

Sustainability report

With the phased occupation of the Suurstoffi site, Zug Estates came a step closer to its vision of operating the properties without the use of external sources of energy and with no emission of greenhouse gases.

With its zero-zero vision, the Zug Estates Group wants to operate the buildings in its portfolio in a sustainable, carbon-free manner and without external energy supplies. As well as setting social objectives, the company is thus adopting a holistic approach to sustainable management.

The Zug Estates Group has deliberately chosen not to use sustainability labels common in the construction business as they are awarded on the basis of projected figures. However, since 2010 it has had its energy and water consumption and the CO₂ emissions at its sites measured annually by the Center for Interdisciplinary Building Technology of Lucerne University of Applied Sciences (HSLU).

Ecological objectives of Zug Estates

Energy: Use of renewable energy sources; energy and resource-efficient usage

Emissions: Minimization of CO₂ emissions, other combustion gases and fine particles; reduction of noise and light emissions

Materials and products: Use of materials low in pollutants, energy-efficient technologies, products and equipment; use of renewable materials; short transportation routes

Biodiversity and water: Implementation of suitable measures in landscape design to preserve biodiversity

Primary energy consumption reduced again

In 2014 consumption of non-renewable primary energy for heating per square meter of rental space fell significantly for the entire portfolio for the fourth time in succession: by nearly 10% compared with 2013 and by as much as 29% compared with 2010 (adjusted for heating degree days). There was a comparable reduction in greenhouse gas emissions alongside the fall in primary energy consumption. In addition to the greater proportion of energy-efficient rental space at the Suurstoffi site, numerous small measures at the Zug site also contributed. The 2012 switchover to green electricity instead of the normal electricity mix available from the Wasserwerke Zug (WWZ) utility company also made a difference.

Area heated by renewable energy doubles

Whereas 87% of the entire rental space was still heated with natural gas (64%) or heating oil (23%) in 2013, this fell to 75% (natural gas 55%, heating oil 20%) in 2014. This means that the area heated by renewable sources has almost doubled since the last reporting period. The main reason for this change in the energy mix is that additional, more energy-efficient, rental spaces at the Suurstoffi site are now in use. Downhole heat exchanger pumps provide heating and hot water there. These are run on electricity from the WWZ grid (green electricity) and from photovoltaic panels on the buildings. In the current reporting period, photovoltaic panels provided 37% of the electricity used by the Suurstoffi heat pumps, and this is set to rise to about 80% when the photovoltaic-thermal (PVT) system

comes into operation. The aim is that all the electricity required for the production of heating will be provided by photovoltaics by the time construction is completed in 2020/21.

Electricity consumption down by a quarter in five years

Over all the sites, electricity consumption per square meter of rental space fell by 9% compared with the previous reporting period, despite rising occupancy levels. Consumption by the tenants can be influenced only indirectly, by fitting economical electrical appliances and lighting. Demand for general electricity per square meter is a more meaningful indicator. This fell by 12% compared with 2013 and by 23% compared with 2010. A corresponding reduction was observed in CO₂ emissions, too. Specific water consumption in cubic meters per square meter of rental space has stabilized since 2012 at the Zug city center site and the Oberentfelden factory site. There was a slight increase at the Suurstoffi site compared with the previous period connected with the rental of the spaces available there.

Simultaneous production of heating and power

The very latest technology for producing energy from sunlight has been widely installed at the Suurstoffi site. PVT modules produce power and heating simultaneously. More solar energy can thus be harvested from the same surface area. Furthermore, the solar cells do not become as hot because the «waste» heat is constantly being removed. This extends their life and increases their electricity production efficiency by about 5% over the year. On hot summer days the extra amount produced can be as much as 15%. The heat thus collected is then fed into the energy grid installed on the site. The buildings draw on this for heating and service water via heat pumps. In summer, the surplus heat produced by the PVT system is directed into the ground; it can then be recovered in winter. To the best of our knowledge, the PVT system at the Suurstoffi site is currently the largest in the world.

Key figures for PV and PVT systems

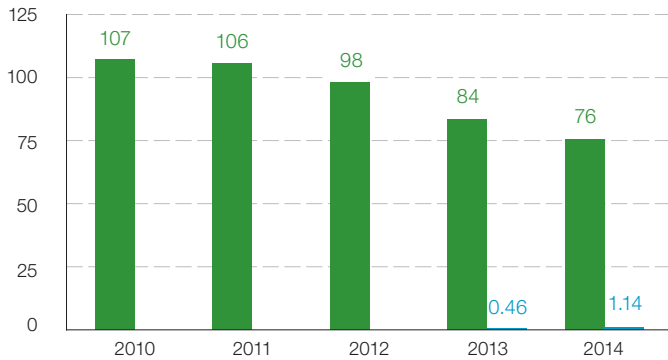
System	Module area in m ²	Electricity output in kWp	Electricity yield in kWh p.a.	Thermal yield in kWh p.a.	Commissioning
PV system ¹	3 484	595	552 000	–	2012/2013
PVT system ²	2704	424	365 000	1 626 000	2014/2015
Total share	6 188	1 019	917 000	1 626 000	–

¹ Photovoltaic system

² Thermal photovoltaic system

Primary energy construction for heating and hot-water production

kWh/m² rental space (adjusted for heating degree days)



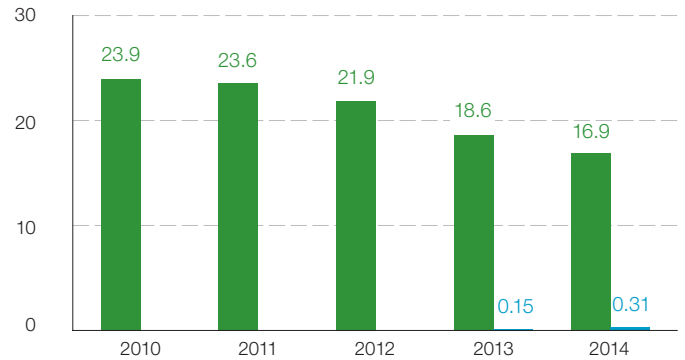
All properties

Suurstoffi site

Primary energy consumption (non-renewable) for heating and hot-water production. Due to the small share of non-renewable energies in the electricity mix of WWZ (factor 0.058), the balance for the Suurstoffi site is much more favorable than for the other properties heated with fossil fuels (factor 1.11 or 1.23).

CO₂ equivalents for heating and hot-water production

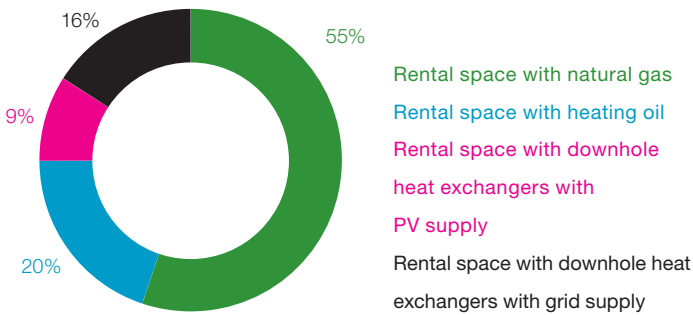
kg CO₂/m² rental space (adjusted for heating degree days)



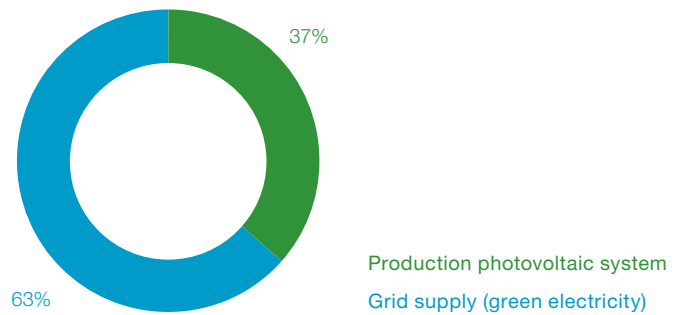
All properties

Suurstoffi site

Space broken down by energy source for heating (2014)

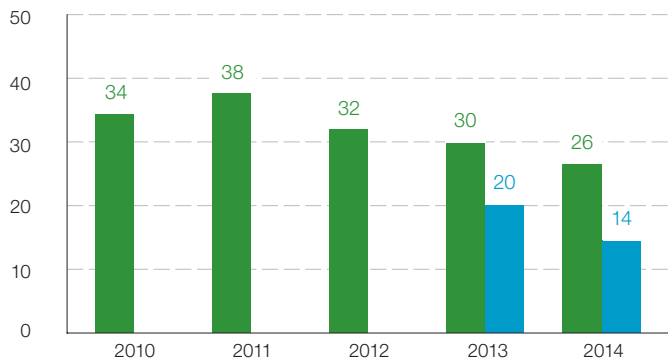


Operating current for heating and hot-water production at Suurstoffi site (2014)



Final energy consumption electricity (common area ¹)

kWh/m² rental space

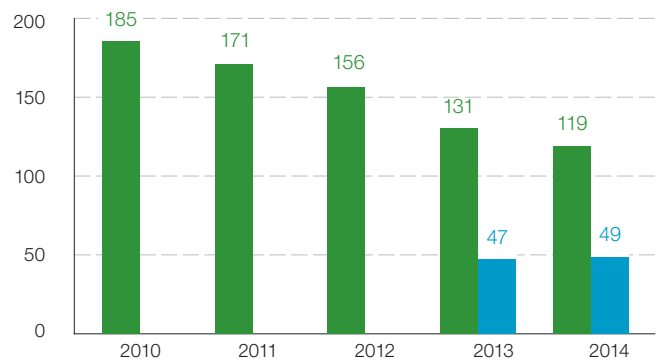


All properties

Suurstoffi site

Final energy consumption electricity (incl. tenants)

kWh/m² rental space



All properties

Suurstoffi site

¹ Without operating current for heating and hot-water production at Suurstoffi site

Overview of consumption data

(from October of previous year to September of report year)

	2010		2011	
	Absolute	per m ²	Absolute	per m ²
Rental space ¹	95 400 m ²	–	100 900 m ²	–
Primary energy supply for heating and hot-water production	10.6 Mio. kWh	111 kWh	9.9 Mio. kWh	99 kWh
Primary energy supply adjusted for heating degree days	10.2 Mio. kWh	107 kWh	10.6 Mio. kWh	106 kWh
Residential/commercial properties	8.0 Mio. kWh	108 kWh	7.3 Mio. kWh	97 kWh
Hotel properties	1.6 Mio. kWh	223 kWh	1.8 Mio. kWh	151 kWh
Industrial property	1.0 Mio. kWh	71 kWh	0.9 Mio. kWh	64 kWh
CO₂ equivalents heating/hot-water	2 369 t	25 kg	2 225 t	22 kg
CO ₂ equivalents heating/hot-water adjusted for heating degree days	2 285 t	24 kg	2 382 t	24 kg
Zug City Center site	2 054 t	25 kg	2 148 t	25 kg
Suurstoffi site, Risch Rotkreuz	–	–	–	–
Oberentfelden factory site	231 t	17 kg	233 t	17 kg
Electricity – common area	2.6 Mio. kWh	34 kWh	2.8 Mio. kWh	38 kWh
Electricity – tenants	15.1 Mio. kWh	158 kWh	14.4 Mio. kWh	143 kWh
Residential	–	–	–	–
Office/retail/commercial	–	–	–	–
Hotel/catering incl. common area electricity	–	–	–	–
Industrial incl. common area electricity	6.1 Mio. kWh	440 kWh	5.3 Mio. kWh	379 kWh
Other (parking areas, warehouses/archives)	–	–	–	–
Total electricity ²	17.7 Mio. kWh	185 kWh	17.2 Mio. kWh	171 kWh
Zug City Center site	11.5 Mio. kWh	142 kWh	11.9 Mio. kWh	137 kWh
Suurstoffi site, Risch Rotkreuz	–	–	–	–
Oberentfelden factory site	6.1 Mio. kWh	440 kWh	5.3 Mio. kWh	379 kWh
CO₂-equivalents electricity	283 t	3.0 kg	274 t	2.7 kg
Water consumption	71 948 m³	0.75 m³	74 344 m³	0.74 m³
Zug City Center site	71 392 m ³	0.88 m ³	73 775 m ³	0.85 m ³
Suurstoffi site, Risch Rotkreuz	–	–	–	–
Oberentfelden factory site	556 m ³	0.04 m ³	569 m ³	0.04 m ³

¹ Data per square meter refer to rental space

² Electricity mix Zug City Center site and Suurstoffi site: Before 2012, 25% nuclear power and 75% hydropower; from 2012, green electricity from Wasserwerke Zug (WWZ) with 95% hydropower and 5% solar electricity. Oberentfelden factory site (2010 to 2013): 83.2% nuclear power and 16.8% hydropower.

2012		2013		2014	
Absolute	per m ²	Absolute	per m ²	Absolute	per m ²
105 000 m ²	–	119 900 m ²	–	140 600 m ²	–
10.2 Mio. kWh	97 kWh	10.5 Mio. kWh	88 kWh	9.2 Mio. kWh	66 kWh
10.3 Mio. kWh	98 kWh	10.0 Mio. kWh	84 kWh	10.6 Mio. kWh	76 kWh
7.5 Mio. kWh	97 kWh	7.8 Mio. kWh	84 kWh	6.9 Mio. kWh	61 kWh
2.0 Mio. kWh	144 kWh	2.0 Mio. kWh	152 kWh	1.6 Mio. kWh	115 kWh
0.8 Mio. kWh	55 kWh	0.7 Mio. kWh	50 kWh	0.8 Mio. kWh	55 kWh
2 280 t	22 kg	2 351 t	20 kg	2 064 t	15 kg
2 297 t	22 kg	2 232 t	19 kg	2 375 t	17 kg
2 109 t	23 kg	2 069 t	23 kg	2 150 t	24 kg
–	–	2 t	0.15 kg	10 t	0.3 kg
188 t	14 kg	161 t	12 kg	212 t	15 kg
2.5 Mio. kWh	32 kWh	2.8 Mio. kWh	30 kWh	3.0 Mio. kWh	26 kWh
13.9 Mio. kWh	133 kWh	12.8 Mio. kWh	107 kWh	13.8 Mio. kWh	98 kWh
–	–	1.0 Mio. kWh	24 kWh	1.2 Mio. kWh	23 kWh
–	–	6.0 Mio. kWh	114 kWh	6.7 Mio. kWh	107 kWh
–	–	2.0 Mio. kWh	147 kWh	2.0 Mio. kWh	143 kWh
4.6 Mio. kWh	329 kWh	3.3 Mio. kWh	239 kWh	3.2 Mio. kWh	232 kWh
–	–	0.6 Mio. kWh	–	0.6 Mio. kWh	–
16.4 Mio. kWh	156 kWh	15.7 Mio. kWh	131 kWh	16.8 Mio. kWh	119 kWh
11.8 Mio. kWh	130 kWh	11.6 Mio. kWh	128 kWh	11.8 Mio. kWh	129 kWh
–	–	0.7 Mio. kWh	47 kWh	1.7 Mio. kWh	49 kWh
4.6 Mio. kWh	329 kWh	3.3 Mio. kWh	239 kWh	3.2 Mio. kWh	232 kWh
297 t	2.8 kg	284 t	2.4 kg	305 t	2.2 kg
72 202 m³	0.69 m³	81 240 m³	0.68 m³	100 471 m³	0.71 m³
71 734 m ³	0.79 m ³	71 510 m ³	0.79 m ³	72 303 m ³	0.79 m ³
–	–	8 095 m ³	0.54 m ³	26 825 m ³	0.76 m ³
468 m ³	0.03 m ³	1 635 m ³	0.12 m ³	1 343 m ³	0.10 m ³

Consumer data are based on information from local energy suppliers and meter readings at the sites. The data were evaluated by the Center for Interdisciplinary Building Technology (ZIG) of the Lucerne University of Applied Sciences (HSLU). ZIG HSLU attests to the accuracy of the analysis.

To allow better comparison of the different sources of energy, heating energy consumption is reported in the form of primary energy and CO₂ equivalents. Primary energy is energy contained in the original energy form or source, e.g. mineral oil or natural gas. CO₂ equivalents show the amount of greenhouse gas released by energy consumption. These values were calculated using factors according to SIA 2040.