Institut für Gebäude- und Solartechnik
Prof. Dr.-Ing. M. Norbert Fisch
Mühlenpfordtstraße 23
D-38106 Braunschweig

www.igs.tu-bs.de

Technische Universität Braunschweig



EnEff Campus 2020
Integral energetic masterplan

Univ. Prof. Dr.-Ing. M. Norbert Fisch

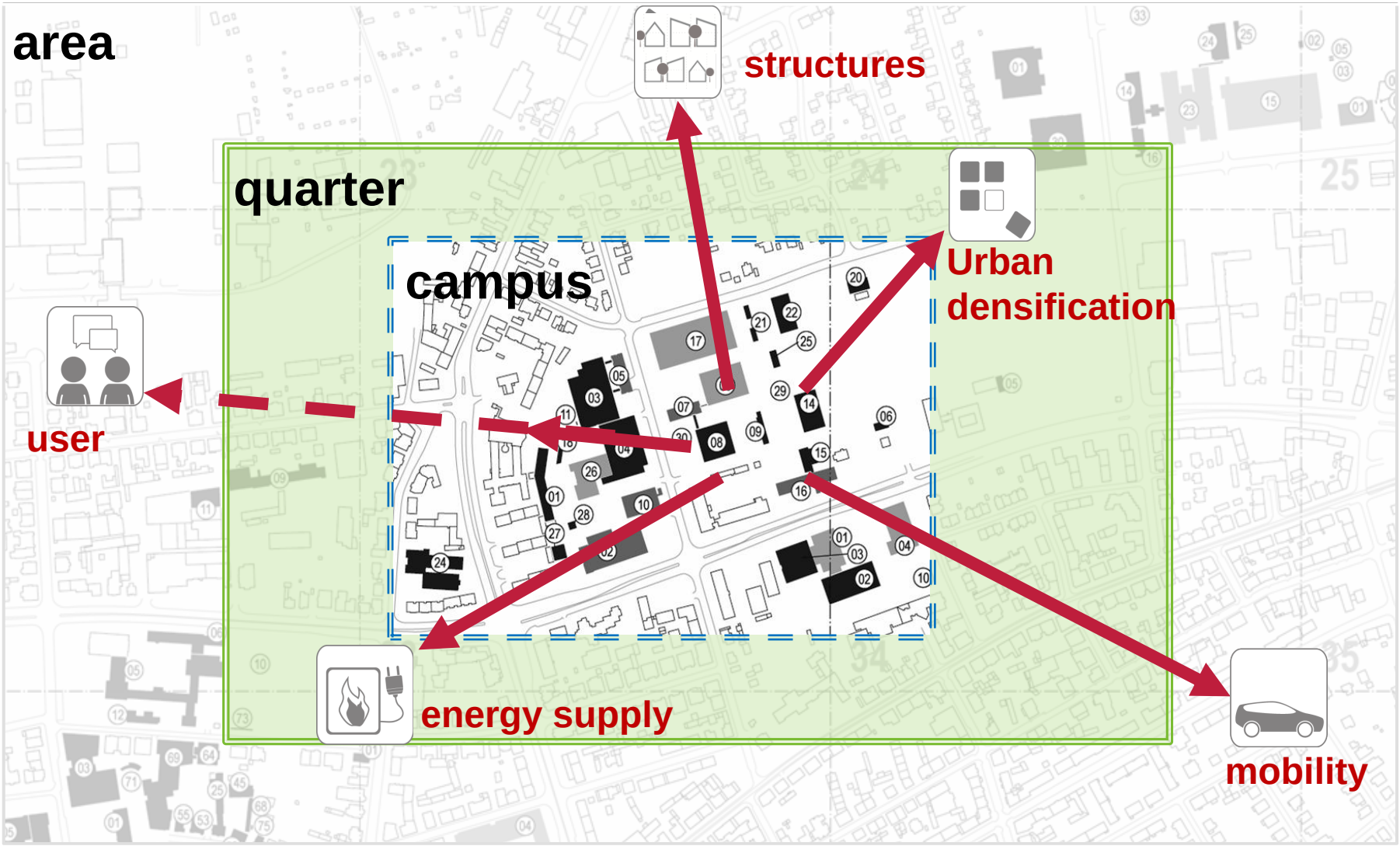
Federal Ministry for Economic Affairs and Energy

2020: primary energy minus 40%

improvement of learn and living conditions

2035: climate-neutral Campus

nearly balanced CO_2- footprint


area
structures
quarter
campus
Urban densification
user
energy supply
mobility

phase 1 – master plan

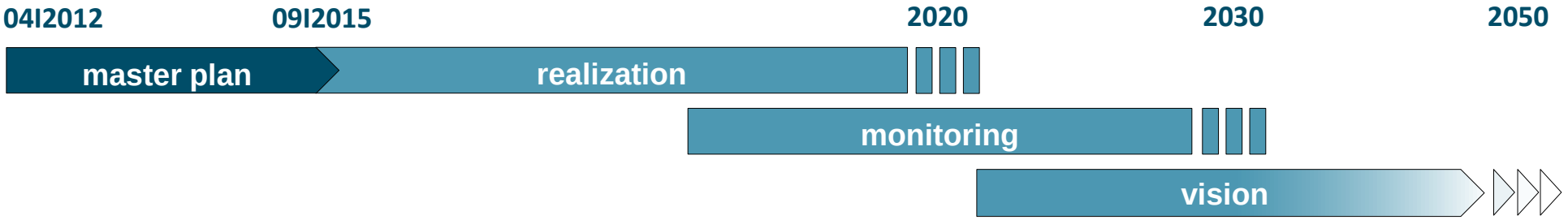
- project term: 2012 – 2015
- delivery BMWi: (1,6 Mio. €)



phase 2 - realization

- 2015 – 2018
- 1,7 Mio. €

phase 3 - continuation…. ?



TU Braunschweig

6 faculties

120 institutes

3.500 employees

18.500 students

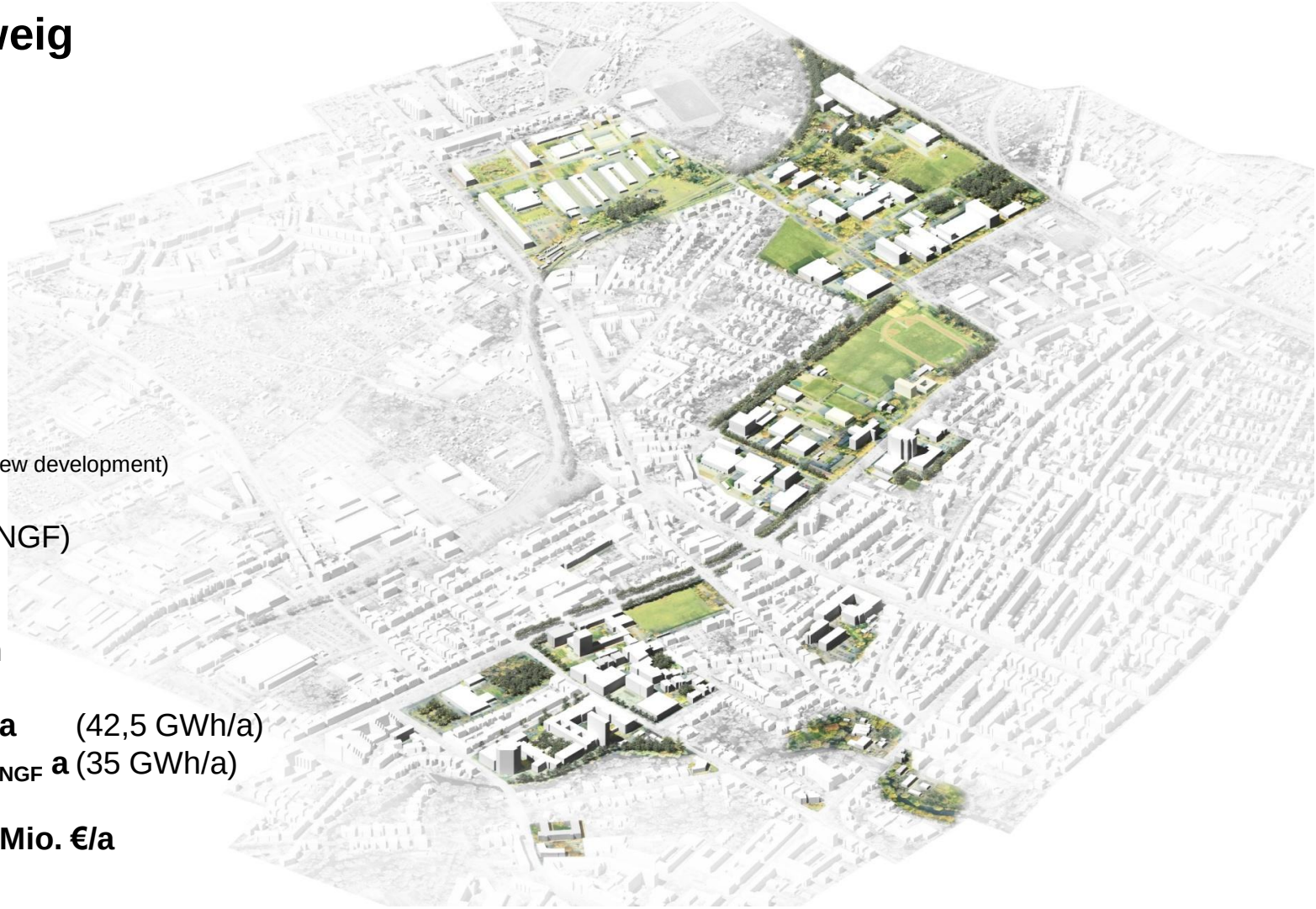
201 buildings (incl. new development)

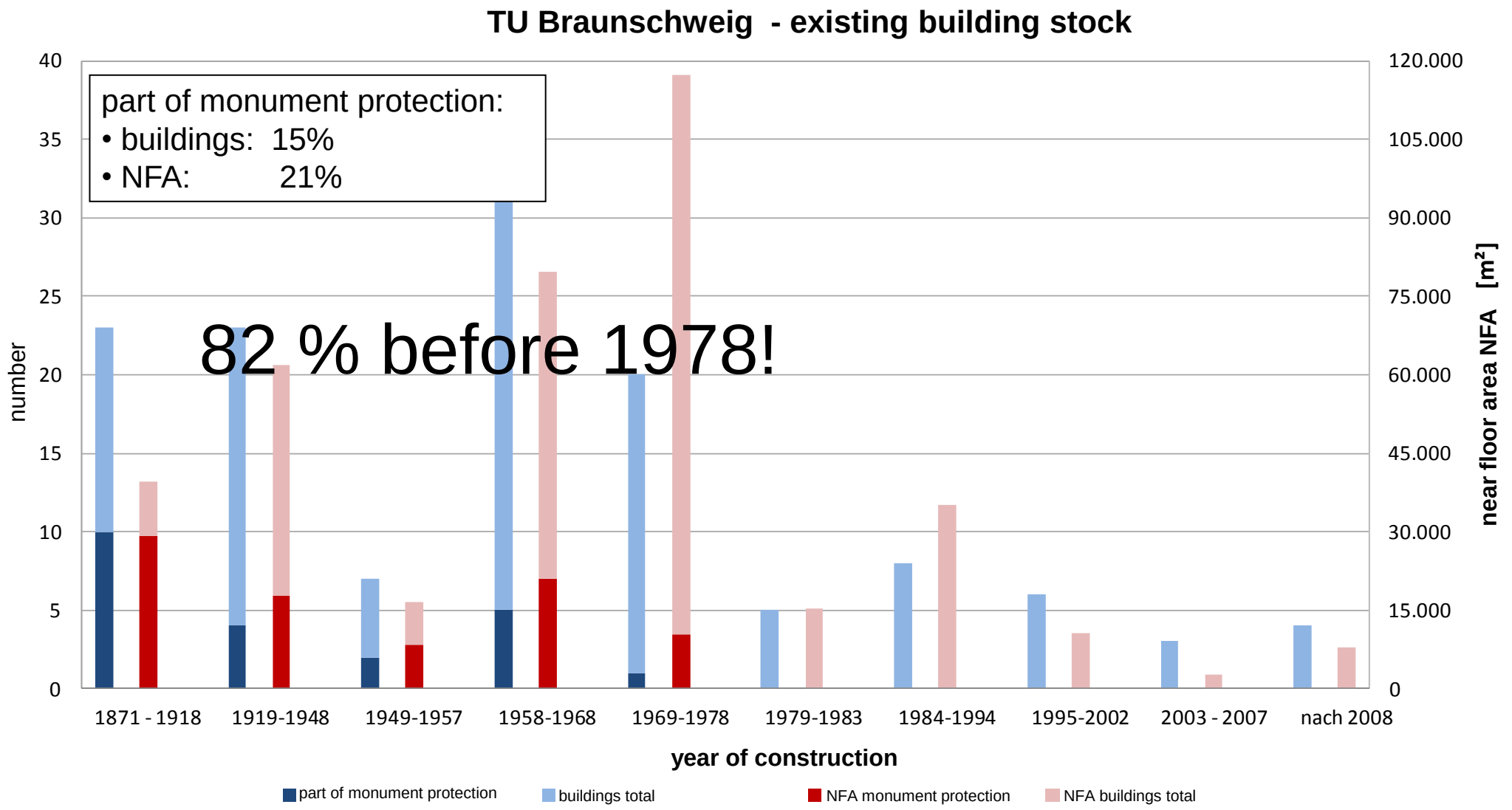
400.000 m² net area (NGF)

energy consumption

heat: **106 kWh/m²$_{NGF}$ a** (42,5 GWh/a)
electricity: **87 kWh/m²$_{NGF}$ a** (35 GWh/a)

energy costs: ca. 11 Mio. €/a




TU Braunschweig - existing building stock
part of monument protection:
• buildings: 15%
• NFA: 21%
82 % before 1978!
number
near floor area NFA [m²]
0
5
10
15
20
25
30
35
40
0
15.000
30.000
45.000
60.000
75.000
90.000
105.000
120.000
1871 - 1918
1919-1948
1949-1957
1958-1968
1969-1978
1979-1983
1984-1994
1995-2002
2003 - 2007
nach 2008
year of construction
part of monument protection
buildings total
NFA monument protection
NFA buildings total

data basis

- metering and measuring installations

  (> 500 measuring points, collecting 15-min.-consumption)
- building-specific parameter (area, use, structure, building services engineering)
- comprehensive building services management system

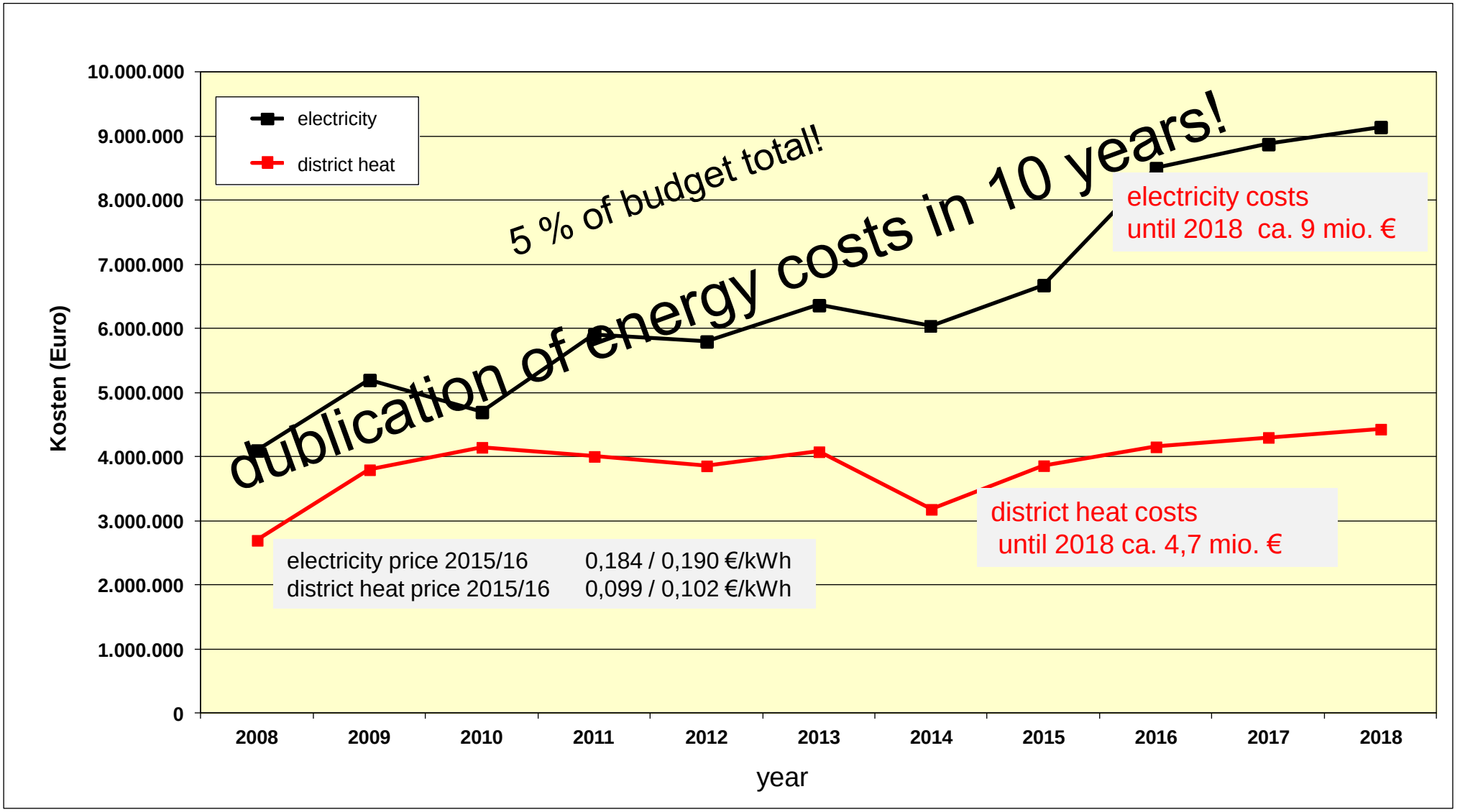

Altgebäude


Audimax

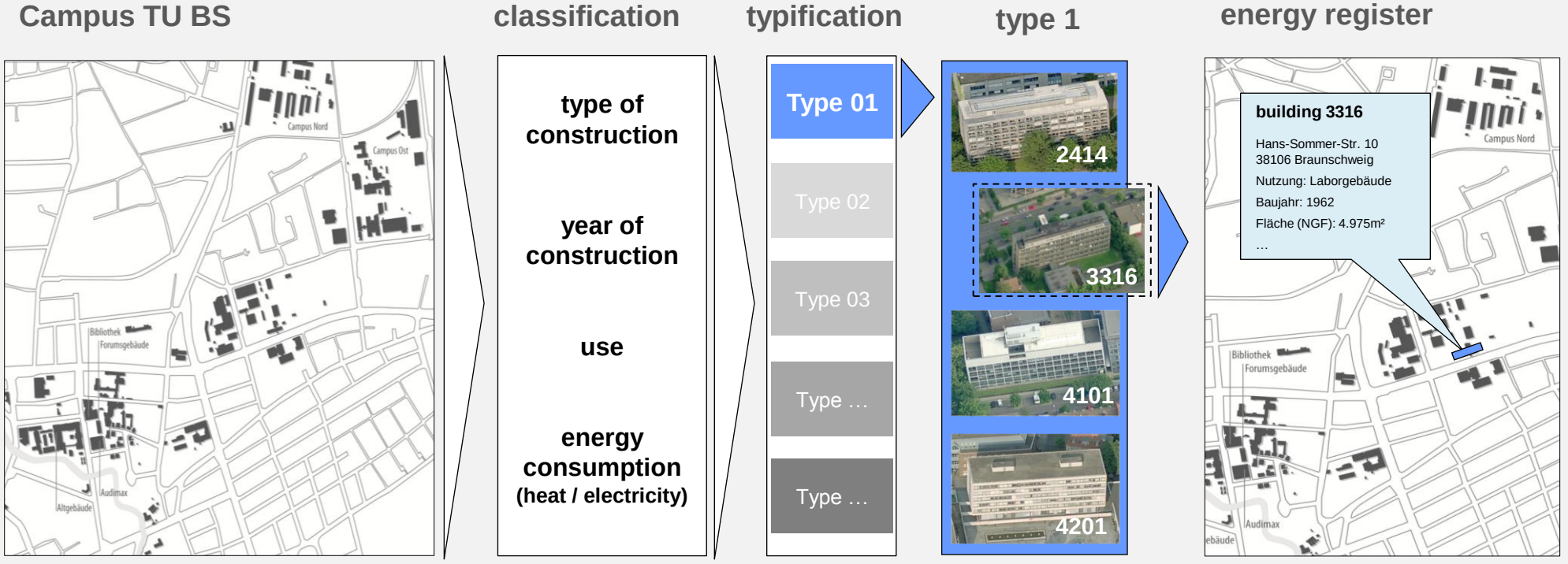

TU Hochhaus „Scheibe“


Neubau Informatikzentrum (NIZ)

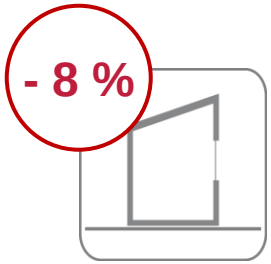
EnEff Campus 2020
development of energy costs



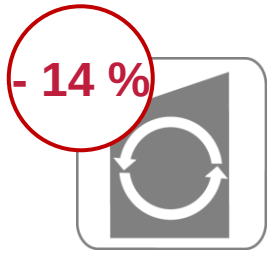
concept development – building for quartier – energy cadastre



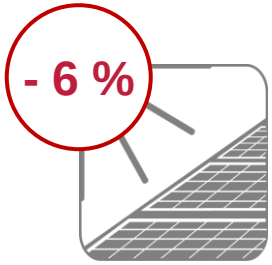
(primary energy)



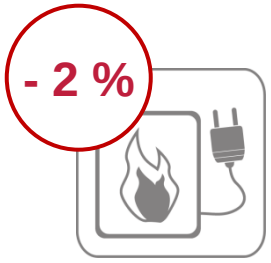
building envelope
investment: 120 Mio. € (300 €/m²$_{NFA}$)
coast savings: 1,6 Mio. €/a
amortisation: > 20 a



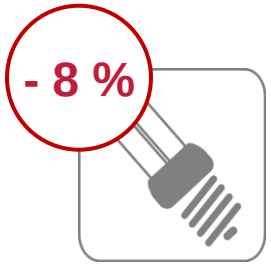
building services
Investment : ca. 4,0 Mio. €
coast savings: 1,1 Mio. €/a
amortisation: 2,5 a



photovoltaics
investment : 2.500 €/kWp
coast savings : 480 T€/a
amortisation: 10-12 a



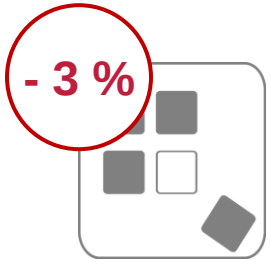
integration CHP
investment : 590 T€
coast savings : 320 T€/a
amortisation: 2 bzw. 6 a



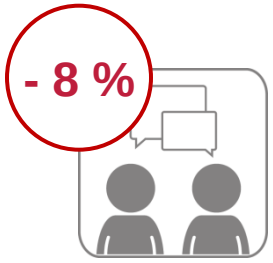
lighting
investment : 2,6 Mio. €
coast savings : 570 T€/a
amortisation: 3 a



technical equipment
investment : 1 Mio. €
coast savings : 175 T€/a
amortisation: 5 a

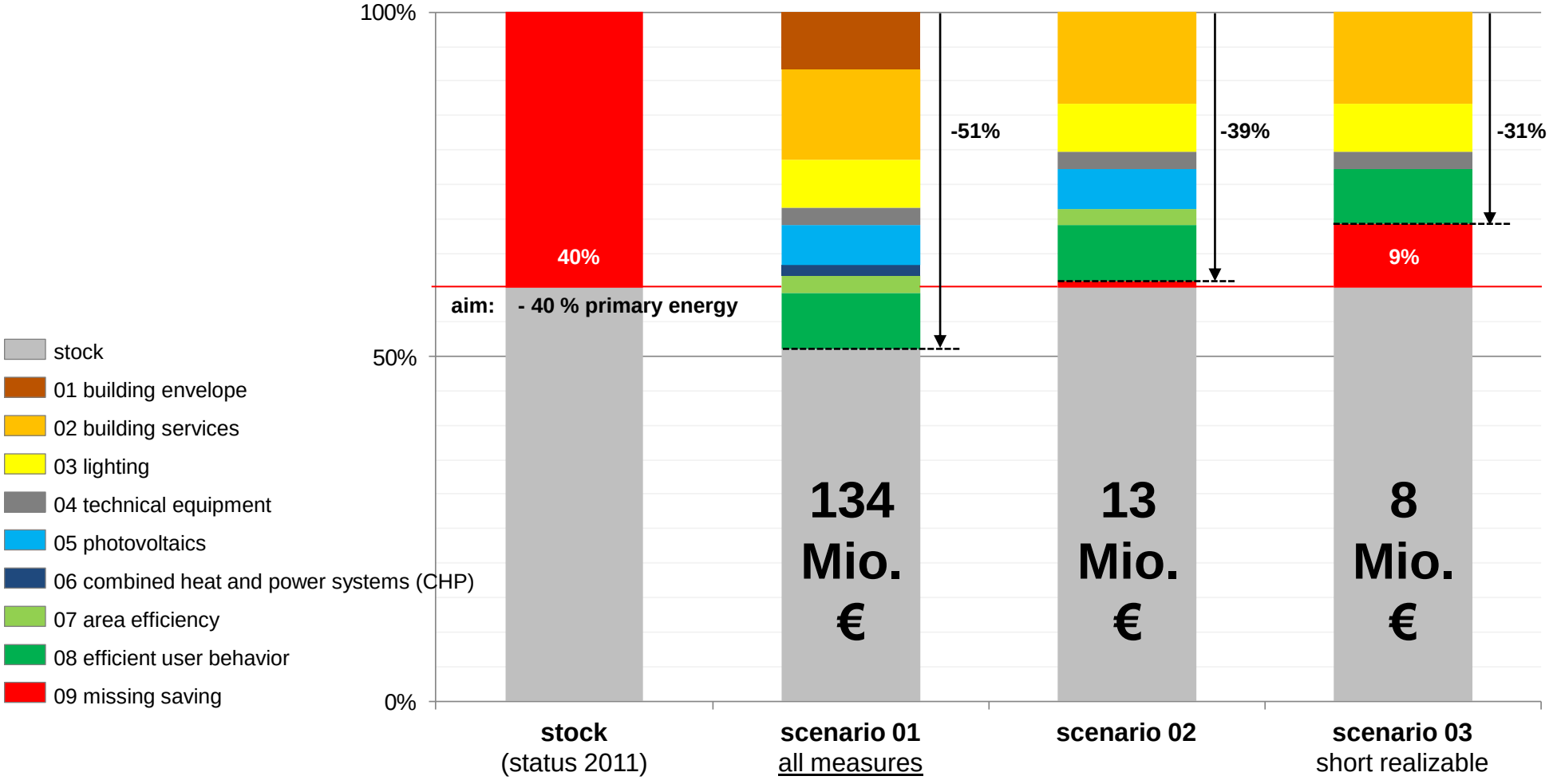


area efficiency
investment : -
coast savings : 436 T€/a
amortisation: -



user behavior
investment : 120 T€
coast savings : 900 T€/a
amortisation: -

scenario: – 40 % primary energy



package of measures



construction projects
implemented (2010 to 2014): 28 Mio. €
new construction projects: 146 Mio. €
individual measures: 60 Mio. €



monitoring und -optimization
easy monitoring: 200 buildings
detailed monitoring: 10 buildings



solarization
installation of at least 1 MW_p PV plants



building services
optimization HVAC systems >1.000 m^3/h



CHP stations
decentralized supply > 650 kW_{th}
supplementary power plant capacities RU
involvement of adjacent urban quarter



area efficiency
evaluation „real“ area required
urban densification
centralization main campus



user behavior
communication training, user motivation
education 160 energy-coaches



energy costs budgeting
decentralized energy cost calculation
direct energy cost responsibility institute

University continues to grow (19.500 students)

phase II – flagship project – real laboratory

additional area by 2017: 15.740 m² HNF

(6,31% growth)

- **digital function-description** (Navigator) BMWi delivery
- quality management into operation!









Thank you for your attention!

