

Energy-efficient building design from Germany

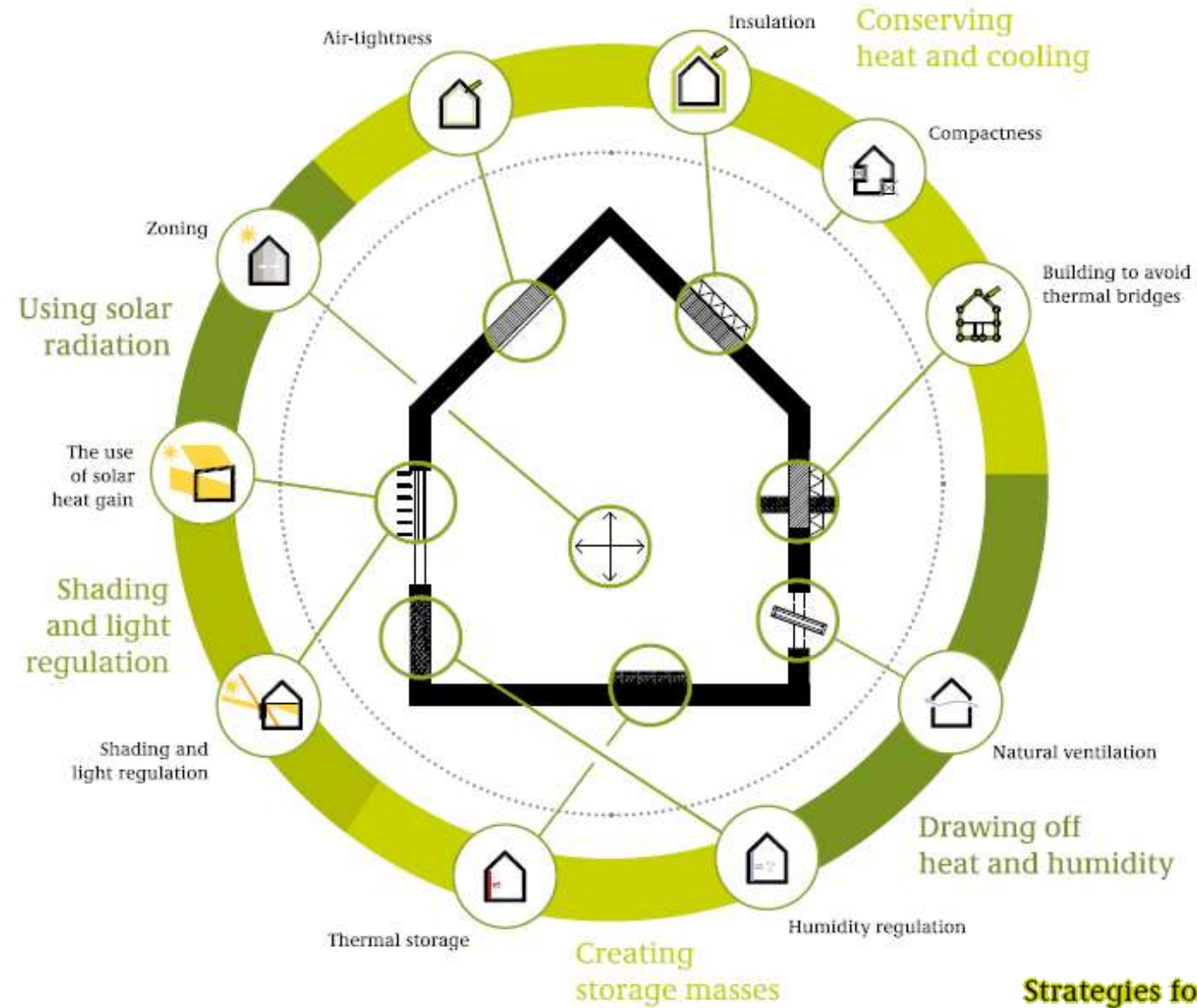
Best Practice

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Facilitator



Strategies for energy-efficient building

POLAR ZONE

	BUILDING	ZONING	PRECIPITATION
POLAR ZONE			
REQUIREMENTS	Protection from cold (all year round)	Protection from cold (all year round)	Heavy snowfall
CONSTRUCTION MEASURES	Very compact volume Very good insulation Low facade permeability	e.g. onion principle, create buffers to protect warm zones from cooling	Loadbearing capacity of structure

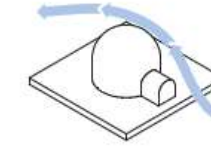
TEMPERATE ZONE

	BUILDING	ZONING	PRECIPITATION
TEMPERATE ZONE			
REQUIREMENTS	Protection from winter cooling Protection from summer heat	Protection from winter cooling	Localised protection from frequent heavy precipitation
CONSTRUCTION MEASURES	Compact volume Good insulation High airtightness	Main usage areas in the south to use passive heat	Protection of building (e.g. by roof overhang) Facade protection on the weather side

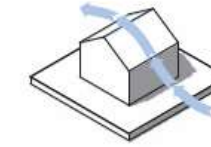
SUBTROPICAL ZONE

	BUILDING	ZONING	PRECIPITATION
SUBTROPICAL ZONES			
REQUIREMENTS	Protection from strong heat	Protection from excessive heat	Low rainfall in desert regions
CONSTRUCTION MEASURES	Shape building to create shade	Arrange good shade for main use areas (e.g. pergolas)	Collect precipitation and water

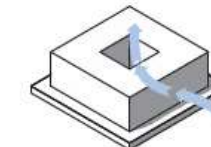
AIR



Gales and storms in the cold season
Eliminate windward faces (wind redirection)
Requires porch in entrance area

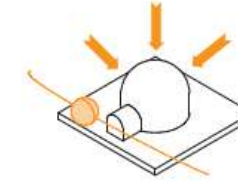


Higher requirements not necessary
Observe basic principles (avoid causing wind turbulence, use prevailing summer wind direction for cooling)



Sandstorms are common in desert regions, otherwise medium wind speeds
Use porch in main wind direction for passive cooling and constant good through ventilation

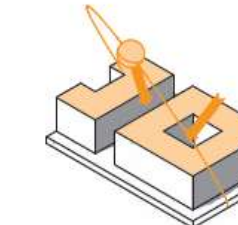
SUN



Moderate solar radiation / high reflection
Open to low sun path in summer (no shading necessary)
Heat-absorbing surfaces

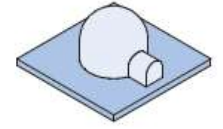


Insulation to prevent excessive cooling and overheating
Use solar radiation for passive heat in winter
Suitable solar shading and thermally active envelope surfaces in summer as appropriate

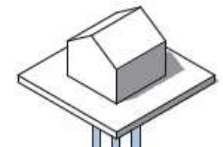


High proportion of direct solar radiation striking the building (almost all year round)
Provide buildings and open areas with shade or solar shading, integrate thermal stores into the construction (e.g. soil)

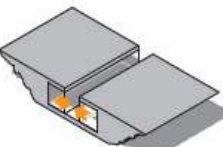
GROUND



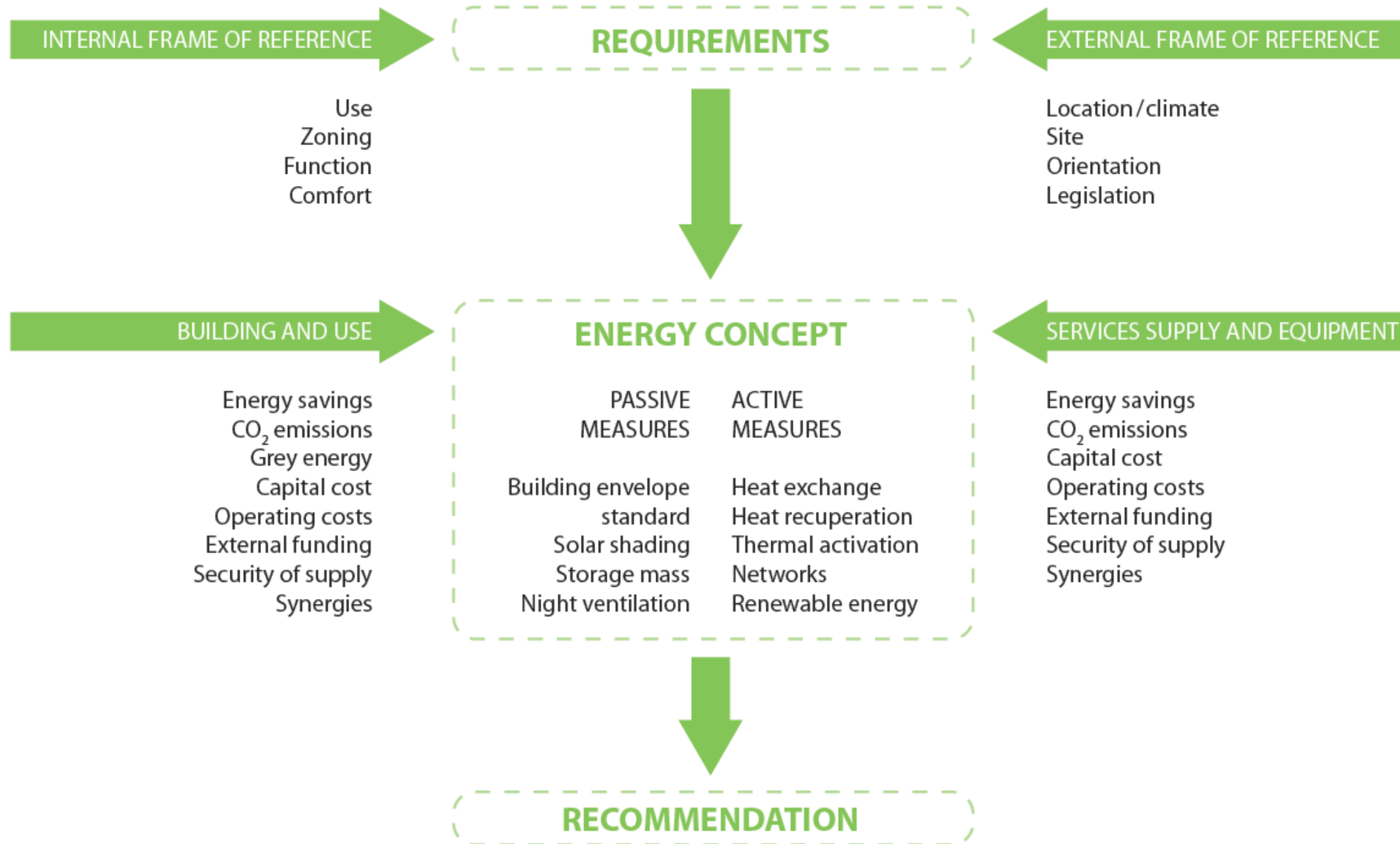
Protection from ground freezing
Avoid founding directly on soil



Higher requirements not necessary
Ground freezing and thermal properties of the soils are not critical (can be used for heat generation)



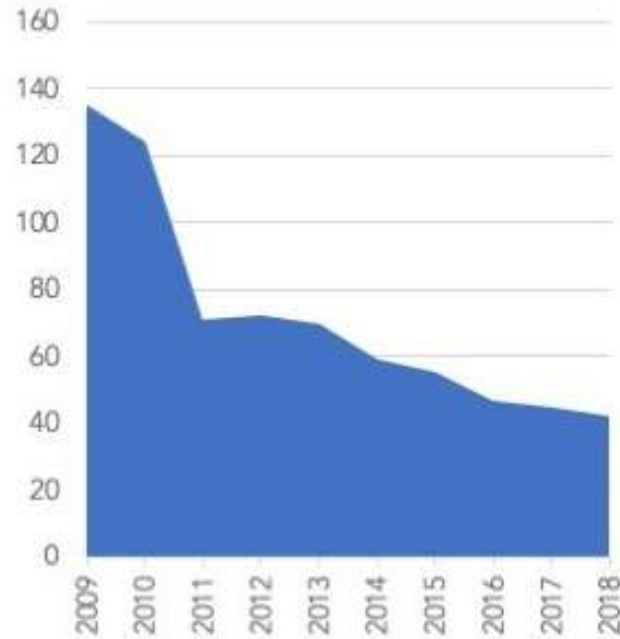
Dry, mainly sandy soils
Exploit constant ground temperatures, where possible (e.g. earth houses, or earth tubes for ventilation)



Strategic process for recommending a building energy concept on the basis of the specific use and site

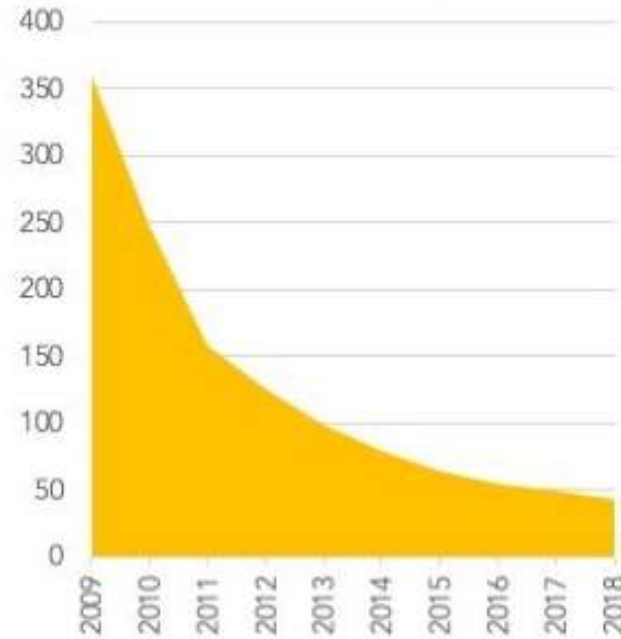
design | declining cost

Wind (USD/MWh)



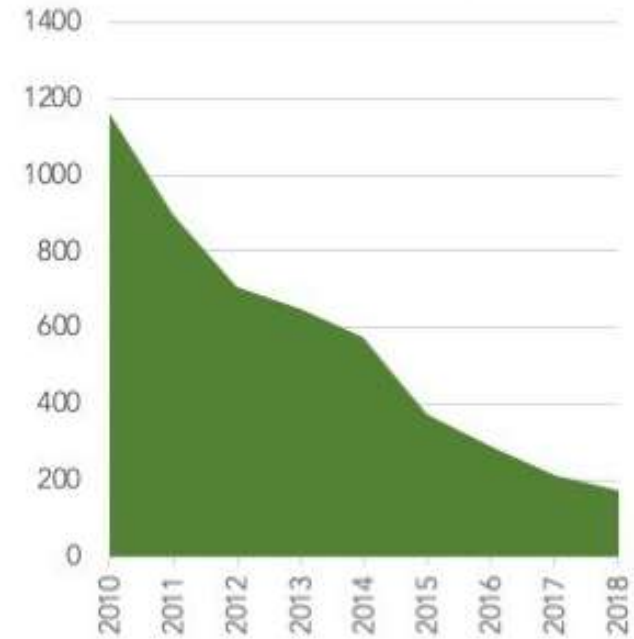
Source: Lazard LCOE, v12, 2018

Solar (USD/MWh)



Source: Lazard LCOE, v12, 2018

Batteries (USD/MWh)



Source: Bloomberg NEF 2019

Energy Campus, Holzminden

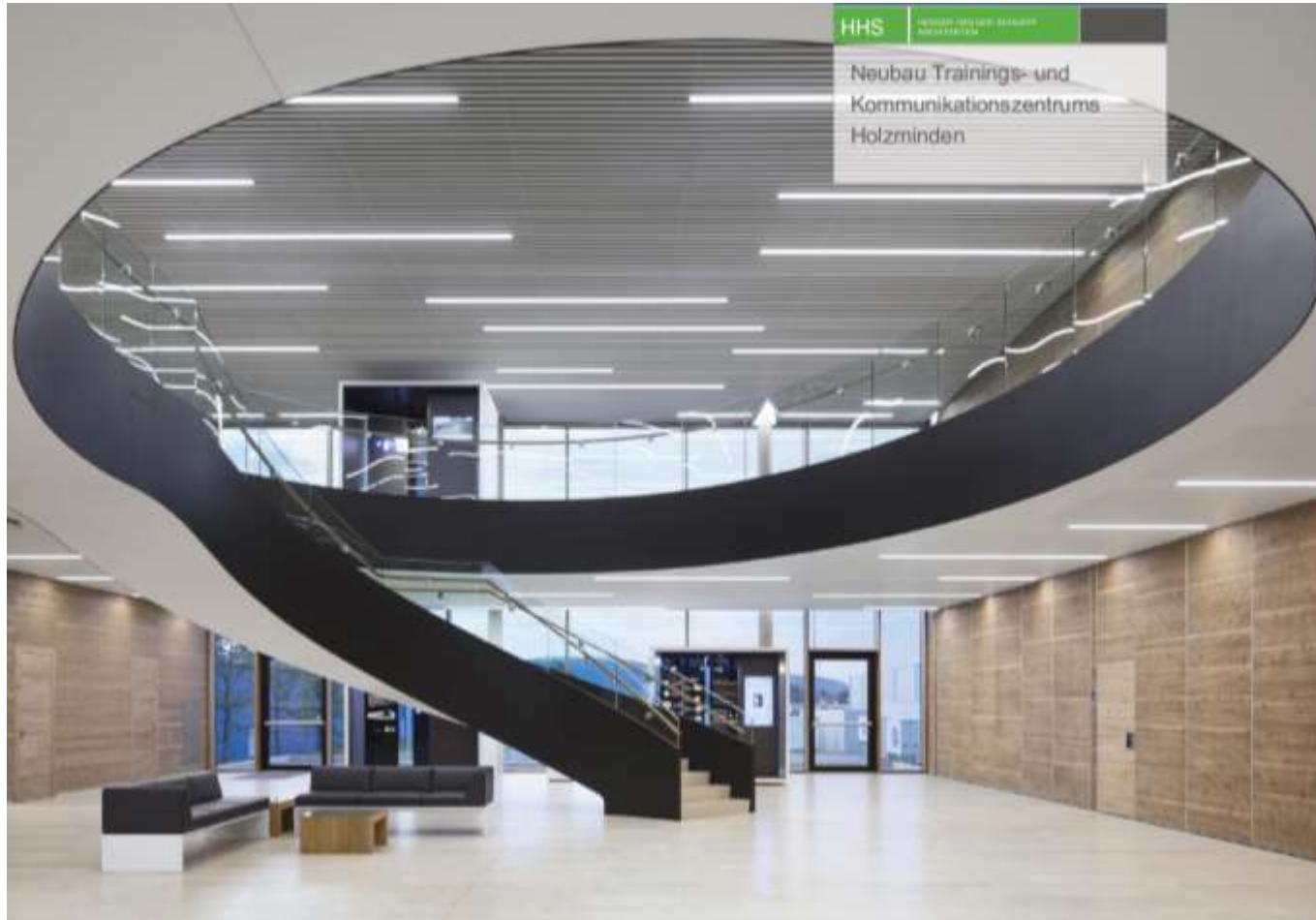
Energy Campus



Energy Campus



Energy Campus



Energy Campus



Energy Campus



Energy Campus



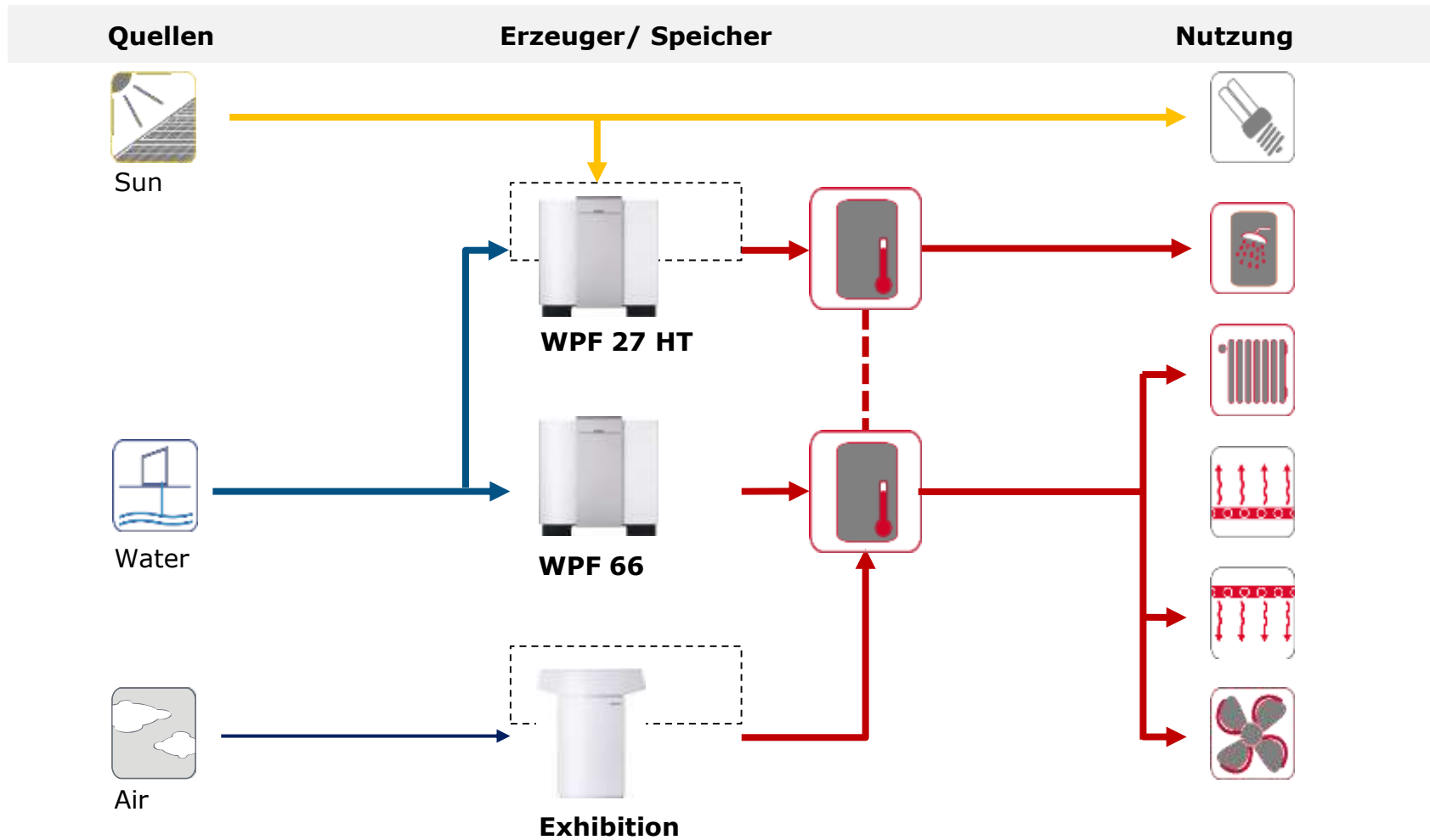
Energy Campus



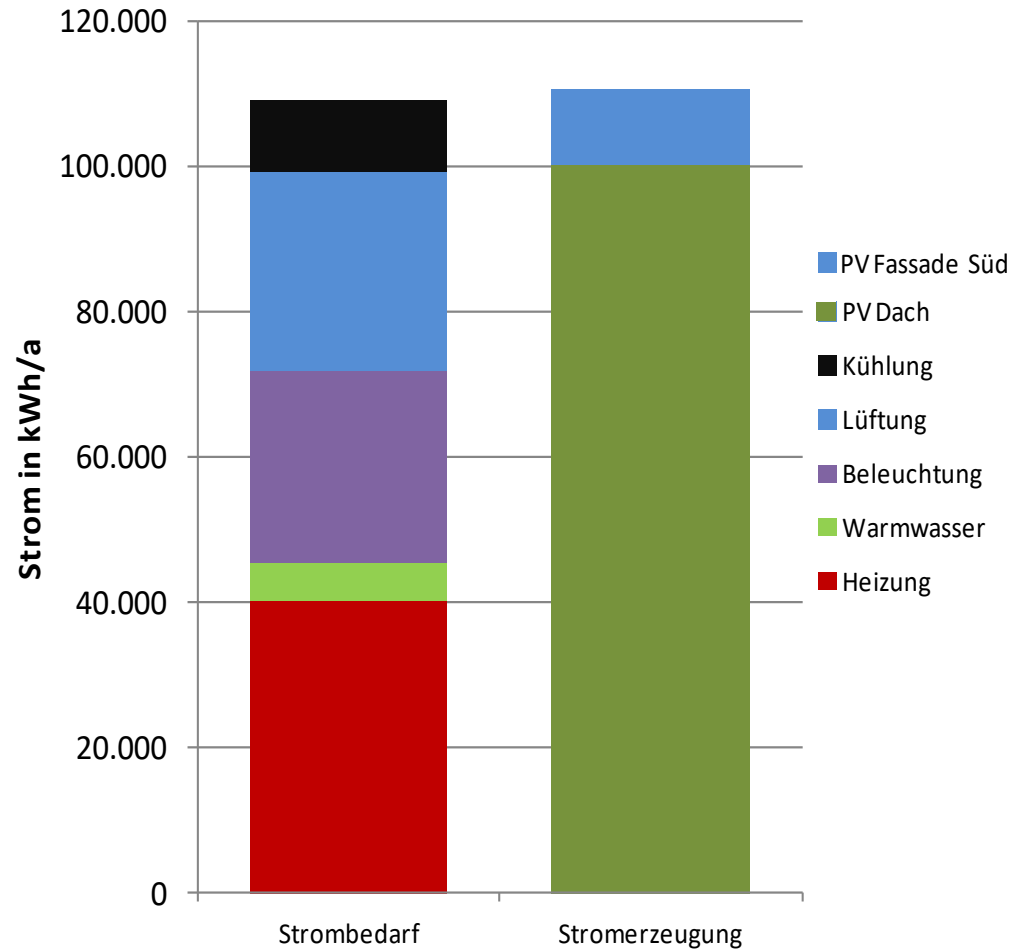
Energy Campus



Energy Campus



Energy Campus



Aktiv-Stadthaus, Frankfurt am Main

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Abbildung: HHS Planer + Architekten AG

Aktiv-Stadthaus, Frankfurt am Main



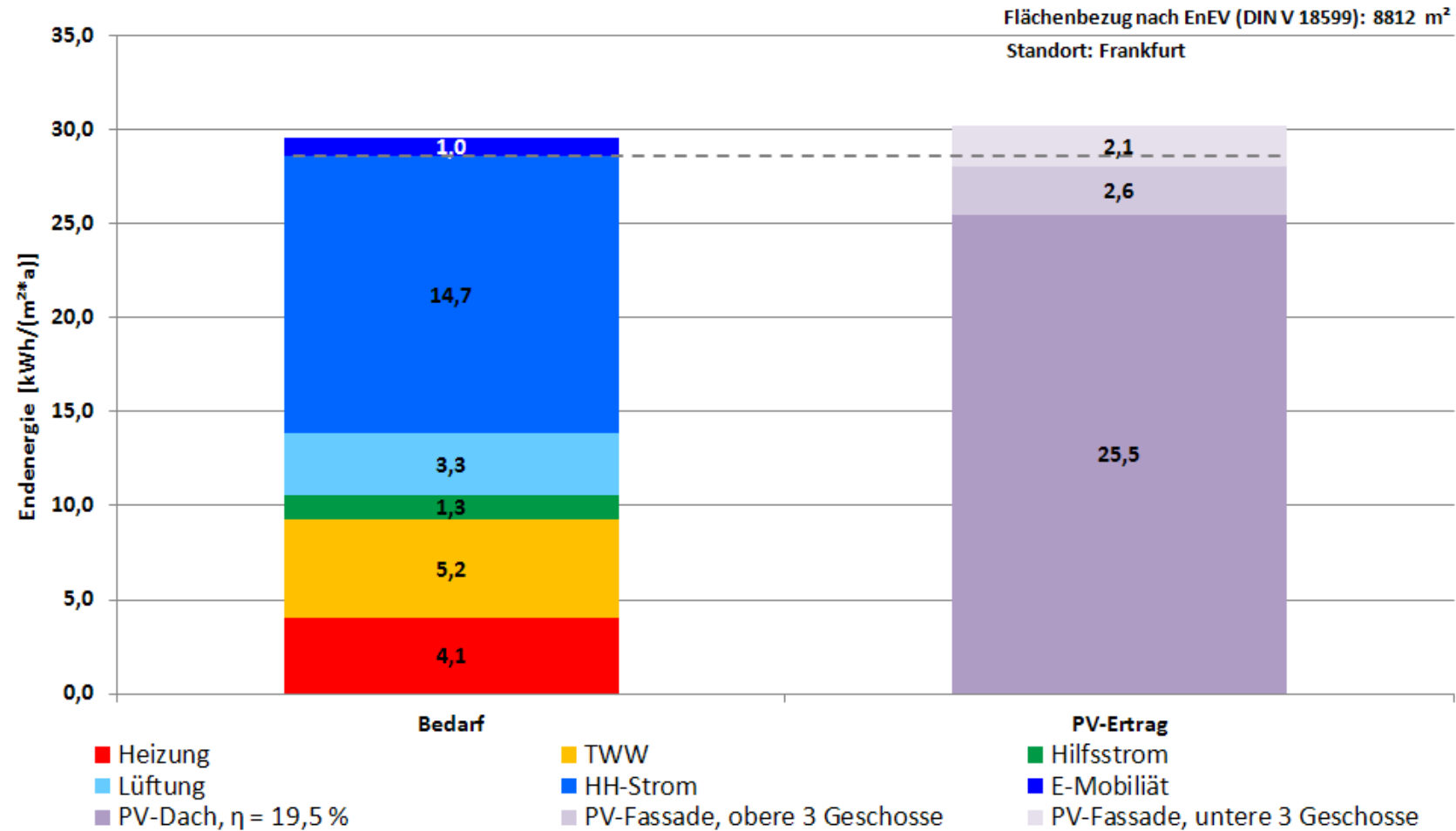
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Aktiv-Stadthaus, Frankfurt am Main



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Spezifischer Endenergiebedarf, Jahresbilanz

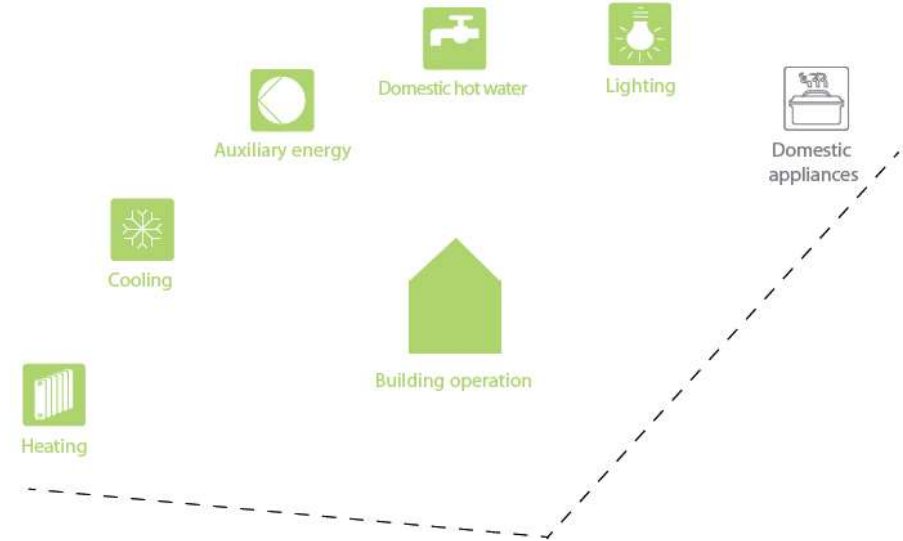


Aktiv-Stadthaus, Frankfurt am Main Germany



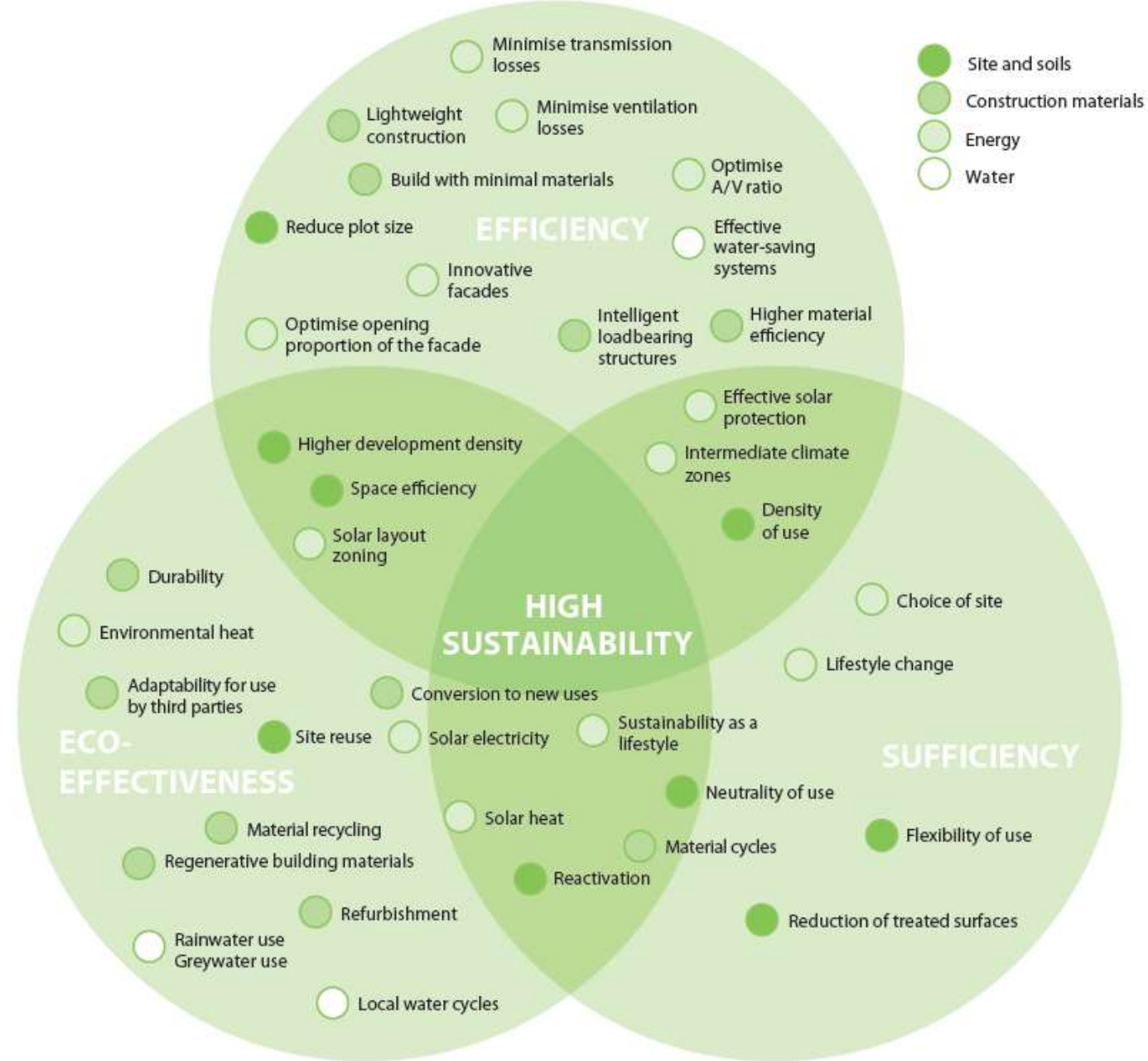
Challenges

In principle, the balance scope can cover three areas: building operation, life cycle and user-dependent energy expenditure. In order to avoid highly complex, error-prone balancing systems and be able to evaluate specific areas, the balance scope defines the balance framework very narrowly. The EnEV considers parts of the building operation for residential buildings and an expanded area for non-residential buildings. These areas are shown against a coloured background in the diagram.



Challenges

Strategies of building to conserve resources,
sustainability map



Quelle: Aktivhaus; Das Grundlagenwerk

Be smart!

