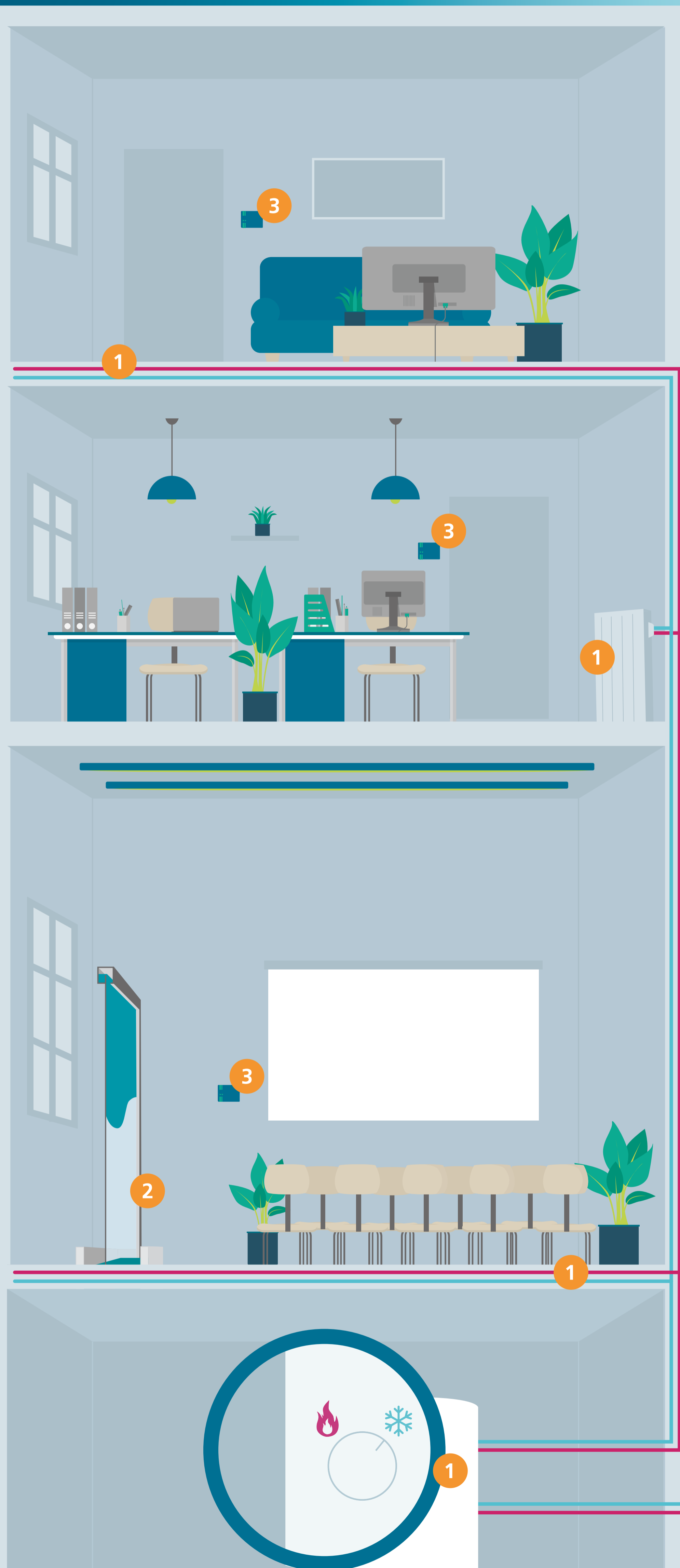


1 Cooling in summer with heating systems

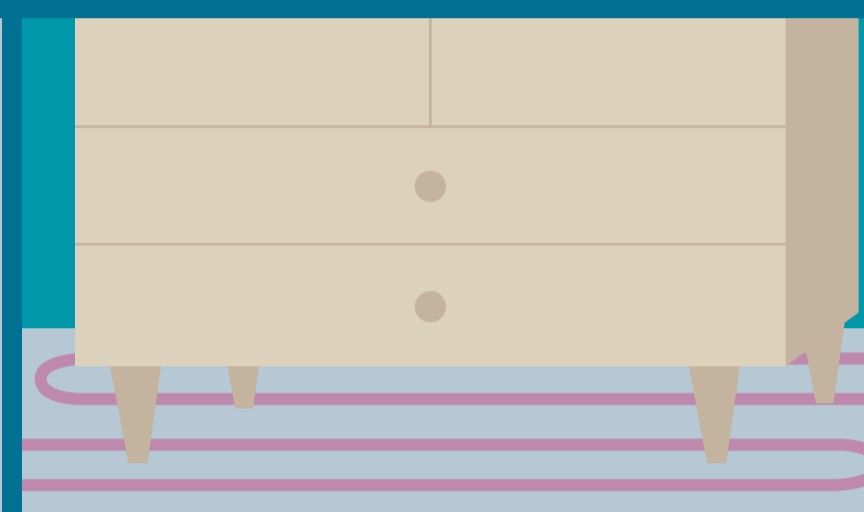
According to the International Energy Agency (IEA), energy requirements for indoor cooling systems will triple worldwide by 2050. Experts anticipate the energy consumption for cooling residential buildings to double in Germany within the next 20 years. According to the German Federal Environment Agency, an increase of 25 % is to be expected for commercial buildings. A cost-effective alternative to installing new cooling systems is to utilize the existing heating systems. These can be modified to cool the interior by using the associated heat pump in reverse operation.

Research questions

Research conducted by Fraunhofer IBP has shown that cooling rooms with radiators as well as floor heating has the potential to significantly lower the indoor air temperature in summer - without unwanted condensation forming on cold surfaces.



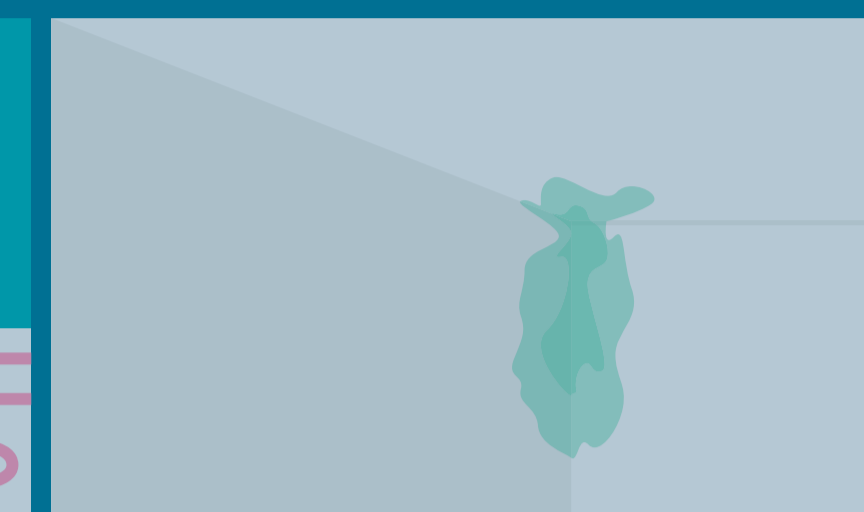
Analysis of the **cooling potential** of the respective system with its specific general conditions



Monitoring/predicting the effect of **temperature changes** on floor coverings and other materials or systems in the room



Evaluating **comfort conditions** for humans - e.g. floor surfaces that are too cold are perceived as unpleasant

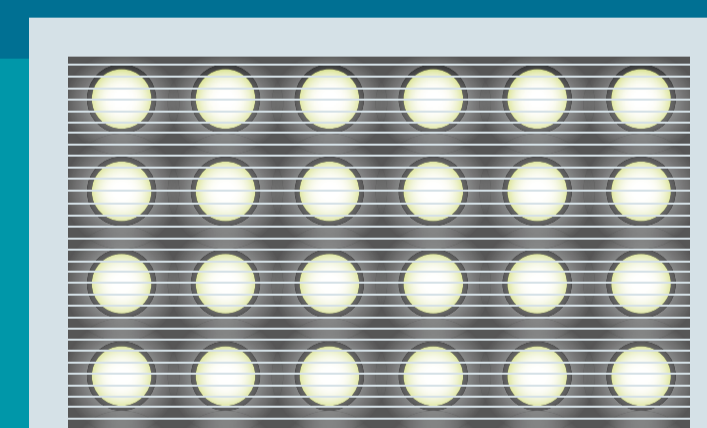


Investigations to **avoid** mold growth in rooms by regulating the dew point temperature

Advantages at a glance

- Pleasantly cool rooms in summer without the user having to install a new system
- Particularly interesting approach for existing buildings because the hardware is relatively easy to adapt
- Energy-efficient cooling by using heat pumps and taking advantage of the heat storage effects of buildings
- Clarity about the market potential of different systems, secures the technological lead
- Increased planning security for system providers, clear information on implementation requirements
- Avoidance of moisture damage (e.g. mold growth) or damage to floor coverings

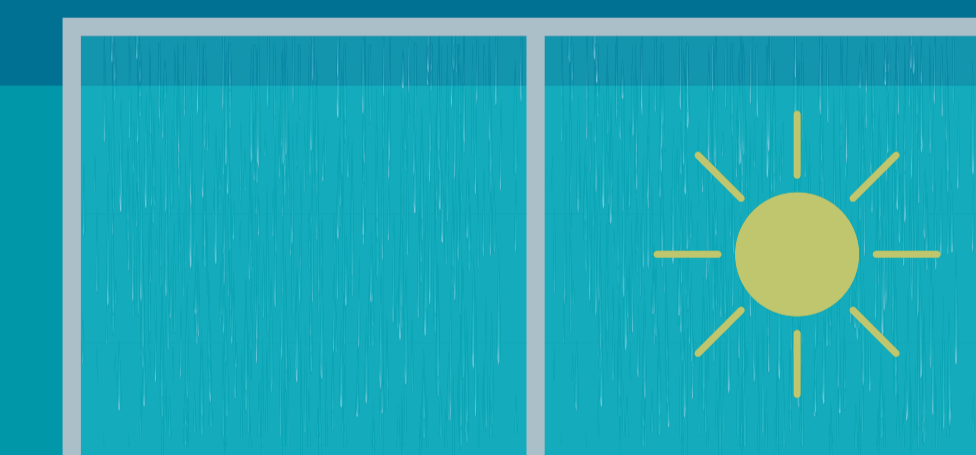
Our services



Detailed tests in our own **climate simulator** (test room) to evaluate heating and cooling system components



Individually adaptable simulation options with the **WUFI® Plus software**



Extensive **hygrothermal expertise** in analyzing the transient heat and moisture behavior of building components and materials as well of buildings

2 Chilled water wall

The chilled water wall is an innovative surface cooling system that balances out radiant temperatures, naturally cools and dehumidifies the air and also binds dust and pollen. It thus purifies the air (reduces the content of fine dust by up to 99% in three hours) and is particularly energy-efficient (cuts energy costs by anything up to 20%).

3 Indoor climate assistant VALEA

The indoor climate analysis platform VALEA from mmc automation GmbH contains Fraunhofer IBP's methodology, which evaluates the measured indoor climate and protects users and the building from damage. In contrast to current market solutions, the intelligent system not only incorporates realtime measured values, but also learns as it goes along.



VALEA