buildings as energy storage for the grid

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example of a multifamily home in Vienna

DI DI Dr. Simon Handler

the architectural design

building data:

- 1400 m²
- 11 flats (for rent - not sale)

the location of building site

1130 Wien, Granichstättengasse 73

![ALLPLAN Die Umweltmanager. logo]
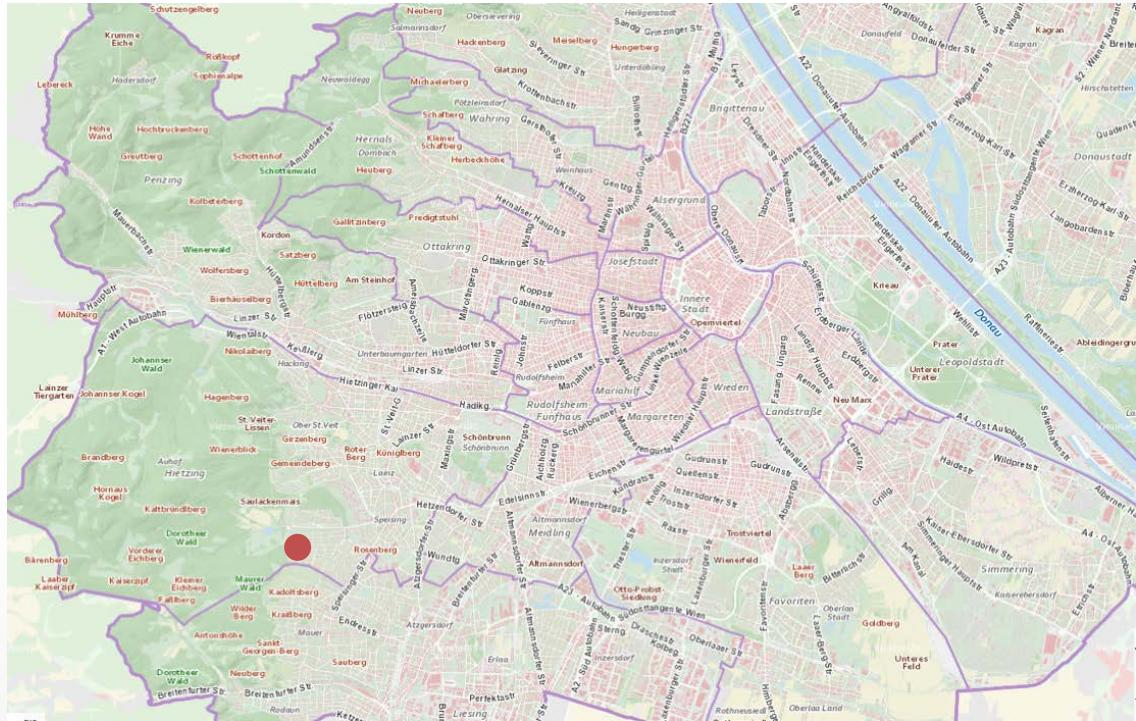
the location of building site
1130 Wien, Granichstättengasse 73
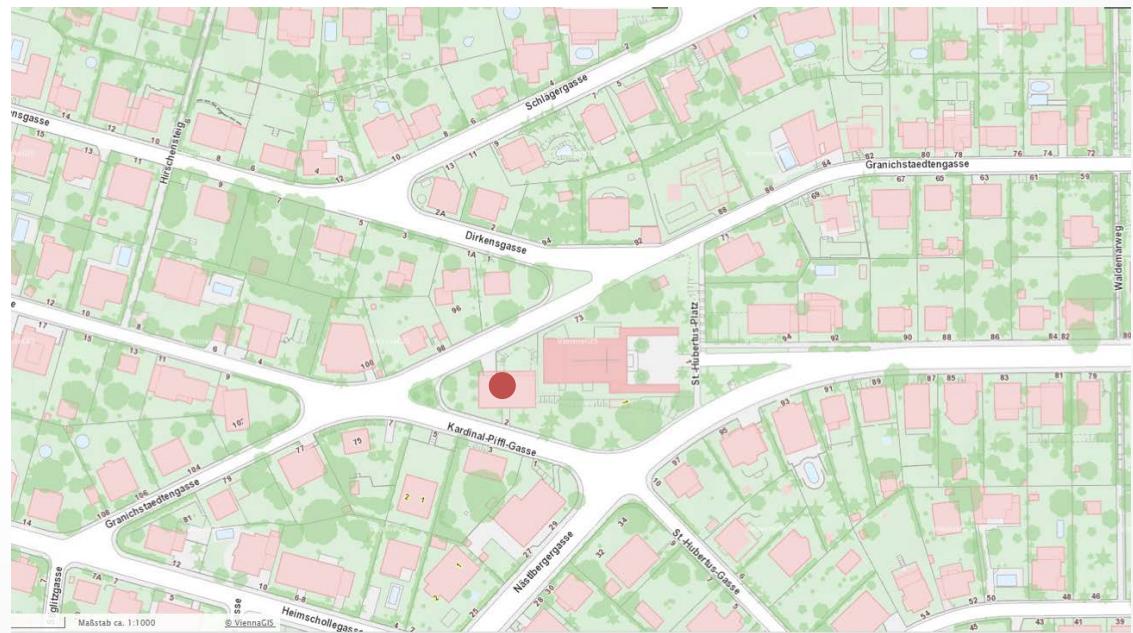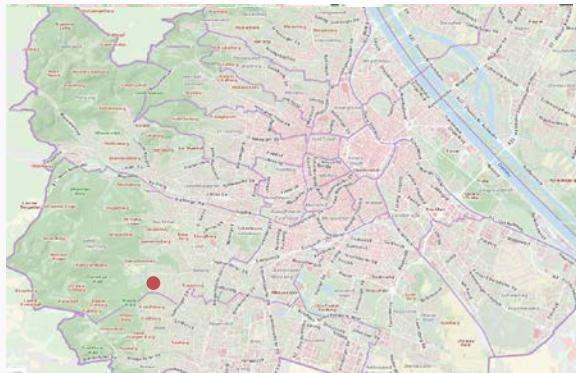
the developer`s interests

- exterior design
- costs
- …

- sustainability
- cooling wanted
- ventilation system not necessary
- floor heating not necessary
- focus on long term cost efficiency

the building envelope
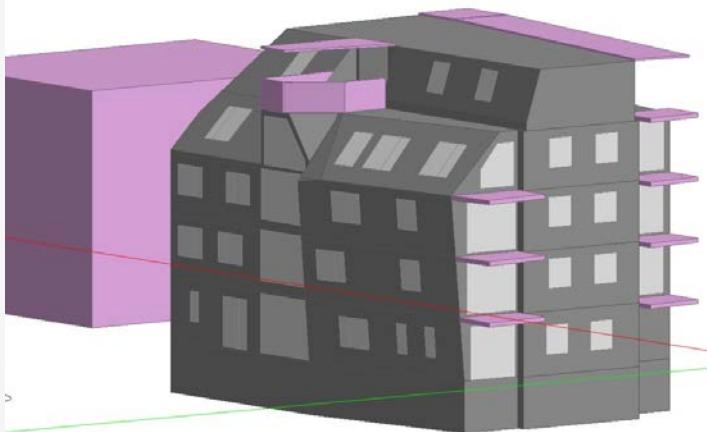
- U-value exterior wall = 0,13-0,15 W/m²K
- U-value roof = 0,11-0,14 W/m²K
- U-value cellar ceiling = 0,17 W/m²K
- U_w-value windows = 0,9 W/m²K

- heating demand OIB RL 6 = 24,5 kWh/m²a
- heating demand simulation = 20,0 kWh/m²a

- heat load ÖNORM H7500 = 27 kW
- heat load simulation (peak) = 22 kW
- heat load simulation (24h average) = 18 kW

the building envelope
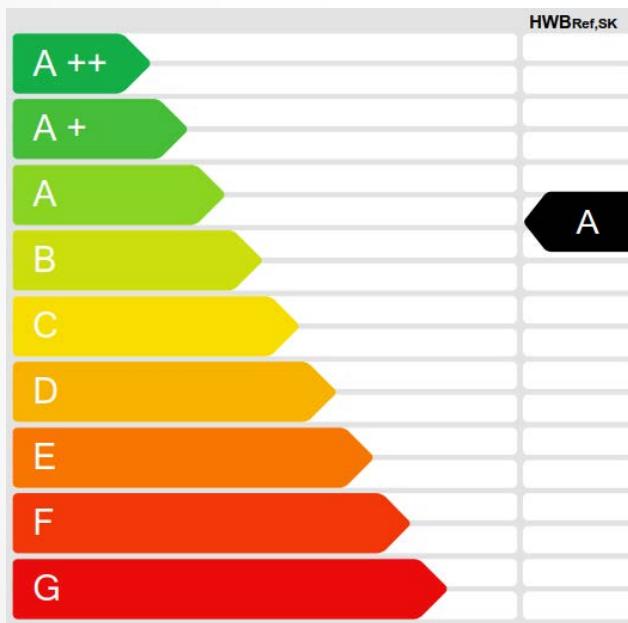
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- U-value cellar ceiling = 0,17 W/m²K
- U_w-value windows = 0,9 W/m²K

- heating demand OIB RL 6 = 24,5 kWh/m²a
- heating demand simulation = 19,5 kWh/m²a

- heat load ÖNORM H7500 = 27 kW
- heat load simulation (peak) = 22 kW
- heat load simulation (24h average) = 18 kW

the accessible energy sources

energy costs
for heating & ww in Euro/a
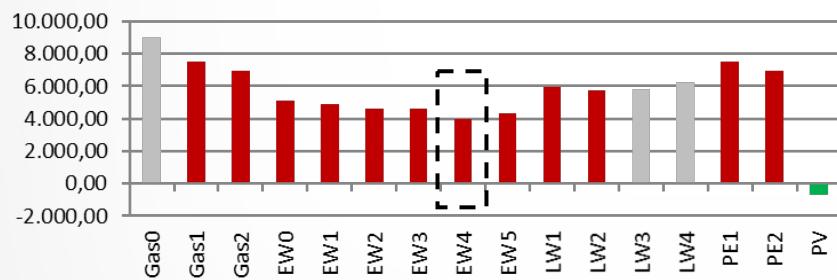
district heating	Wiener Netze	not available
	others	not available

heat pump	groundwater	not available
	geo thermal	possible
	air	possible

fossil	gas	possible
	oil	not wanted

biomass	pellets	possible
	wood chips	not wanted

| production at site	solar thermal	possible
	PV	possible
	wind	not wanted

the hydraulic system

- high temperature distribution for warmwater & bathroom radiators
- low temperature distribution heating and cooling
- free cooling
- apartment stations (4 pipe system)
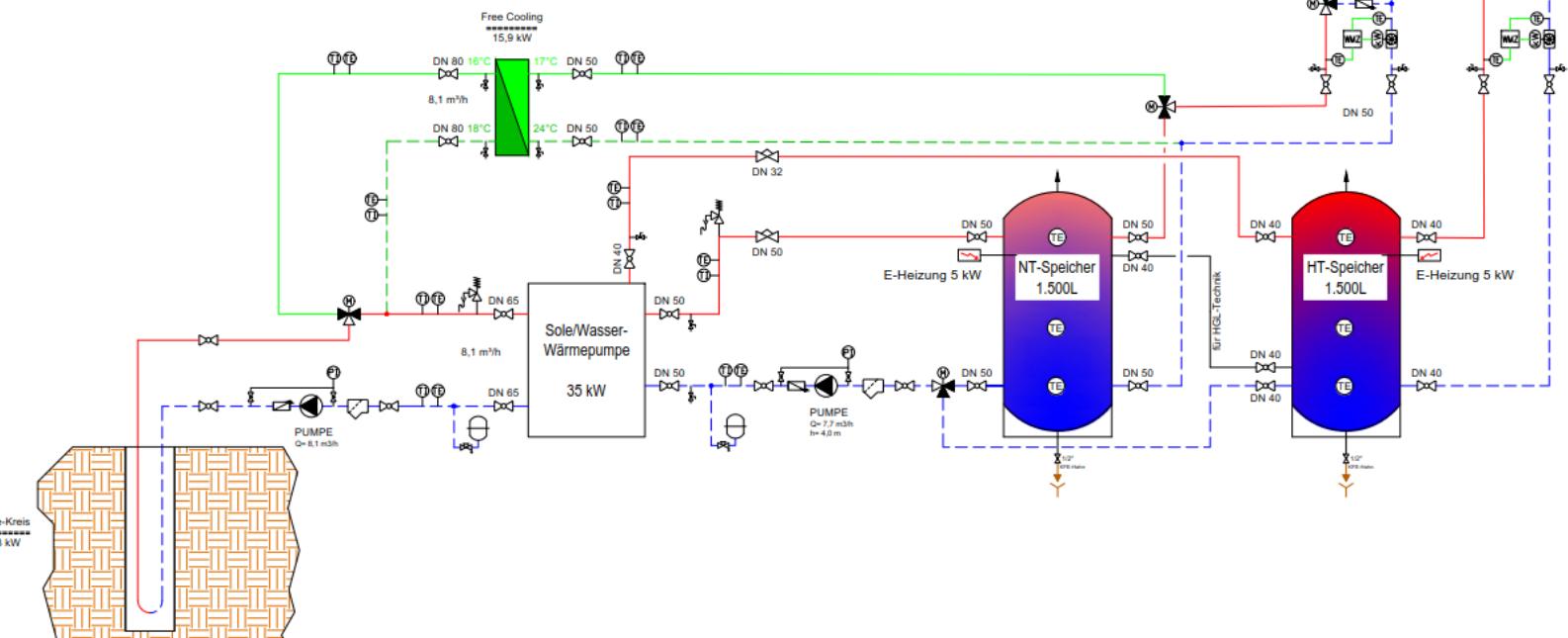
the building mass &
it´s thermal storage capacity
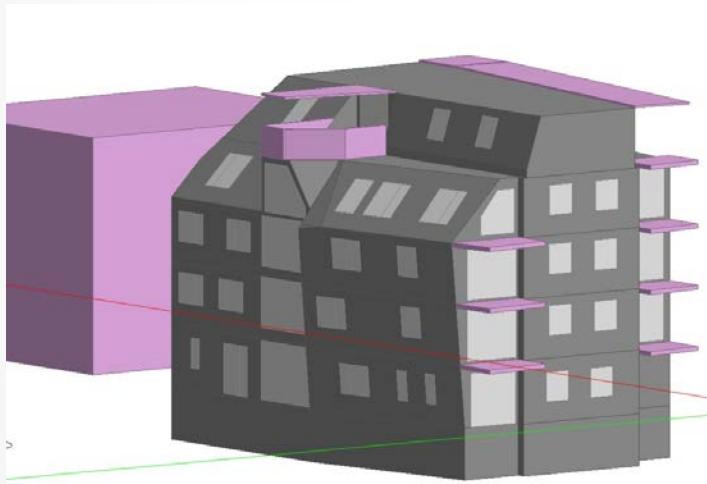
	mass	storage capacity	dT = 2 K
ext. walls concrete	120 t	132000 kJ/K	70 kWh
int. walls concrete	205 t	225500 kJ/K	130 kWh
slabs concrete	820 t	902000 kJ/K	500 kWh
sum	1145 t	1259500 kJ/K	700 kWh
ext. walls brick	104 t	228800 kJ/K	130 kWh
int. walls brick	25 t	55000 kJ/K	30 kWh
other int. Walls	25 t	55000 kJ/K	30 kWh
sum	154 t	338800 kJ/K	190 kWh
sum	1299 t	1598300 kJ/K	890 kWh

# concrete slabs for thermal activation

<15 %

screed 5 cm
insulation 3 cm
EPS fill 5 cm

concrete 20 cm

>85 %
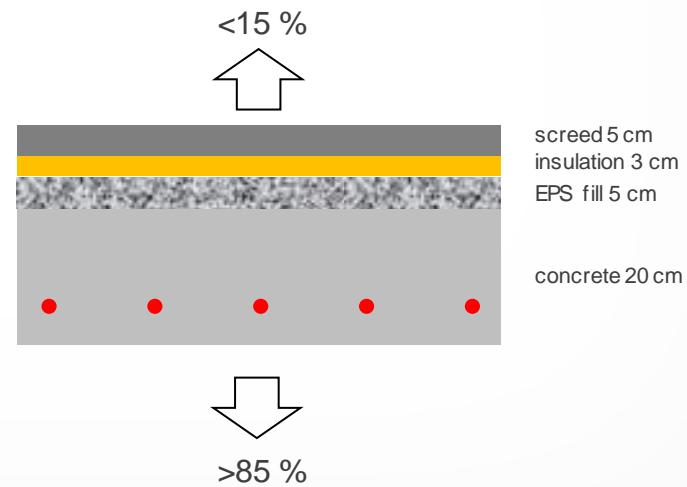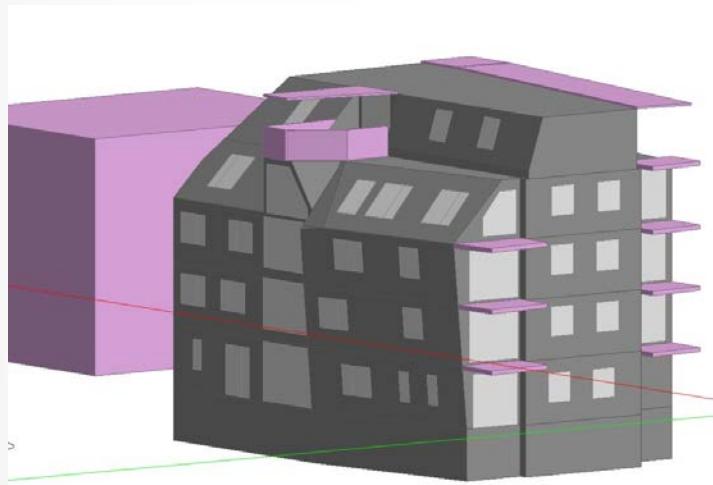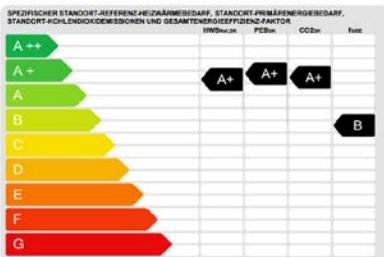
the concept - roundup

- high quality envelope
- geothermal heatpump system
- 2 temperature distribution levels
- apartment stations
- activation of concrete slabs
- smart grid connection to the grid operator
    needed to use storage capacity
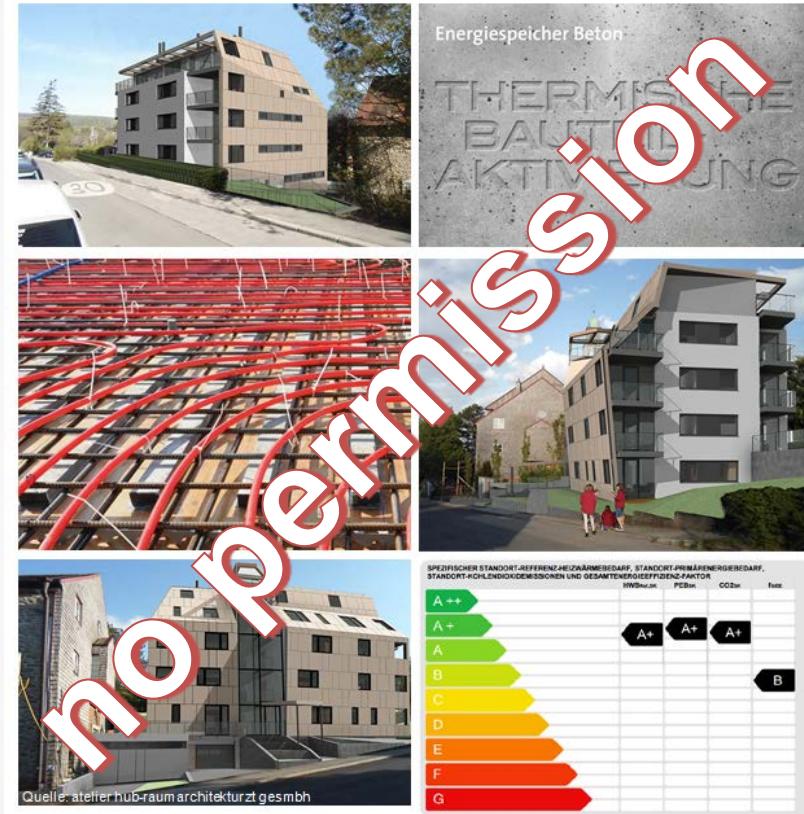
the problem until now…

… the developer has difficulties getting the official permission according to architectural design

on behalf of the Federal Ministry
for Transport, Innovation and Technology

the monitoring

a 2 years program enabled by BMVIT

main goals:

- thermal comfort inside
- over all energy efficiency
- detailed knowledge about the dynamic storage behavior
- experiences in operation of multi-family houses as thermal storage for the grid
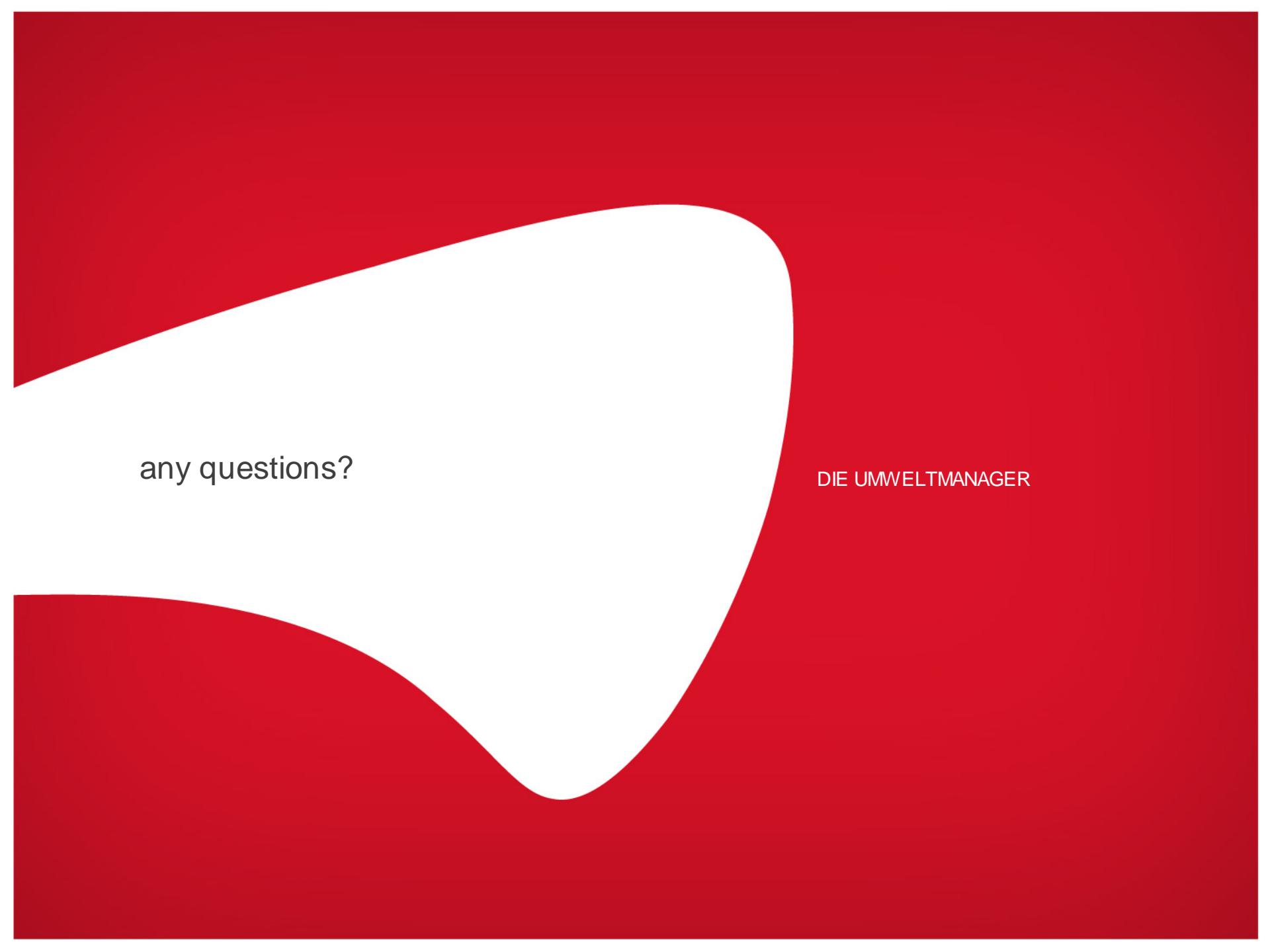
any questions?

DIE UMWELTMANAGER