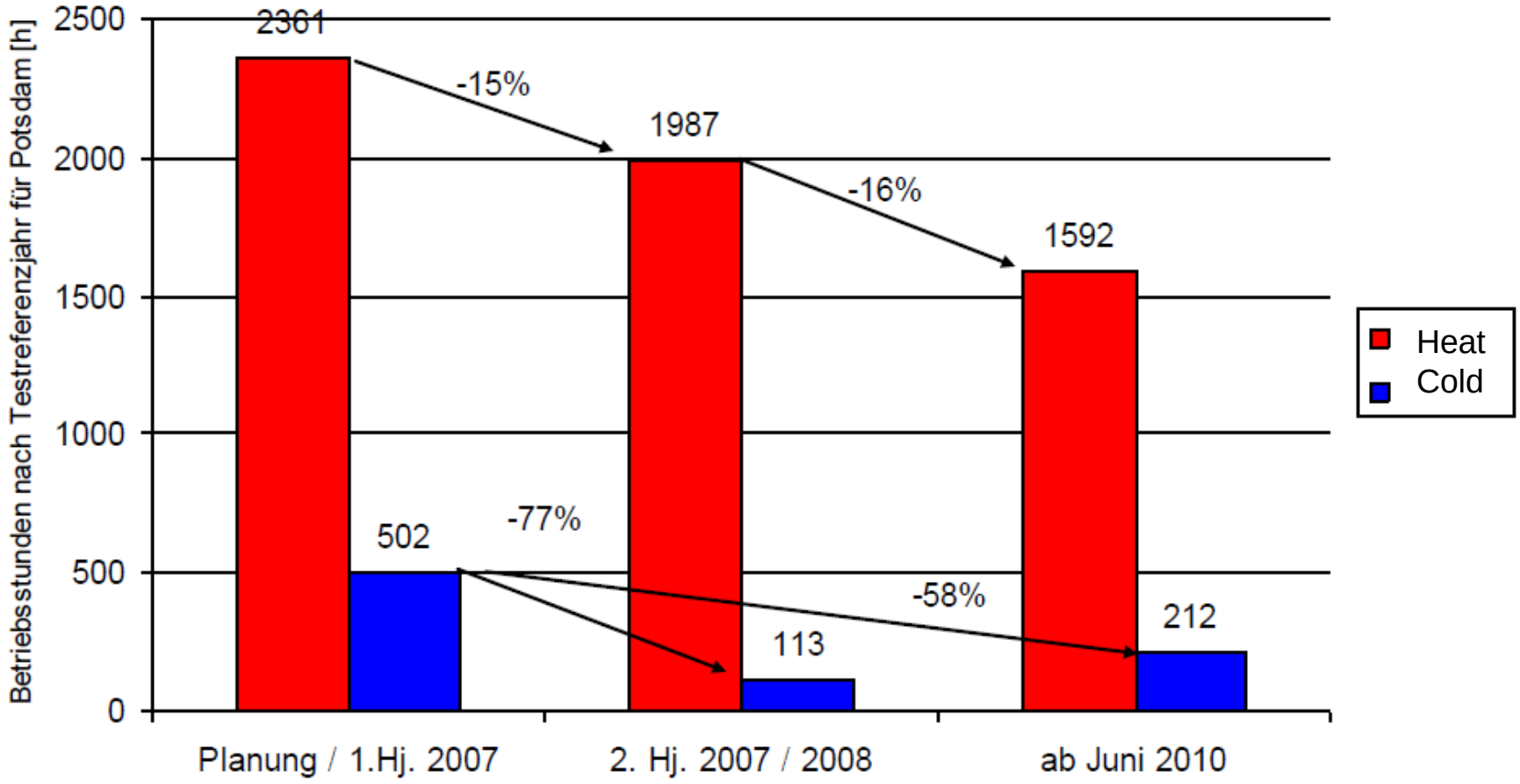
Functional diagram air ventilation (day in winter)
Source: Zibell + Willner + Partner

Use of renewable energy ressources - example: geothermal heat exchanger

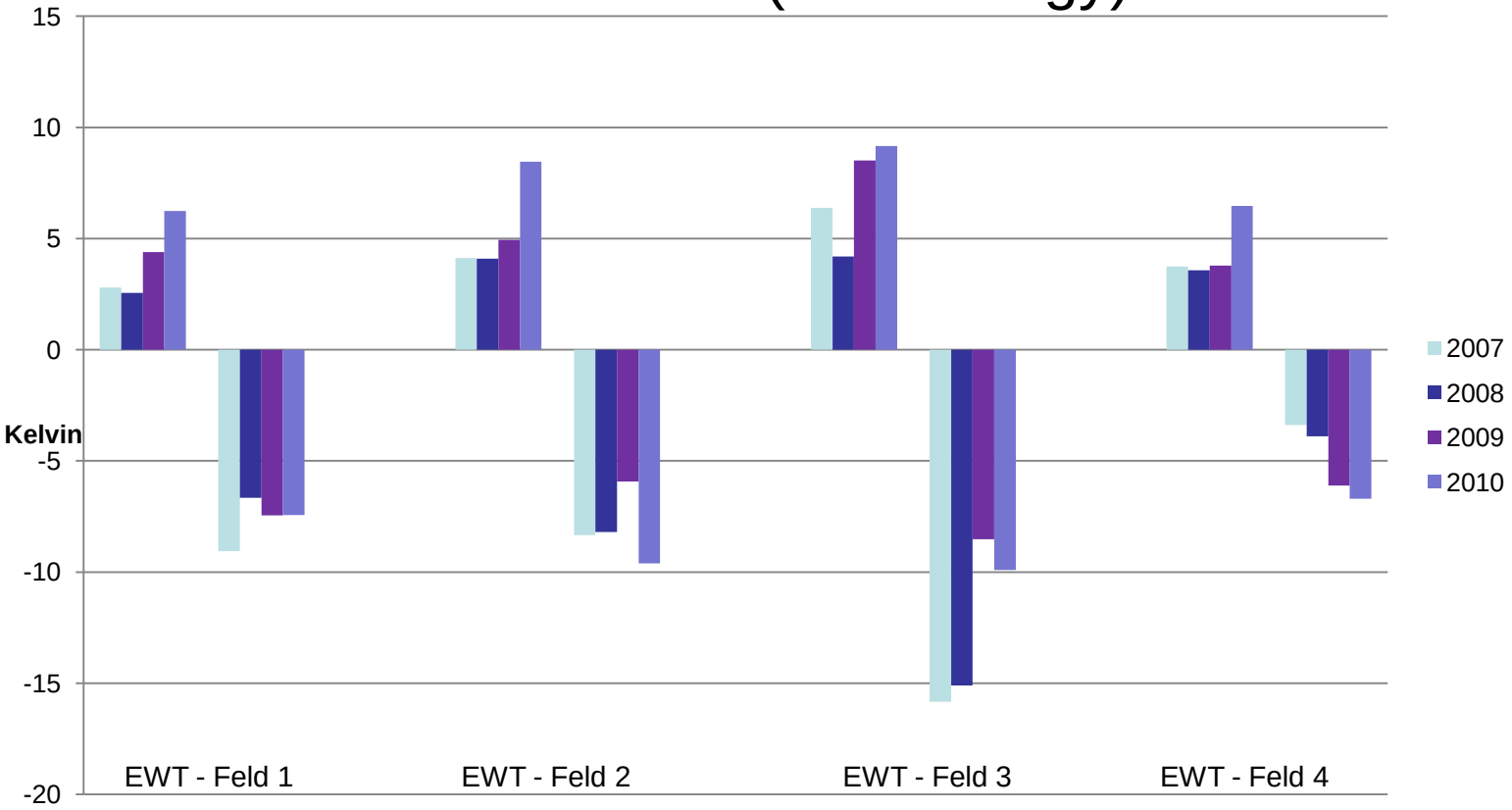


Geothermal heat exchanger - construction, 2002

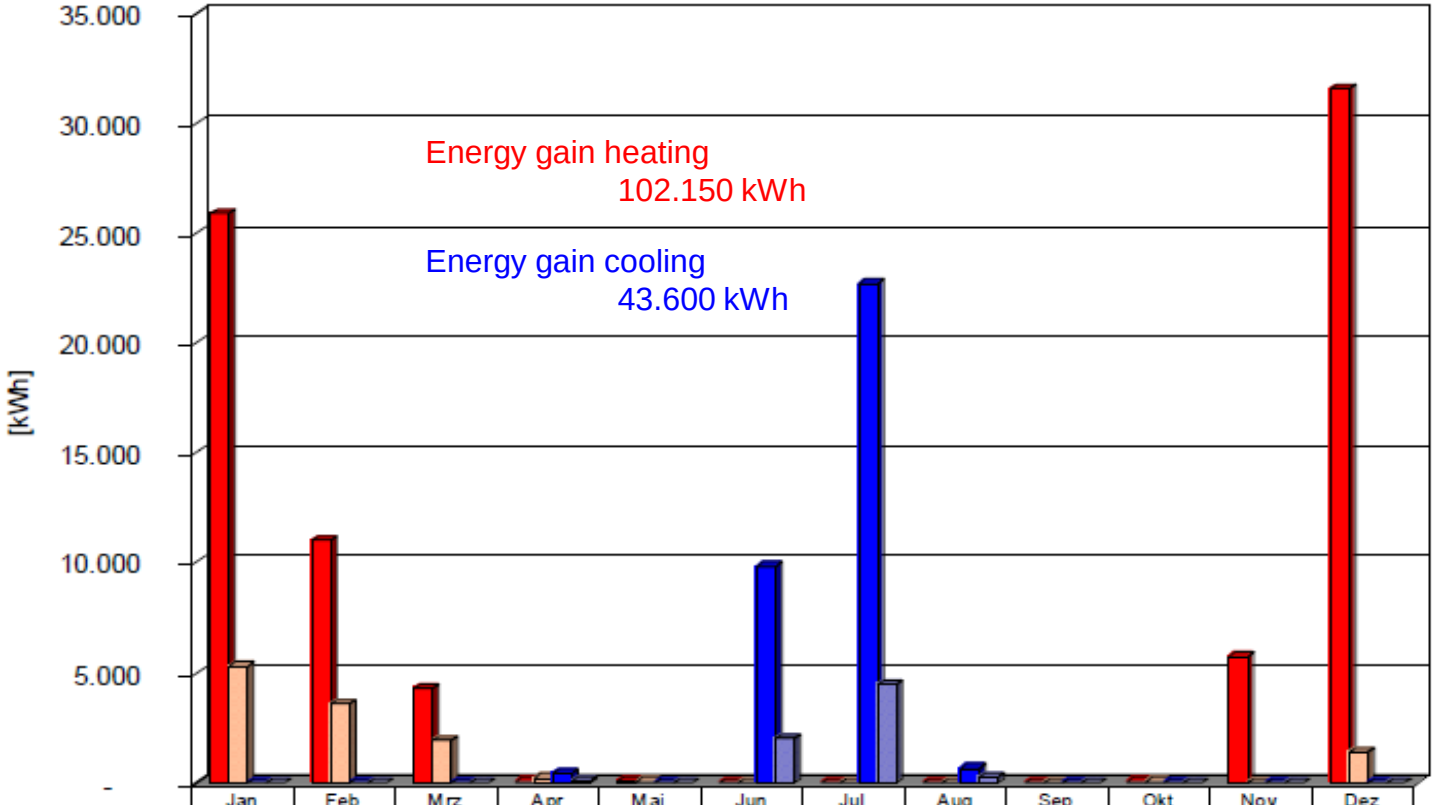
Reducing operating hours in order to improve efficiency



Geothermal heat exchanger: elevation of the temperature 2007 bis 2010 (final energy)



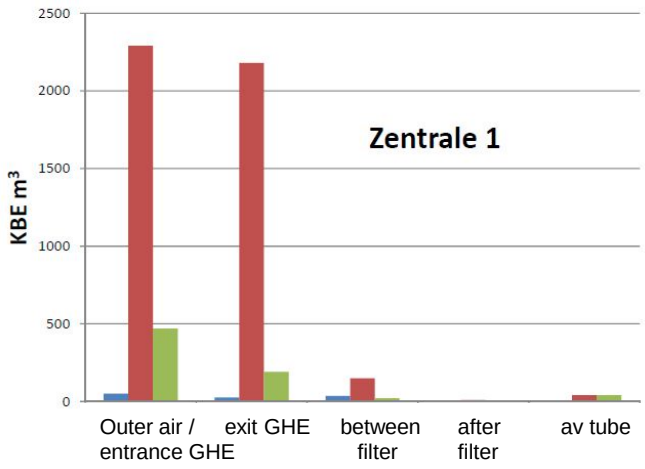
Energy gains of the geothermal heat exchanger

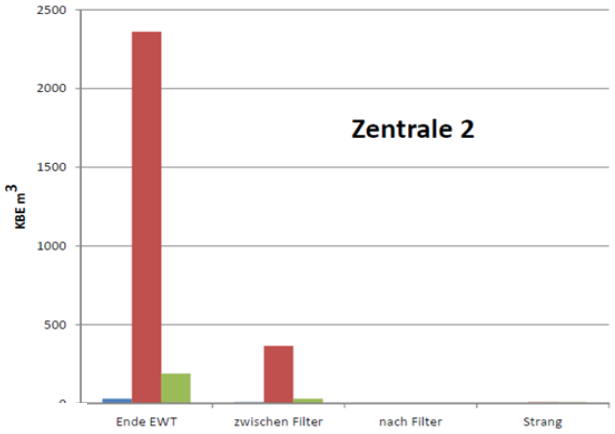


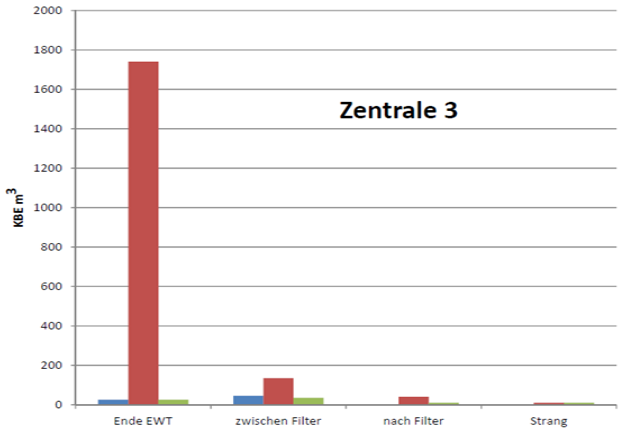
	Jan	Feb	Mrz	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez
Wärmeertrag primärenergetisch	25.923	11.019	4.282	19	83	-	0	-	-	14	5.725	31.590
primärenerg. Einsatz zur Erzeugung HF	5.278,69	3.587,40	1.900,54	202,34	30,75	1,31	-	-	-	3,74	-	1.398,74
Kühlertrag primärenergetisch	-	-	-	397	-	9.829	22.715	634	-	-	-	-
primärenerg. Einsatz zur Erzeugung KF	-	-	-	82,01	0,00	1.997,84	4.436,00	226,01	-	-	-	-

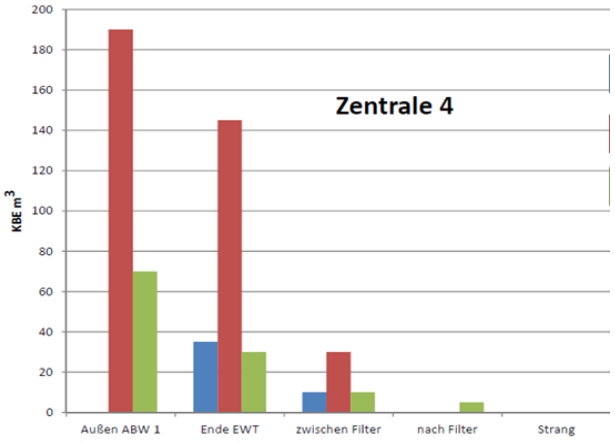
Monate

Hygienic analysis of the geothermal heat exchanger (GHE)









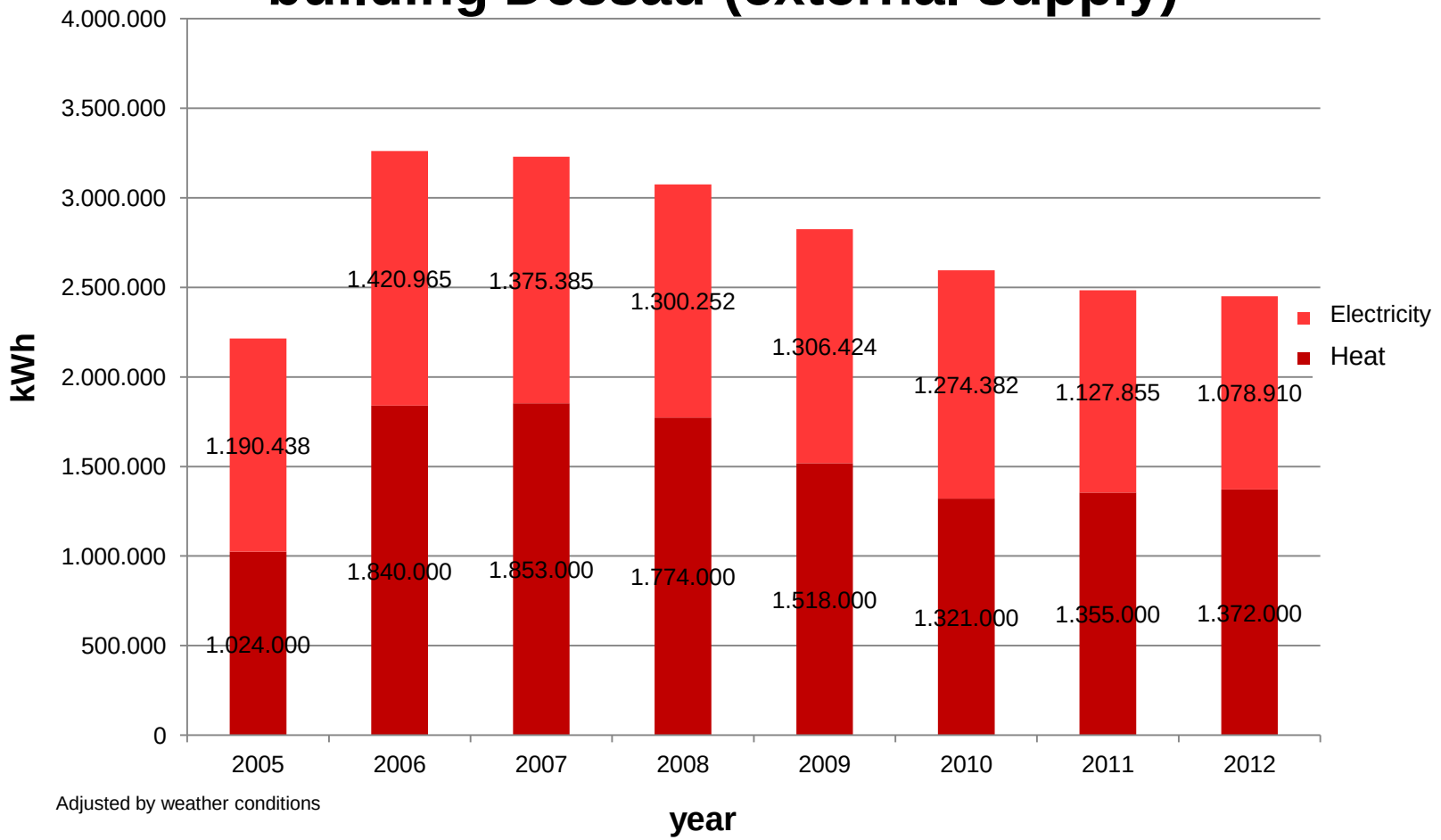
Thermophile mould fungus

Sum Mould fungus

Sum of bacteria

Sampling from 26/06/2012
and analysis by FEA / II 1.3

Consumption of heat and electricity of the office building Dessau (external supply)



Adjusted by weather conditions

Demands concerning air hygiene and construction materials

- Choose a structural design, elements of the construction and construction materials in a way, that
  - the building has a long durability
  - the elements and products, especialls those with a short durability can easily be dismantled
- Using building materials which
  - have no or minimal emissions
  - Are non or low toxic
  - Are proved and have certified attributes (Umweltzeichen „Blauer Engel“ - blue angle -, AgBB …)
- Using reusable or recyclable materials
- Using materials which are renewable
- Using materials with a high recycled content

Choice of building materials example material for the roof parapet

Decision on the basis of life cycle analysis

- global environmental effects:
  1. minimal effects for sheet of titanium zinc
  2. tinned copper sheet
  3. sheet of stainless steel
  4. sheet of aluminium

- local environmental effects
  1. minimal effects for aluminium- and stainless steel sheet
  2. tinned copper sheet
  3. sheet of titanium zinc highest effects

➢ **Choice: tinned copper sheet**

Construction materials for the office building

- Using regional products
  - f.e. stones from Thuringia
- Installation of clay walls
- External wall of wooden pre-fabricated elements (larch)
  - certified wood (FSC, PESC) nearby
  - covered with an emission free couche of fire protection
- Using wiring / cables free of halogens
- Using natural caoutchouc as floor covering material
  - free of PVC
  - free of emissions or low emission
- Tinned copper sheets for roof and window parapets

Quality assurance – air hygiene and building materials

Furniture
Wood-based materials low in formaldehyde

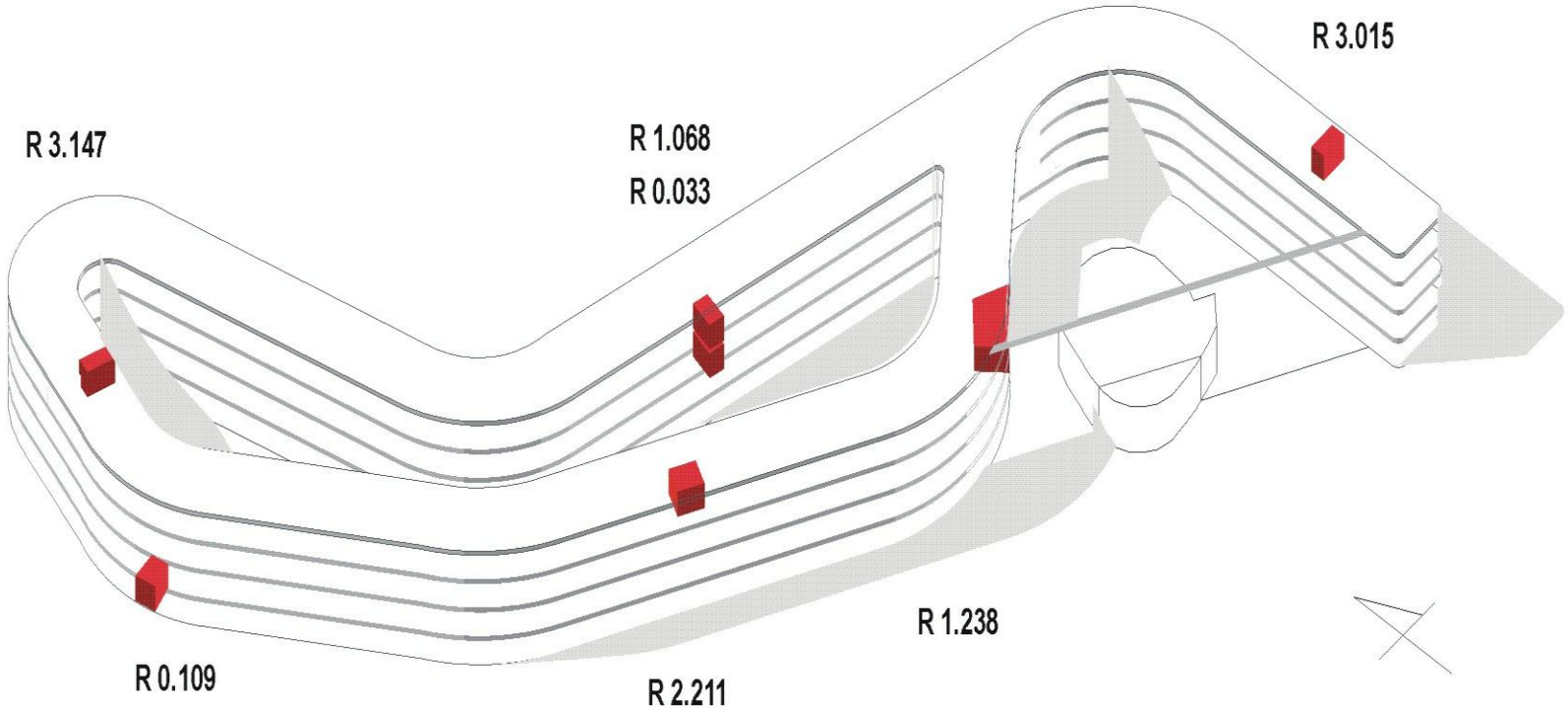
Wall surfaces
Zero-emission silicate paint systems

Floors
Low-emission flooring and adhesives

Metal components
Low-emission paints

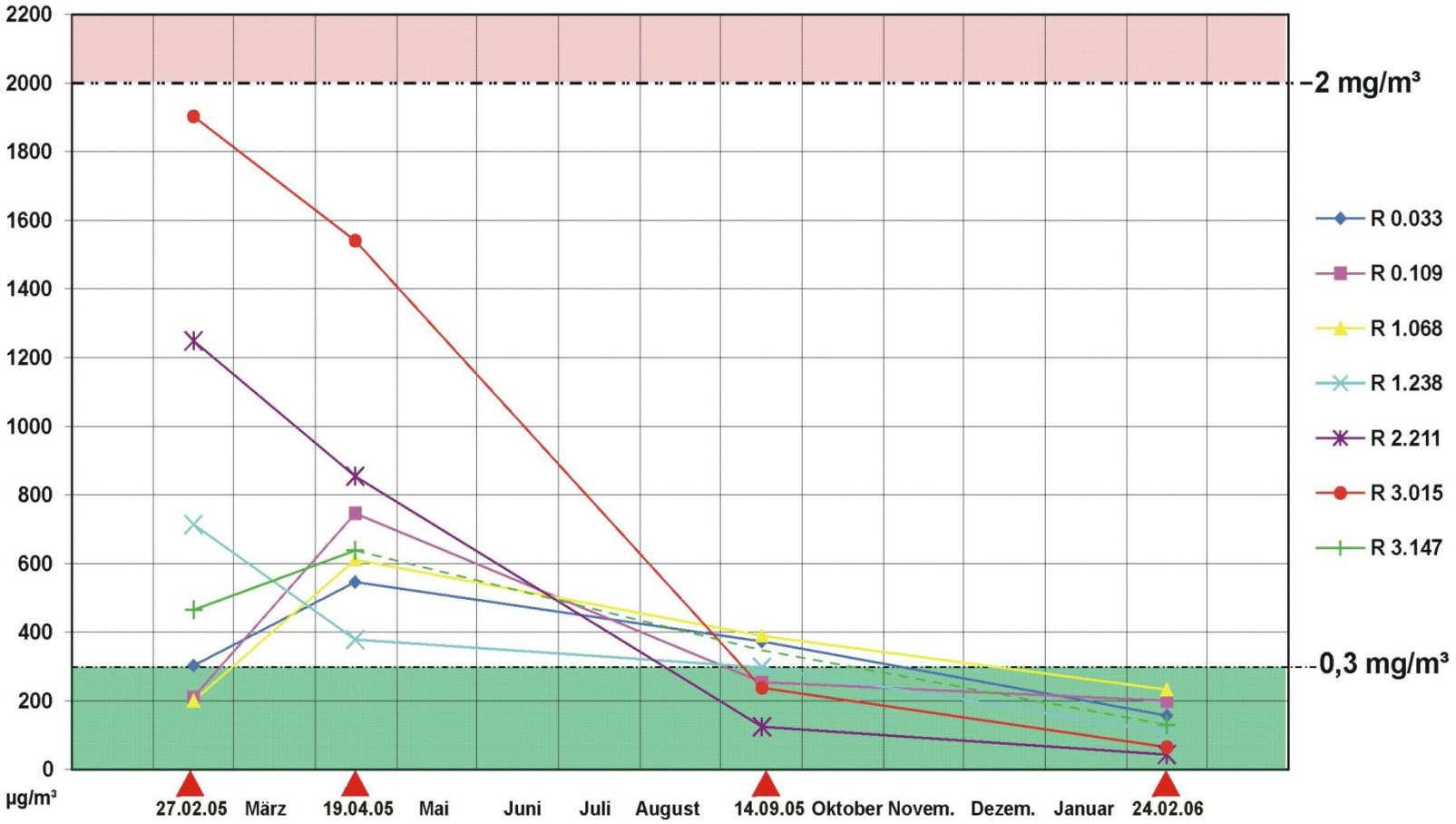
Surfaces of wood-based panels
Low-emission glazing systems on larch

Indoor air monitoring

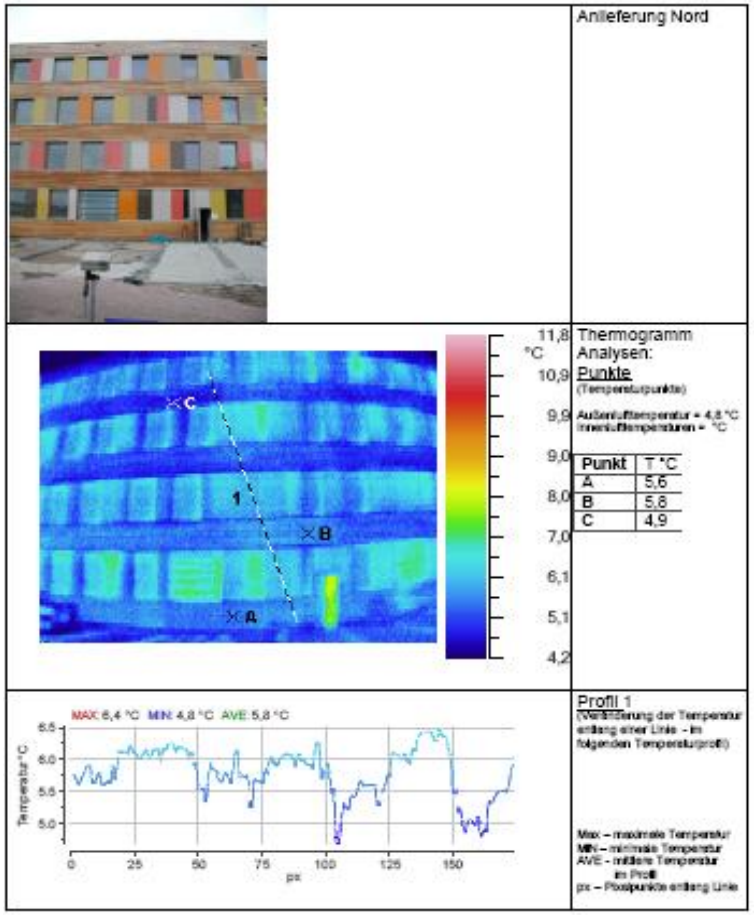


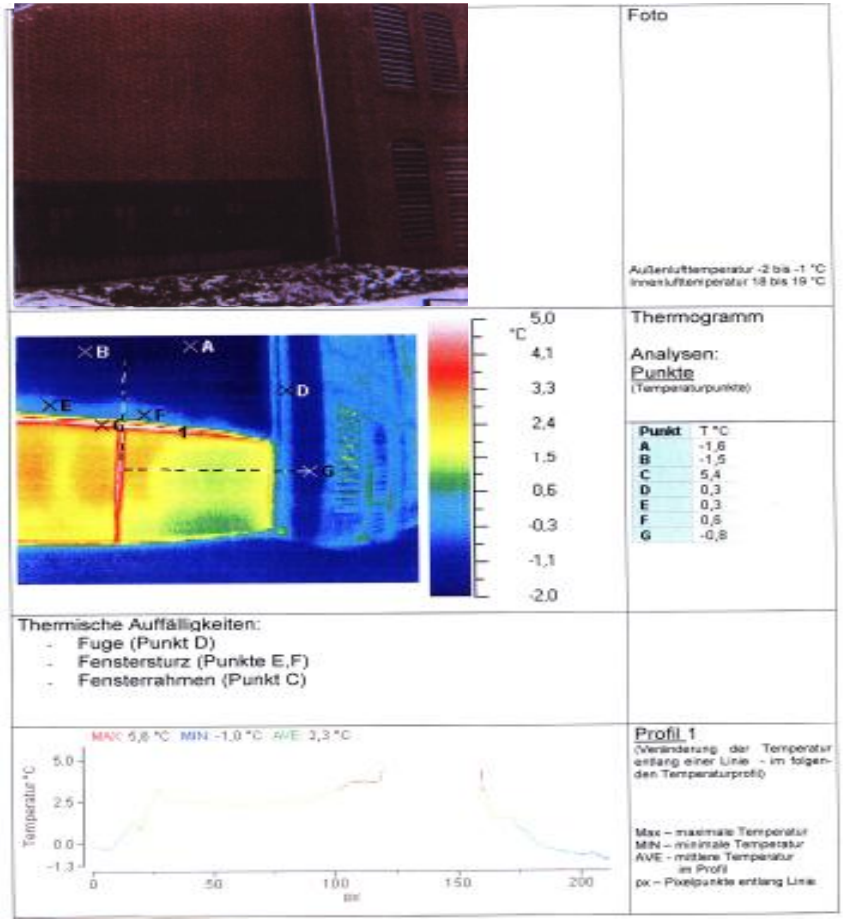
Quelle: GfÖB

TVOC* in indoor air

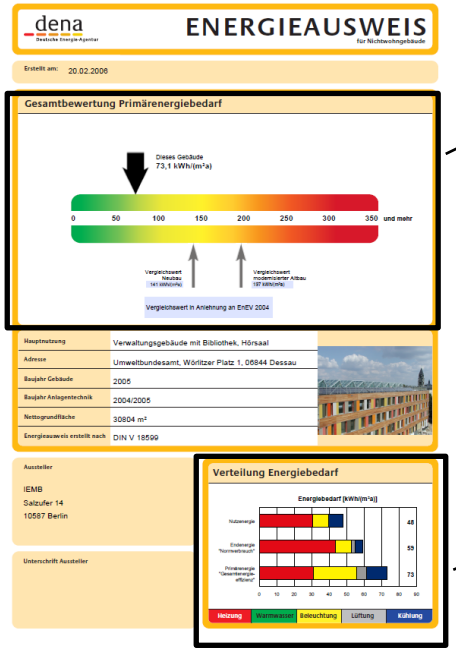


Quality assurance – Thermal insulation

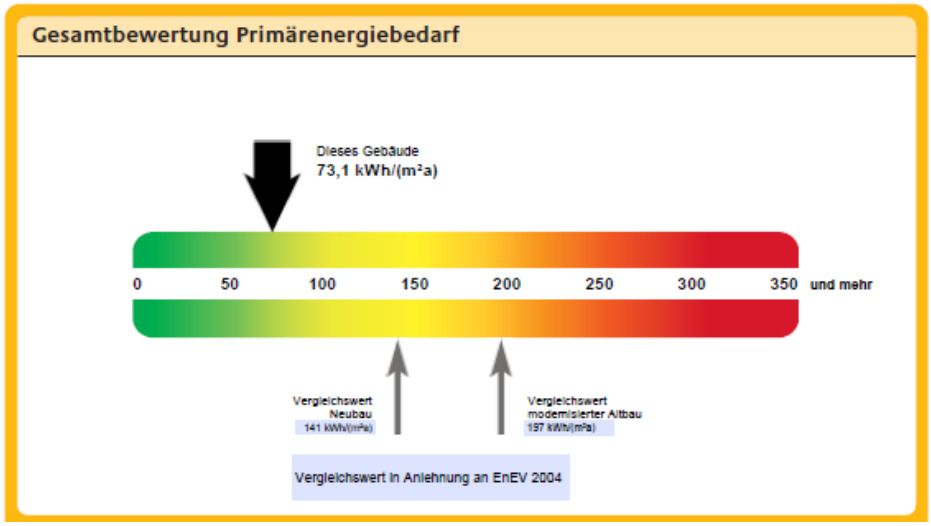


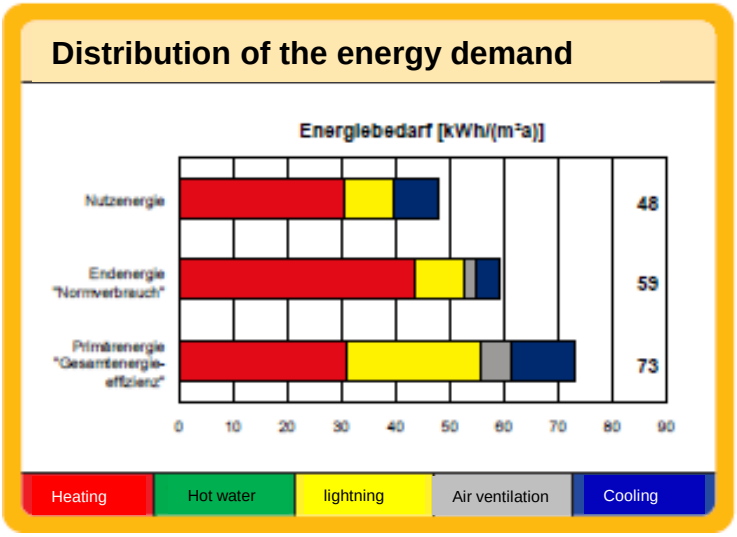


Energy certificate for public buildings under the Energy Saving Ordinance (EnEV)



IEMB, 2006





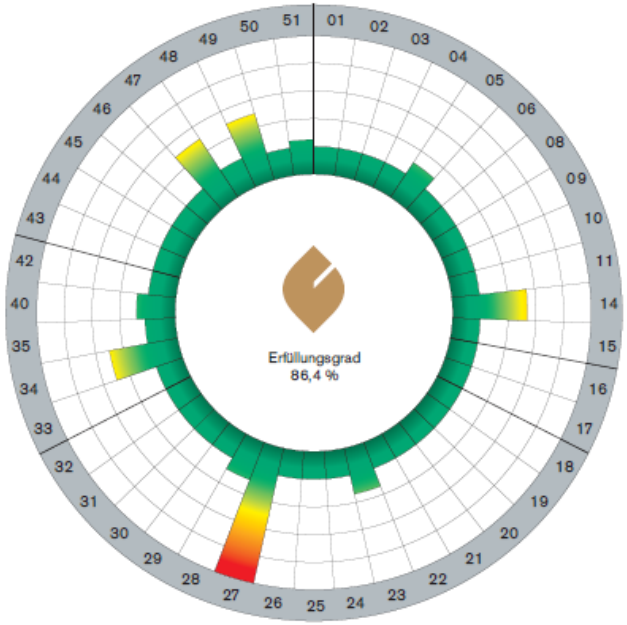
Certification in „gold“ (1,3) by the German Association of sustainable building (DGNB)

	Objektbewertung				
Kategorie	*Ökologische Qualität*	*Ökonomische Qualität*	*Soziokulturelle und funktionale Qualität*	*Technische Qualität*	*Prozess-qualität*
Wichtung	22,5 %	22,5 %	22,5 %	22,5 %	10,0 %
Teilnote	1,2	1,0	1,2	1,7	1,4
Gesamtnote	1,3				

Ratio of performance

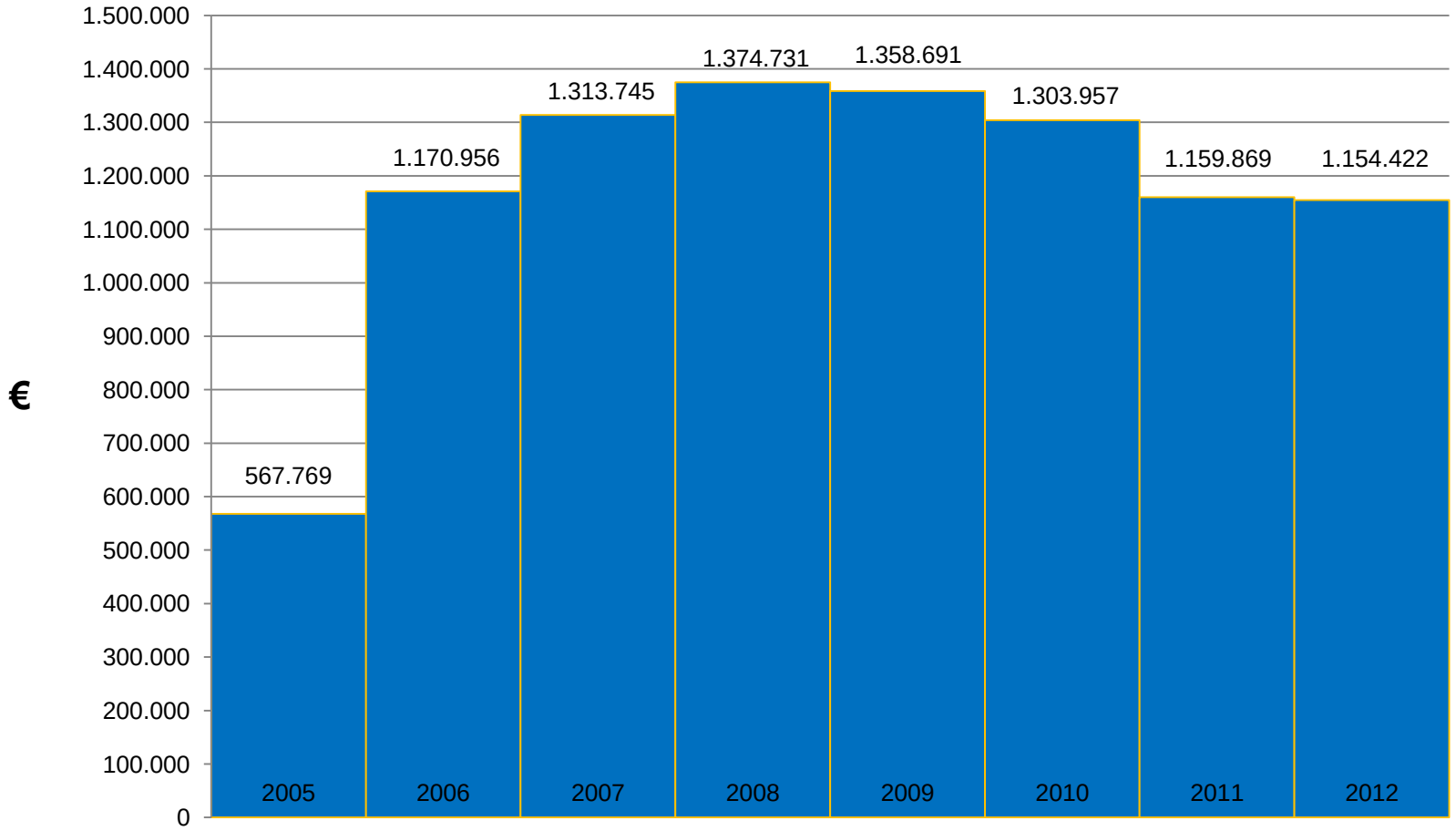
86,4 %

Objektbewertung				
Ökologische Qualität	Ökonomische Qualität	Soziokulturelle und Funktionale Qualität	Technische Qualität	Prozessqualität
01–15	16–17	18–32	33–42	43–51



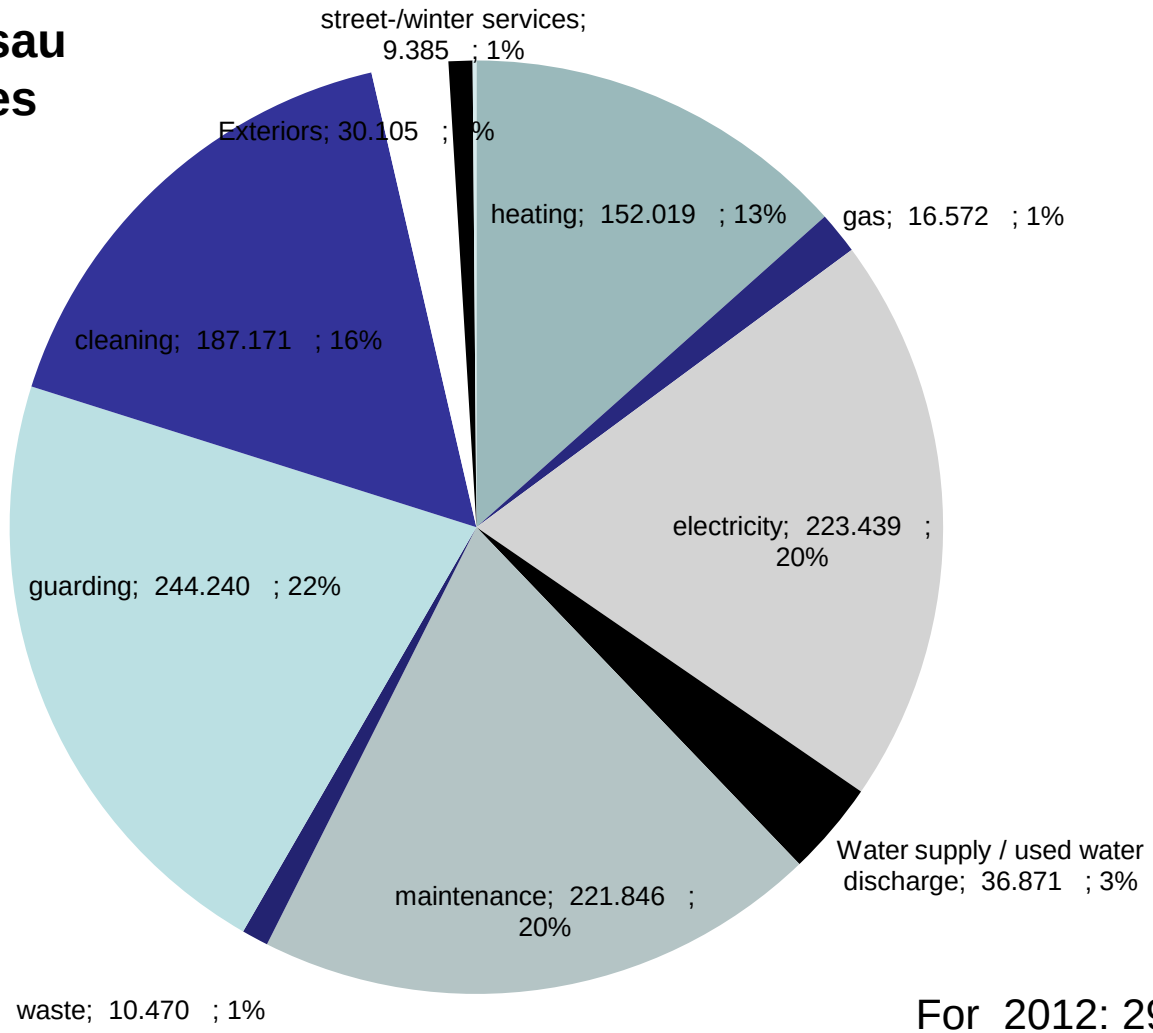
Für die Version 2008 sind die Kriterien 7, 12, 13, 36, 37, 38, 39, 41, 52, 53, 54, 55, 62, 63 zurückgestellt, fließen nicht in die Objektbewertung ein und sind deshalb nicht dargestellt. Die Kriterien der Standortqualität 56–61 sind in dieser Grafik ebenfalls nicht dargestellt.

Costs of operating the building



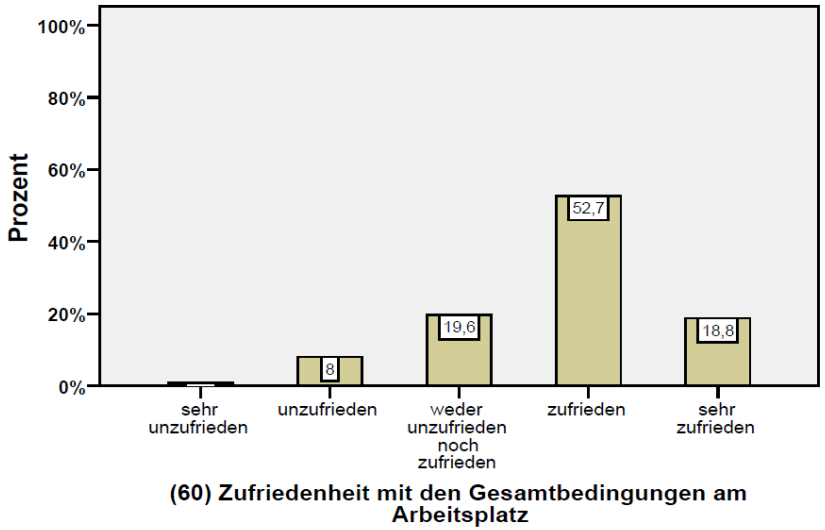
* Guarding, cleaning, maintenance, electricity, heating, water and drainage, waste

Office building Dessau division of cost types 2012

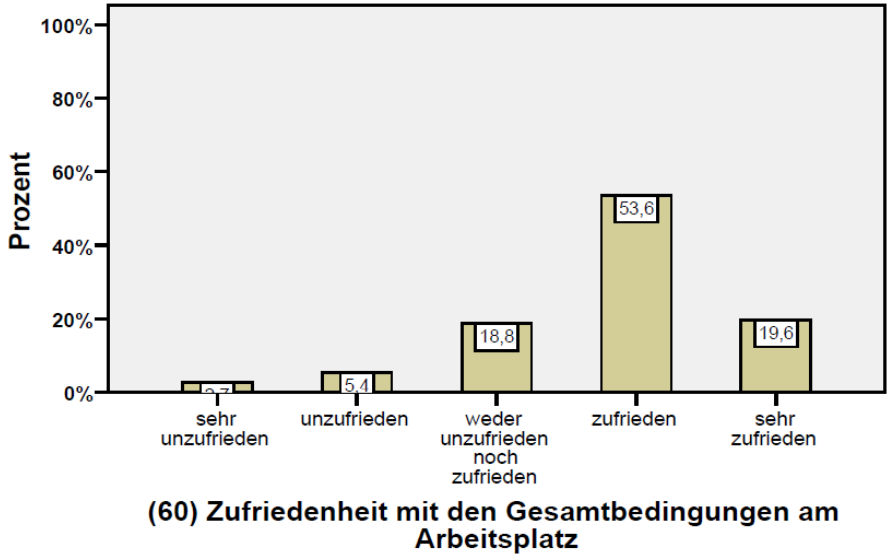


For 2012: 29,32 €/m^2_{BGF}

General contentness with the building – inquiry results



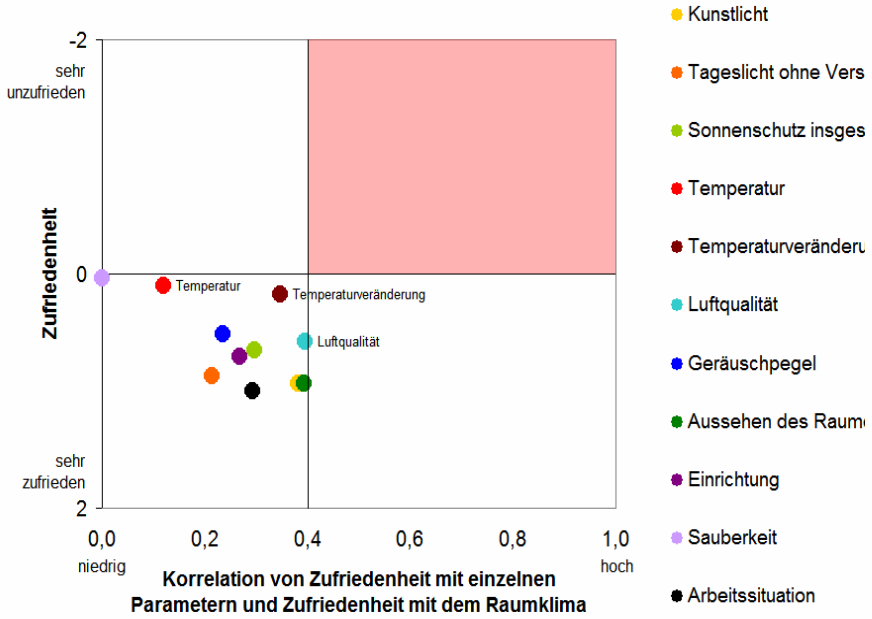
summer 2008



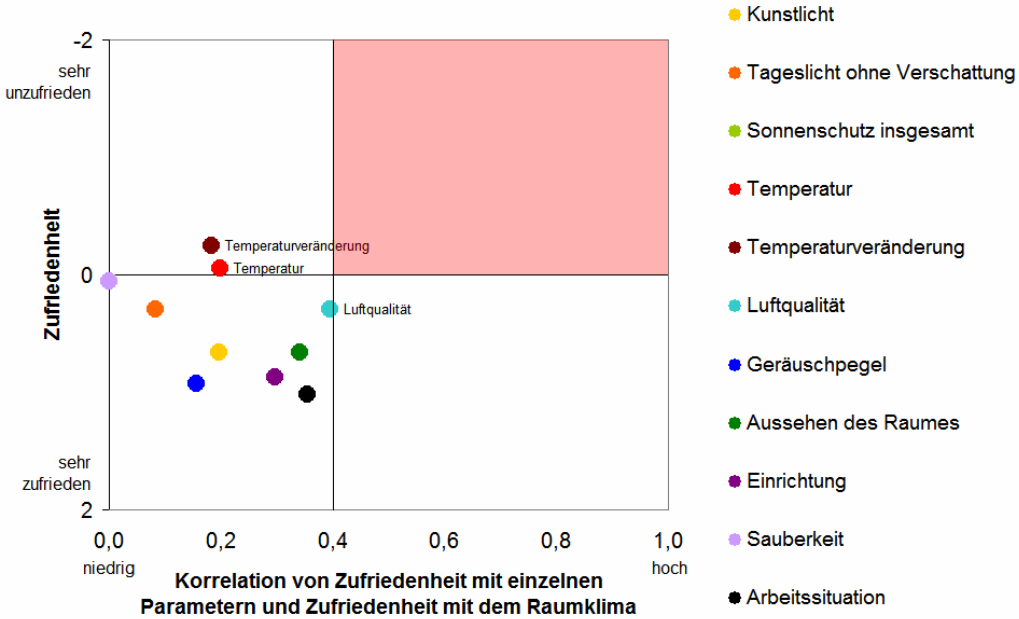
winter 2008

General contentness with the building – inquiry results basis to optimize operation

Offices direction outside



Offices direction atrium / forum



KIT, 11/2010

Building and art projects

Crosswords, Michael Sellmann, Berlin

Foto: Annette Kisling

Consequences, Elisabeth Heindl, München

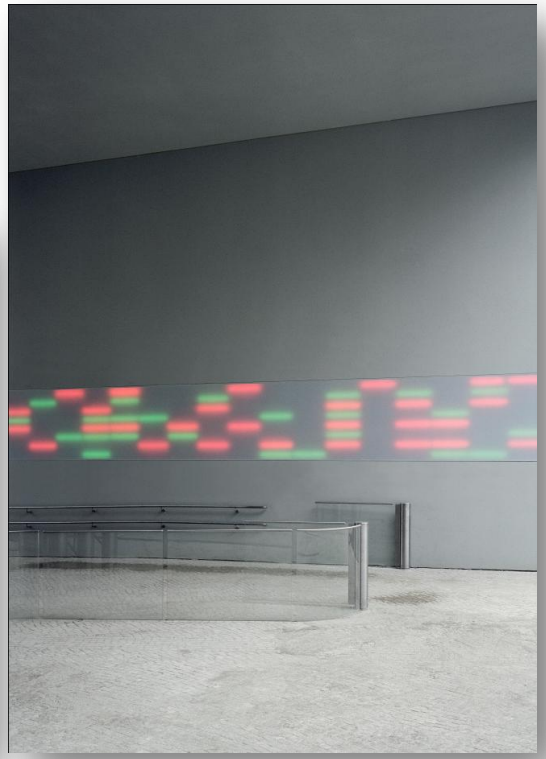


Foto: Jan Bitter

Folded steles, Hans-Joachim Härtel, Erfurt

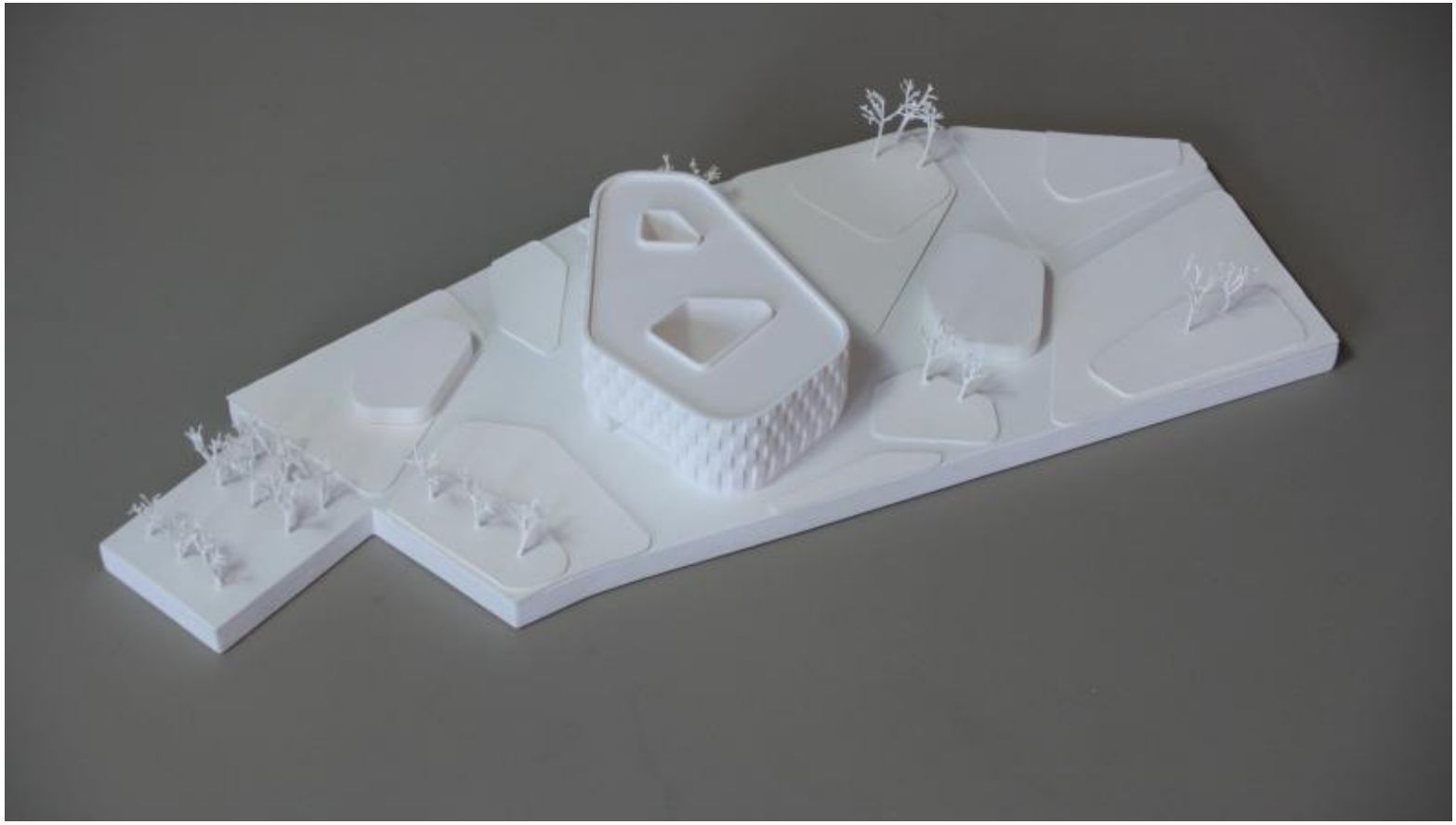
Foto: Jan Bitter

Zero-Energy-Building „Building 2019“ in Berlin-Marienfelde

Reconstruction of the office building in Berlin, Bismarckplatz, Low-energy-standard

Dienstgebäude Bismarckplatz, Innenhof, Entwurf gmp

New office building in Dessau for 102 workplaces – zero-energy-standard




Thank you for your attention!

Contact:

Gerd Schablitzki
Head of section Z 5 Facility Management
Wörlitzer Platz 1
06846 Dessau-Roßlau
Germany
tel.: +49 340 2103 - 2113
e-mail: gerd.schablitzki@uba.de
www.umweltbundesamt.de