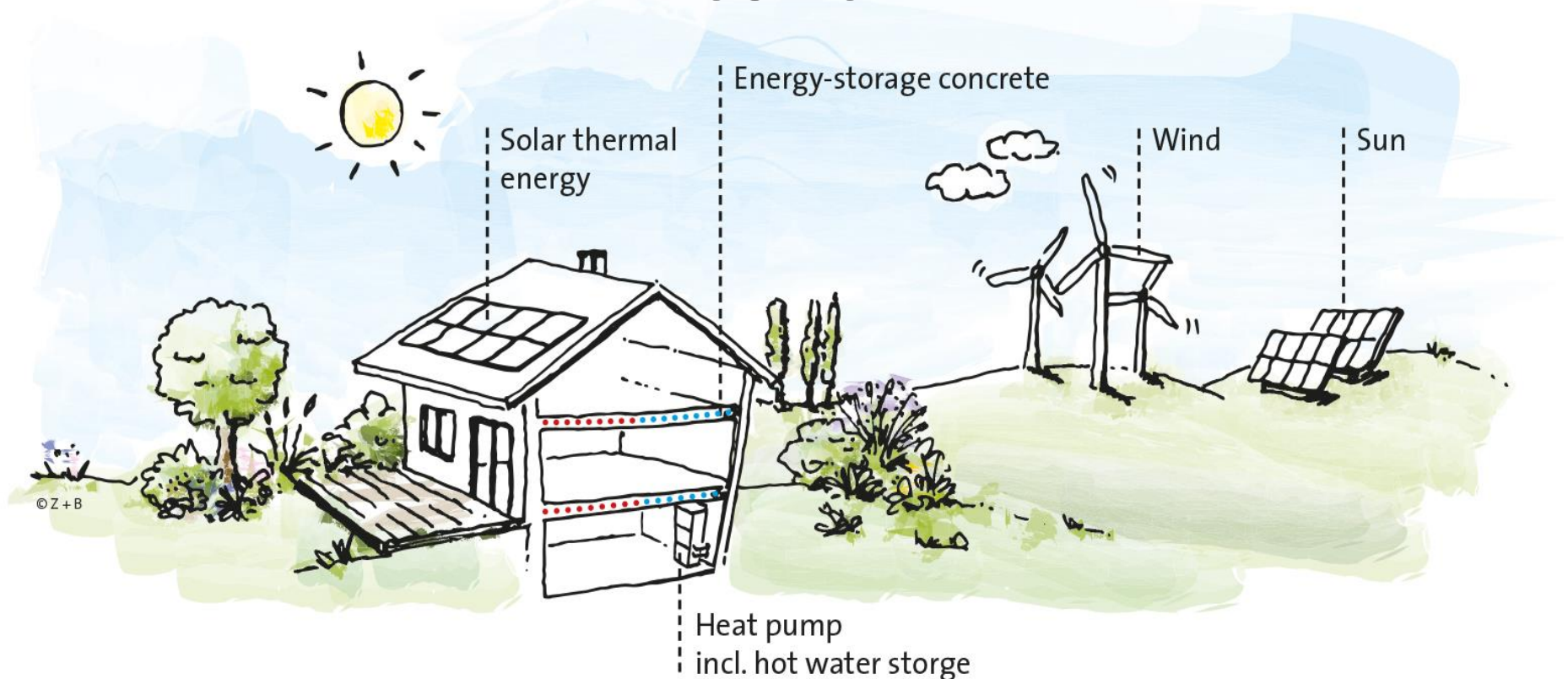


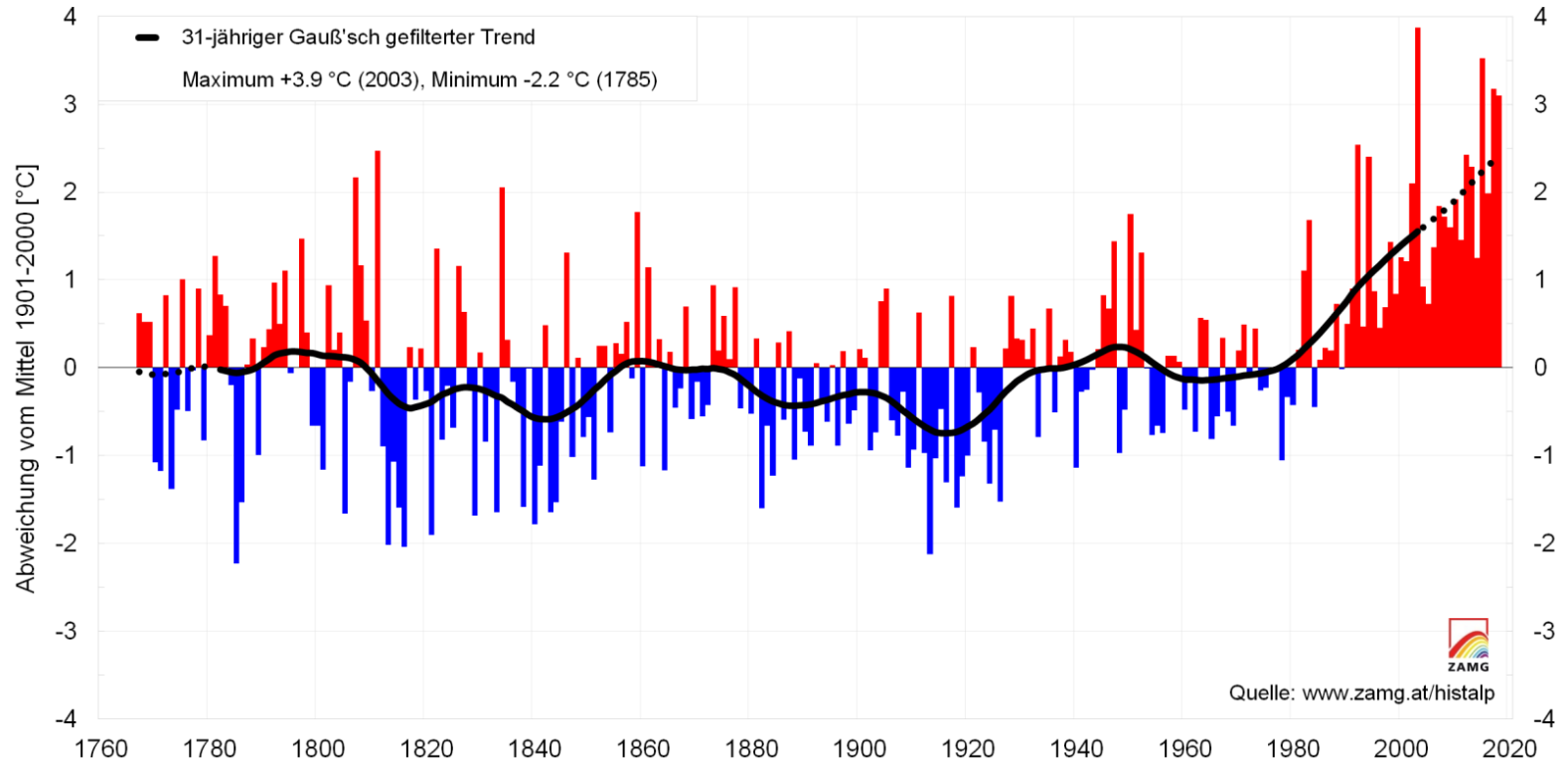
# HEATING, COOLING AND STORING ENERGY WITH CONCRETE



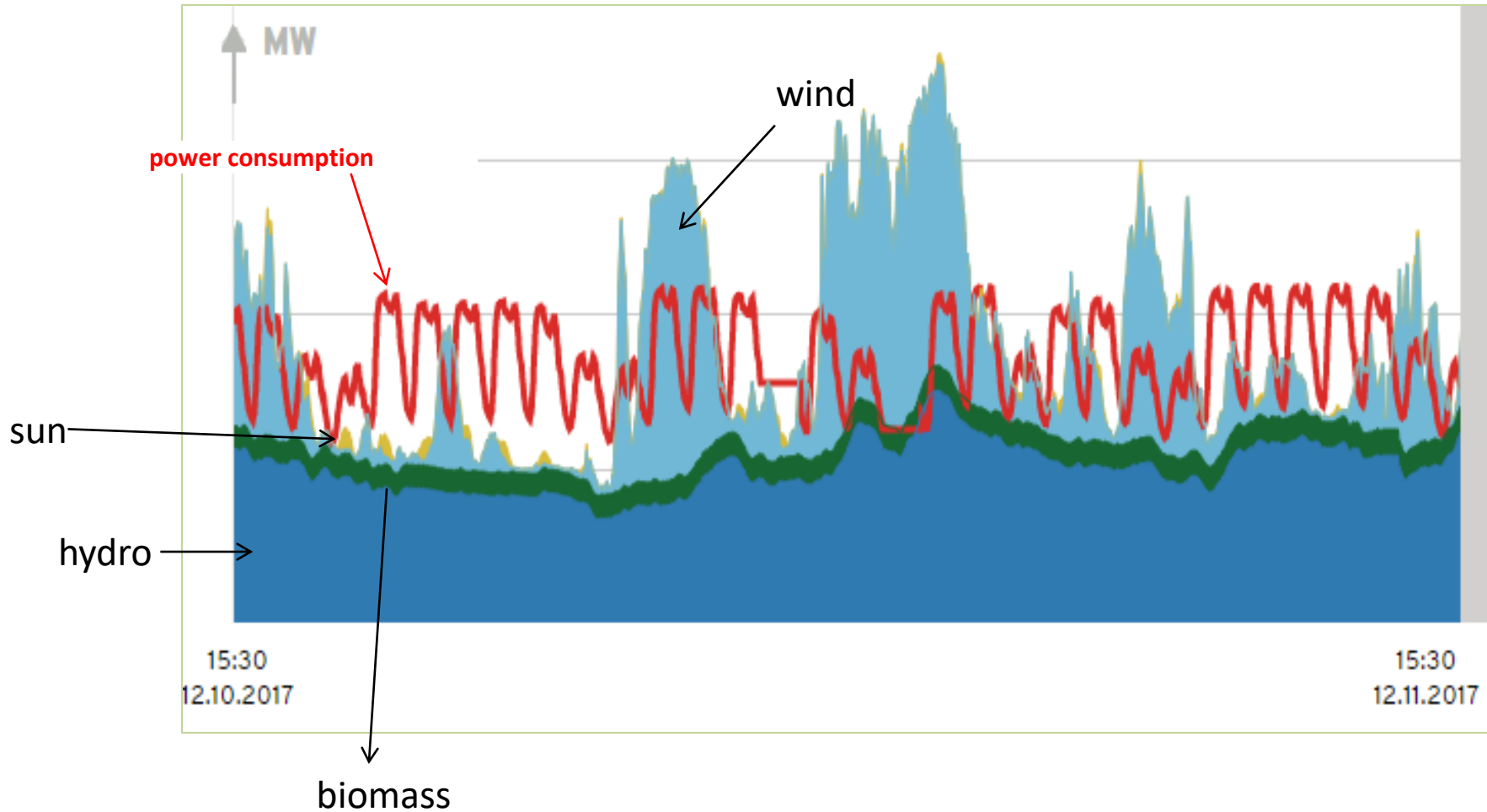
**Claudia Dankl, Austrian Cement Association**

Piestany, 27.02.2020

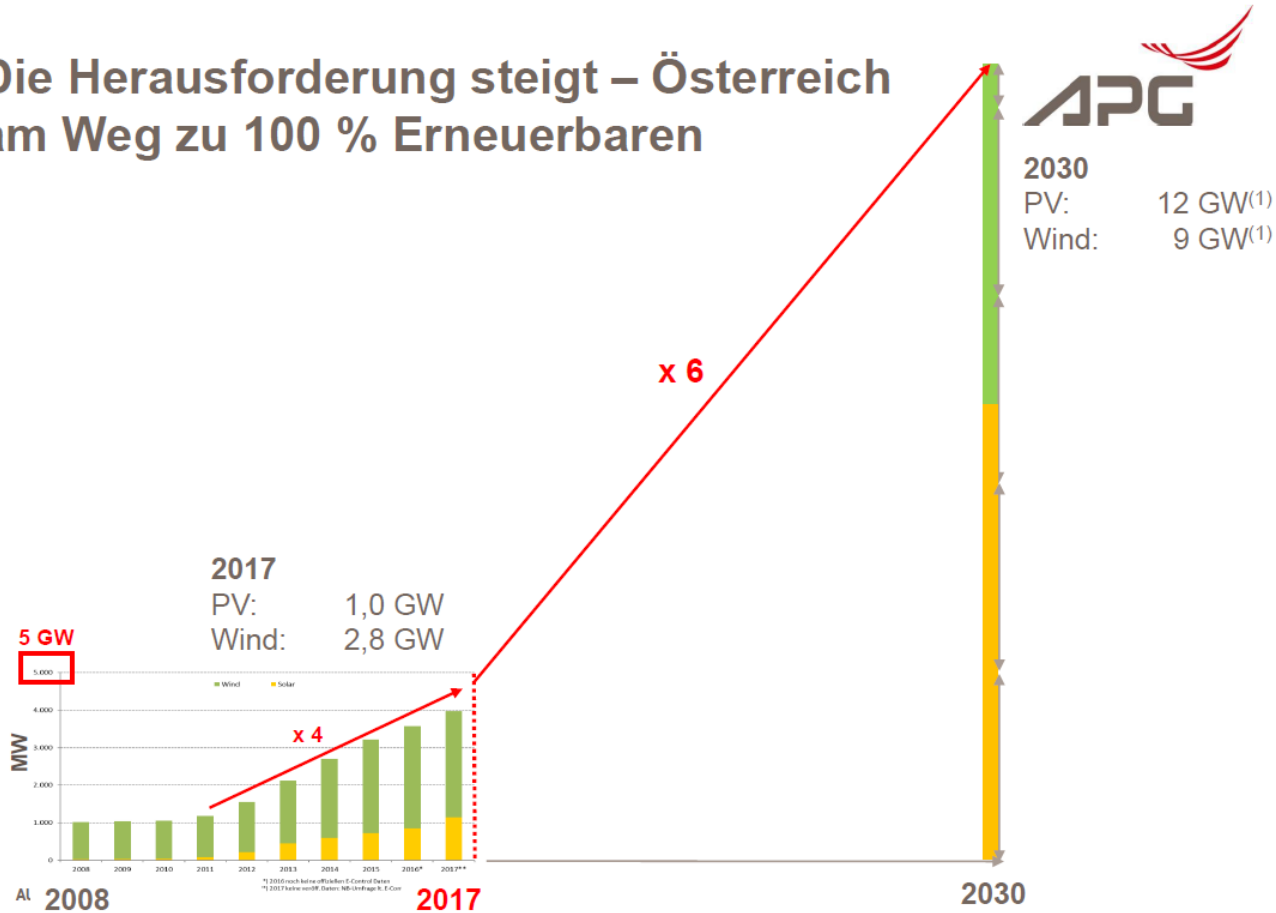
## Summer temperature deviation Austria 1767–2018



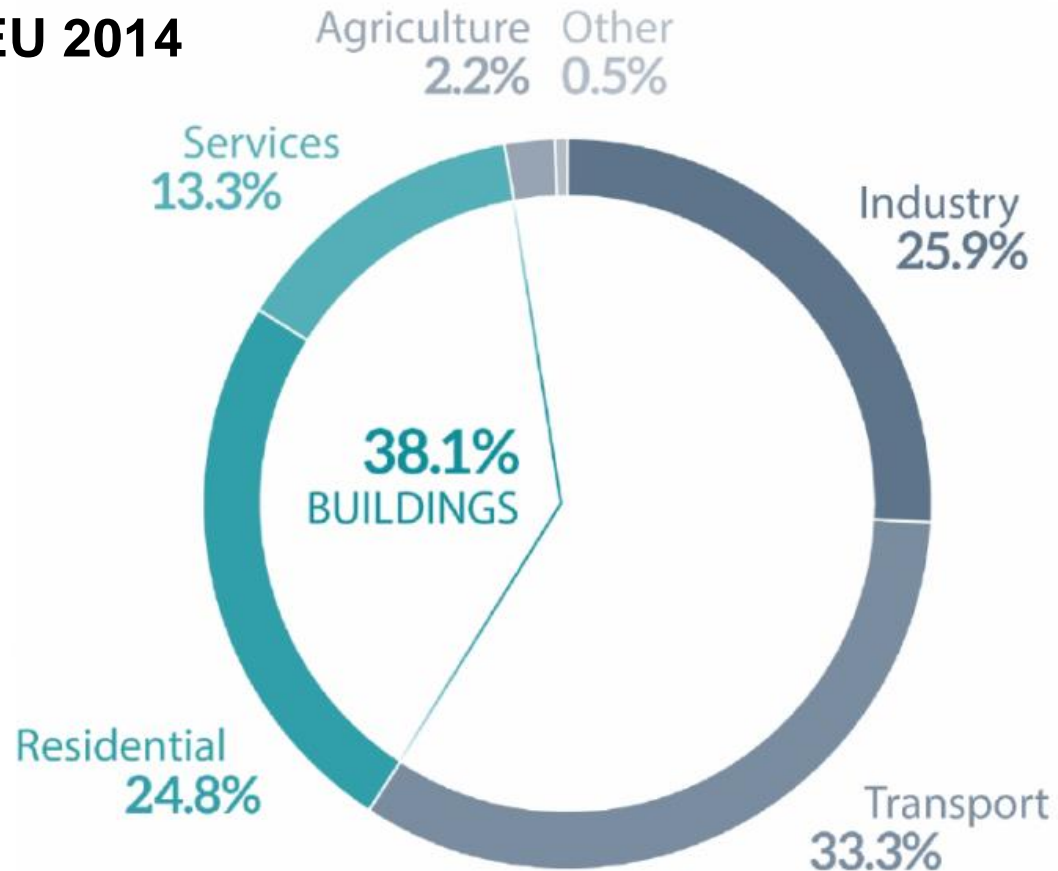
## Renewable electricity and power consumption in Lower Austria



## Die Herausforderung steigt – Österreich am Weg zu 100 % Erneuerbaren



## ENERGY DEMAND EU 2014



- Phase-out from fossil energy sources in space heating from 2020: **off for all oil and coal heating systems by 2035, no more gas boilers / new connections in new buildings from 2025.**
- Planning and construction of buildings of any use category with regard to **increasing outside temperatures**
- High-quality district development with green spaces, reduction of the sealed areas, use of gray water, green roofs, **constructive overheating protection, expansion of energy networks** and **active cooling options**



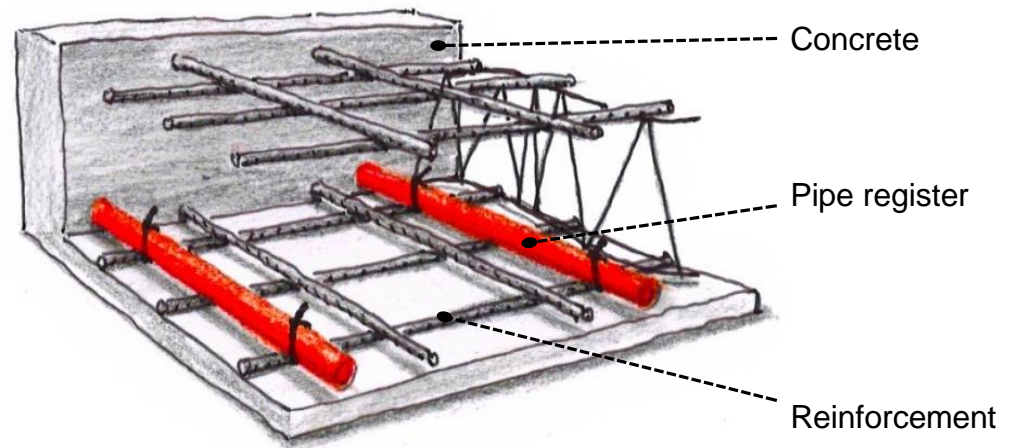
© Aichinger Hoch- und Tiefbau GmbH, Z+B

## WHY CONCRETE ?

- high thermal conductivity
- high specific weight of 2400 kg/m<sup>3</sup>

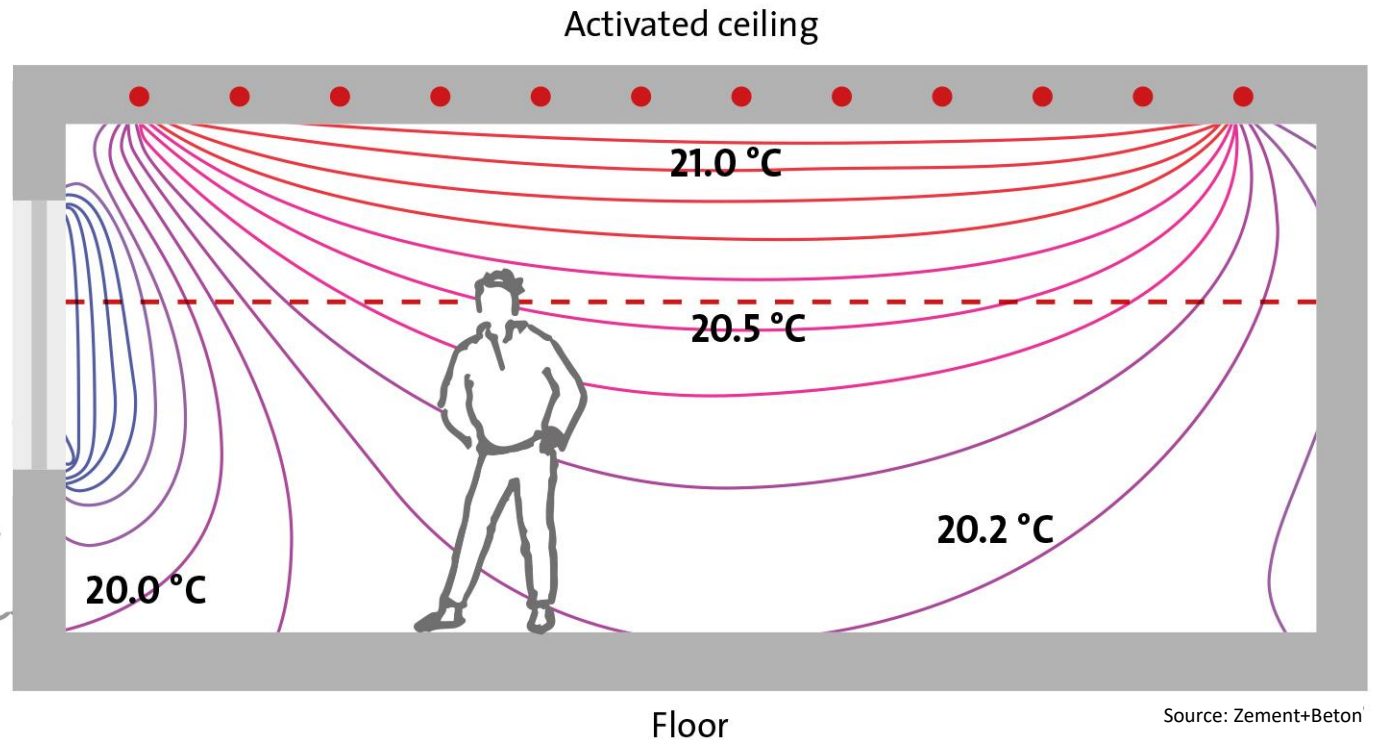
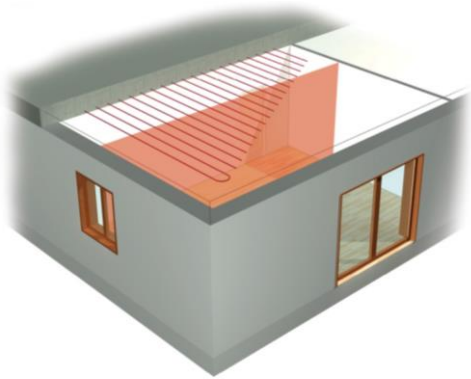
## WHY FLOOR CEILING ?

- excellent cooling
- excellent radiation exchange



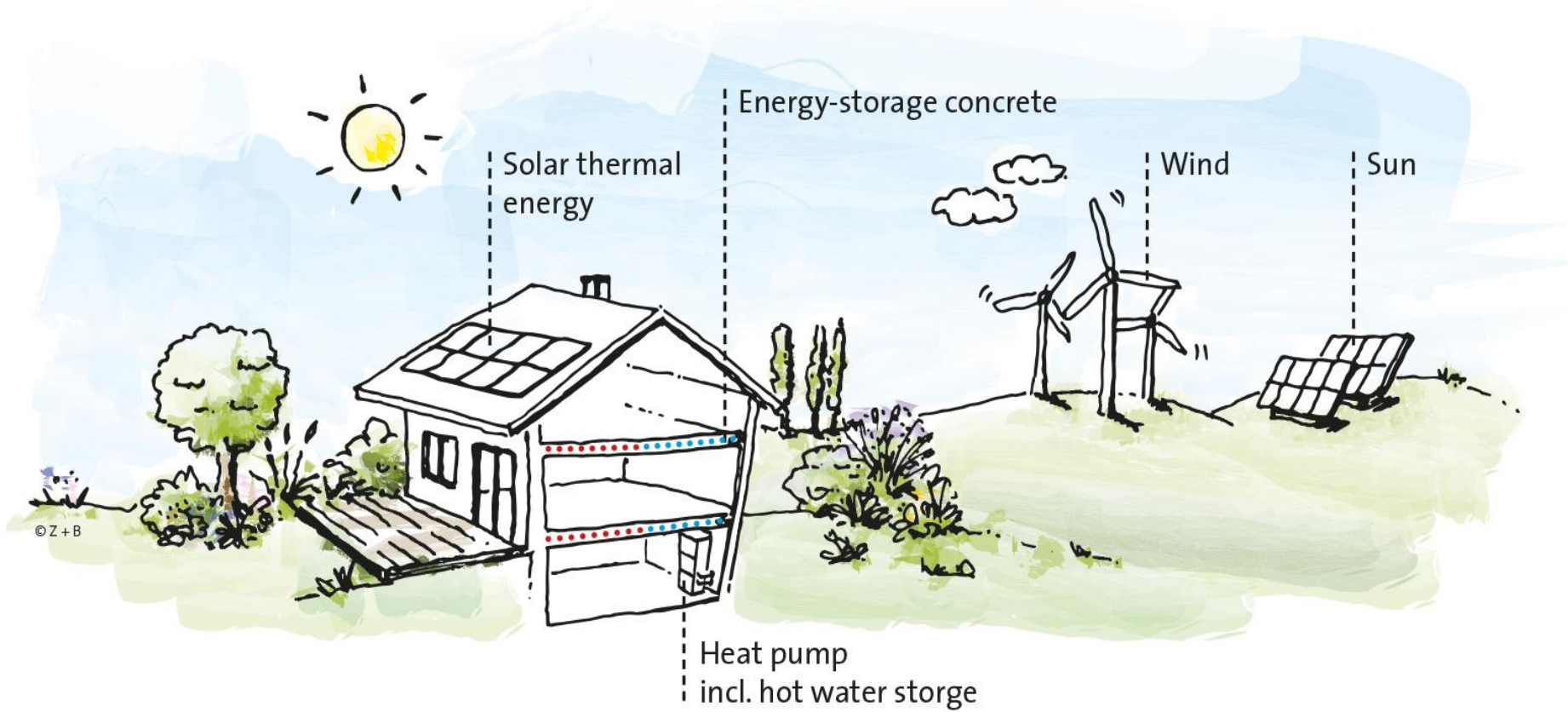
# A maximum of thermal comfort

Room on top floor of a passive house  
 Exterior walls facing West and North  
**Massive construction**



Source: Zement+Beton





# PROJECTS – from Sun to Wind

*100% with Sun*

## FIN - Future is Now

Kuster Energielösungen GmbH

142 h (6 days)



Source: [www.kulturzentrum-hallwang.at/raum-mieten/](http://www.kulturzentrum-hallwang.at/raum-mieten/)

*100% with Sun*

## FIN - Future is Now

Kuster Energielösungen GmbH



Source: [www.kulturzentrum-hallwang.at/raum-mieten/](http://www.kulturzentrum-hallwang.at/raum-mieten/)



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Source [www](http://www): No copy right!

## PILOT PROJECT

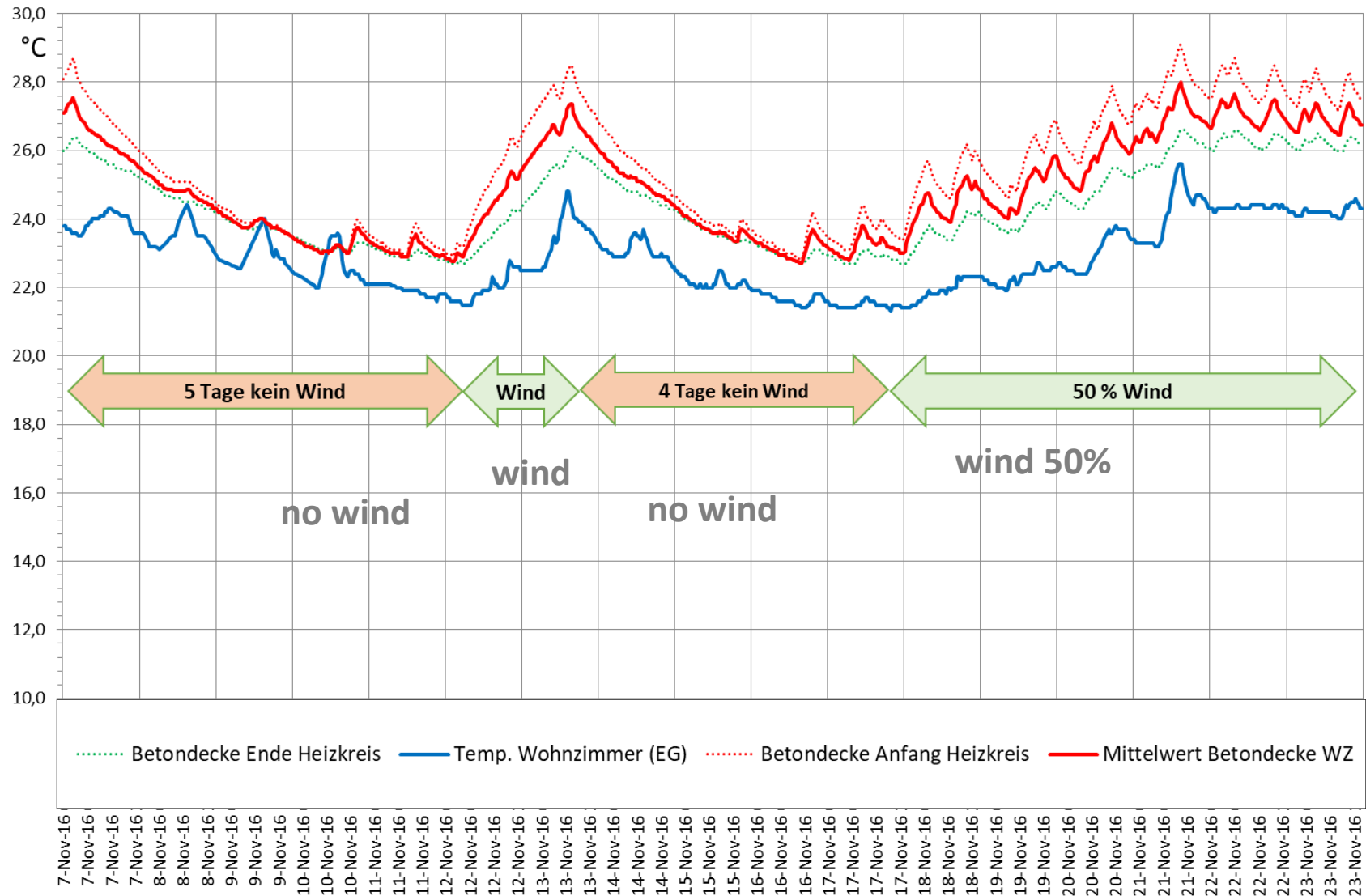
Monitoring 2016–2018:

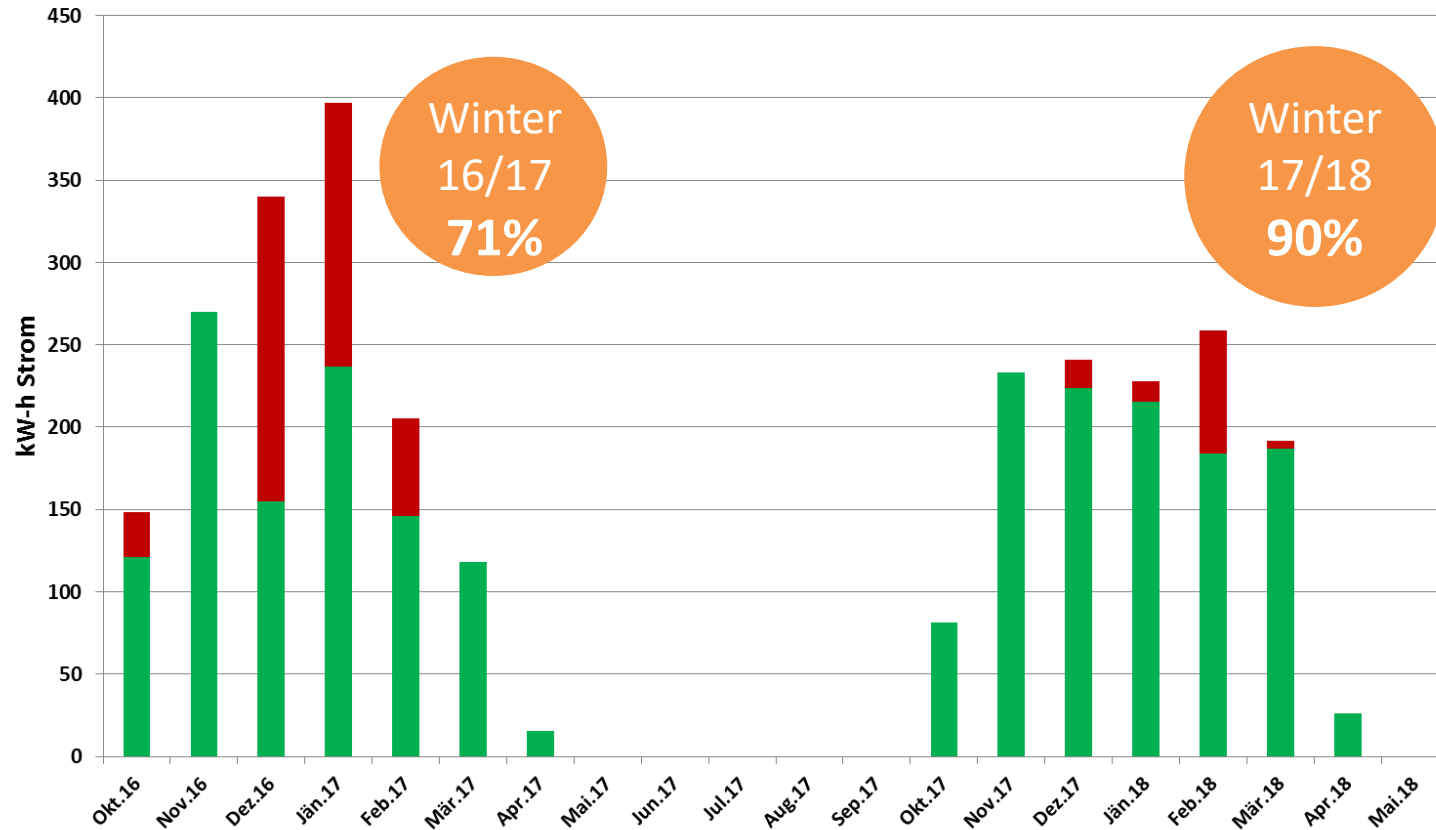
**Thermal component activation works perfectly**

Storage of **wind power** in the form of thermal energy **in the building structure**.

**Heating and cooling in one system.**







**Energy storage concrete enables the heat pump to be supplied with green electricity**

Research report available: <https://nachhaltigwirtschaften.at>  
 „Gebäude als Speicher“





## PROJECT DATA MGG22

Mühlgrundgasse, 1220 Wien

### Developer:

Neues Leben, M2plusImmobilien

### Architects:

Thaler und Thaler, Charamza,  
Sophie und Peter Thalbauer ZT GmbH

### Building component activation:

FIN – Future is Now, Kuster  
Energieslösungen GmbH

### Construction process:

Completion, autumn 2019

- Heating and cooling with building component activation, first time in multistorey social housing in Vienna
- Heat pump with wind release signal (WEB)
- Apartment rented by Zement + Beton

Source: [www.wohnen.at/angebot/pbjelt-detail](http://www.wohnen.at/angebot/pbjelt-detail)

© MA 20/A. Kromus

© Zement+Beton/Kromus



## PROJECT DATA Residential park Wolfsbrunn

2453 Sommerein, Wolfsbrunn

**Developer:**  
SÜDRAUM / EBSG

**Architect:**  
AW/Architekten

**Building component activation:**  
FIN – Future is Now, Kuster  
Energieslösungen GmbH

**Monitoring:**  
eNu, Klaus Krec, FIN, Boku, VÖZ

**Construction process:**  
Completion terraced houses  
autumn 2019  
Generation Living: April 2020

- First phase: 14 terraced houses and „living for generations“
- Heat pump with wind release signal: EVN wind park nearby
- Subsidised by Lower Austria Housing Research, monitoring in cooperation with VÖZ

© AW Architekten, © Spaun/VÖZ



- House typology developed by architects, building physicists and research institutes
- Component activation supplied by air and water heat pump on roof
- Photovoltaic system and micro heat pumps for hot water production

**PROJECT DATA** Housing complex  
**Tonpfeifengasse**  
 Marktgemeinde Theresienfeld , NÖ

**Developer:**  
 Arthur Krupp Ges.m.b.H

**Architect:**  
 Steinkogler Aigner Architekten ZT  
 GmbH

**Research team:**  
 IIBW, EIV, Allplan

**Building component activation:**  
 Gugerell KG, Consultation and  
 Monitoring: Simon Handler, Allplan

**Construction process:**  
 Groundbreaking ceremony  
 22<sup>th</sup> May, 2019



**PROJECT DATA Green living space on Muliarplatz**

Kugelmanngasse 1A, 1230 Wien

**Developer:**

Mischek

**Architect:**


Mischek ZT

**Construction process:**

Hand over May 2019

Source: [www.kugelmanngasse.at](http://www.kugelmanngasse.at)

- Mischek innovation project 2017
- STRABAG intends increased activity in prefabrication
- Freely financed privately owned apartments

 Bundesministerium  
Klimaschutz, Umwelt,  
Energie, Mobilität,  
Innovation und Technologie

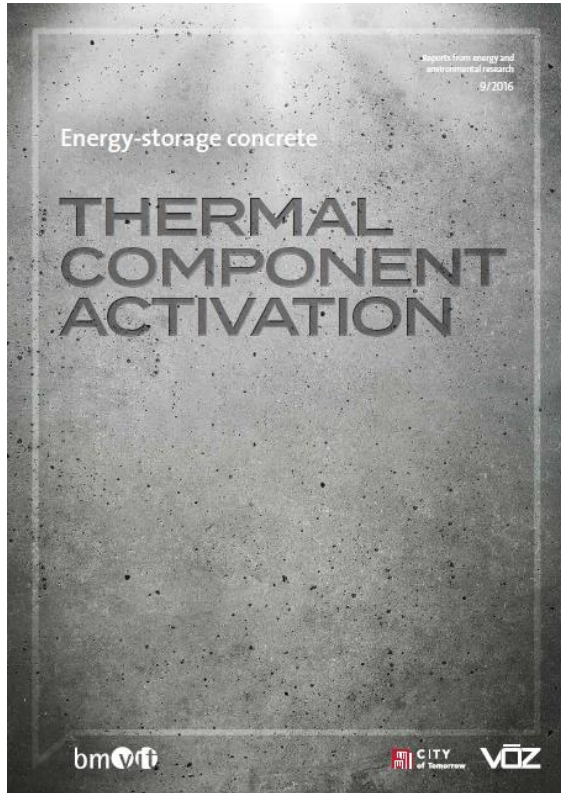
klimaaktiv  


 **ÖGNB**  
Österreichische Gesellschaft  
für Nachhaltiges Bauen



## AUSGEZEICHNETE [ WIENER ] GEBÄUDE 2020

<https://www.klimaaktiv.at/bauen-sanieren/gebaeude-in-oesterreich/auszeichnung-bauz-2020.html>

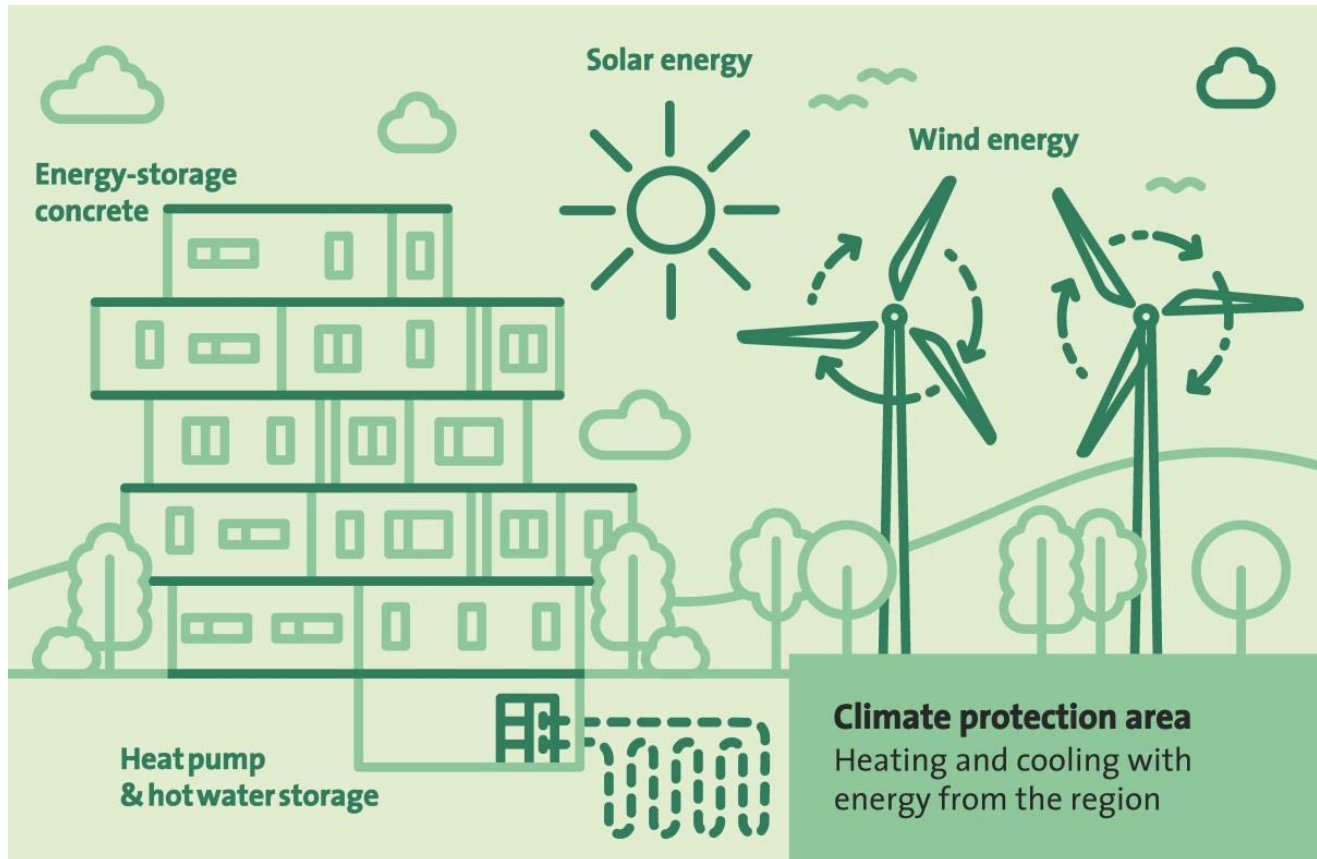


- Published by the Ministry of Innovation
- 5,000 books (120 pages) printed
- Basis for training and further education
- calculation examples



**Free download**

[www.zement.at/services/publikationen/energiespeicher-beton](http://www.zement.at/services/publikationen/energiespeicher-beton)



## CO<sub>2</sub> emissions of different heat supply systems in g/kWh

**Natural gas \***



**District heating**



**Heat pump with 80 % windpower and 20 % Austrian power mix**



\* Gas and renewable energy according Vienna building code  
Source: Calculation on basis OIB-Directive/BMVIT





Specific weight concrete: appr. 2 400 kg/m<sup>3</sup>

Volume related heat storage capacity C: 667 Wh/m<sup>3</sup>K

→ **1 m<sup>3</sup>** concrete **can store** a quantity of heat of **2.67 kWh** when **heated** by 4 K!

→ **1 m<sup>2</sup>** concrete ceiling (25 cm) can thus store **0.68 kWh heat**

New construction volume in housing  
 → **Estimated 4 mio. m<sup>2</sup> concrete ceilings per year**



© Z+B/Aichinger

- Preparing a funding program by the Austrian Climate and Energy Fund: 17&4 and AEE Intec are commissioned to find a way for dissemination and funding possibilities for thermally activated buildings.



- Further cooperation with our funding agencies and partners like

 Federal Ministry  
 Republic of Austria  
 Climate Action, Environment,  
 Energy, Mobility,  
 Innovation and Technology



# CONCRETE IS PART OF THE SOLUTION!

Research results and data base:

<http://zement.at/services/publikationen/energiespeicher-beton>

## Thank you for Your attention!

**Claudia Dankl**

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**Franz-Grill-Straße 9, O 214**

1030 Vienna

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[www.zement.at](http://www.zement.at)