BEYOND2020 NOV 2-4
WORLD SUSTAINABLE BUILT ENVIRONMENT ONLINE CONFERENCE

Positive Energy Districts in Austria – Frameworks, Case Studies and Definitions

Simon Schneider

Research group Sustainable buildings and cities @ University of Applied Sciences Vienna

2nd November 2020

Questions addressed

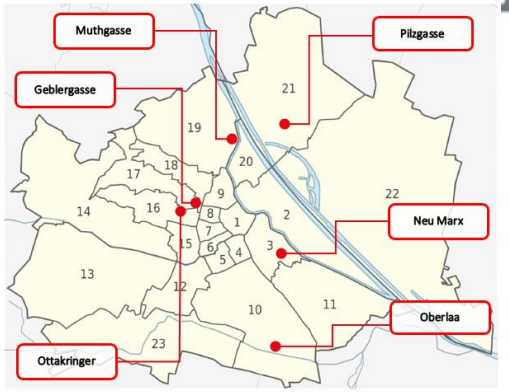
- **How can neighbourhoods be defined and their system boundaries be determined?**
- **How can climate neutrality of buildings and neighborhoods be assessed and demonstrated?**
- How can the cross-linking of individual buildings and within a district be optimized in the interest of saving energy and protecting the climate?
- How is exported energy handled and what role do embodied emissions play?
- How can an assessment of climate protection measures at building and district level be integrated into different steps of the design process?

Zukunfts Quartier

Exploration of "Future Districts" in Vienna

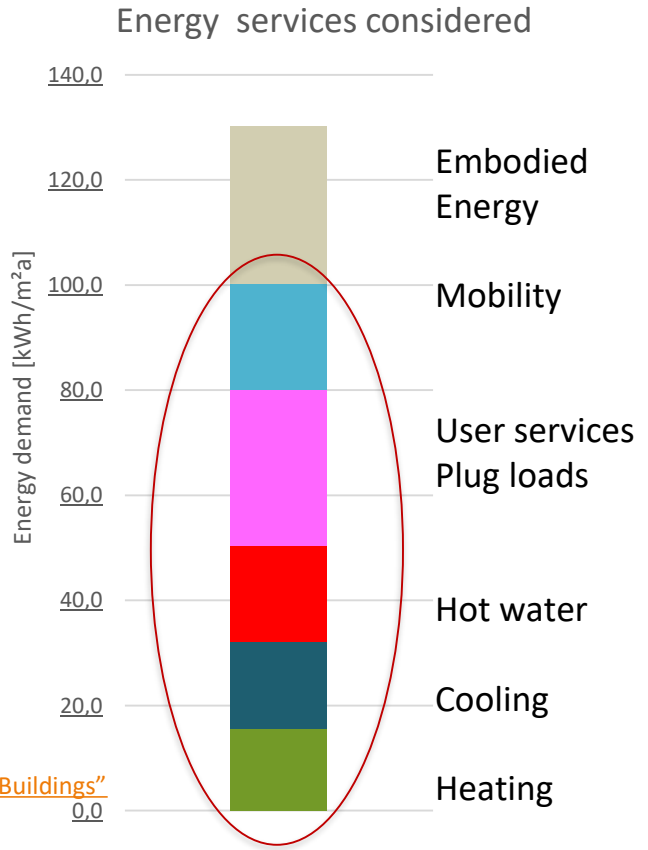
July 2018 – June 2019 (Completed)

6 exploration sites in Vienna (25 – 40 000 m² mixed use)



Proposition of PED definition & system boundaries

- Includes **Mobility** (location efficiency) and **User energy services** (usage mix synergies)



Final Project Report (German)

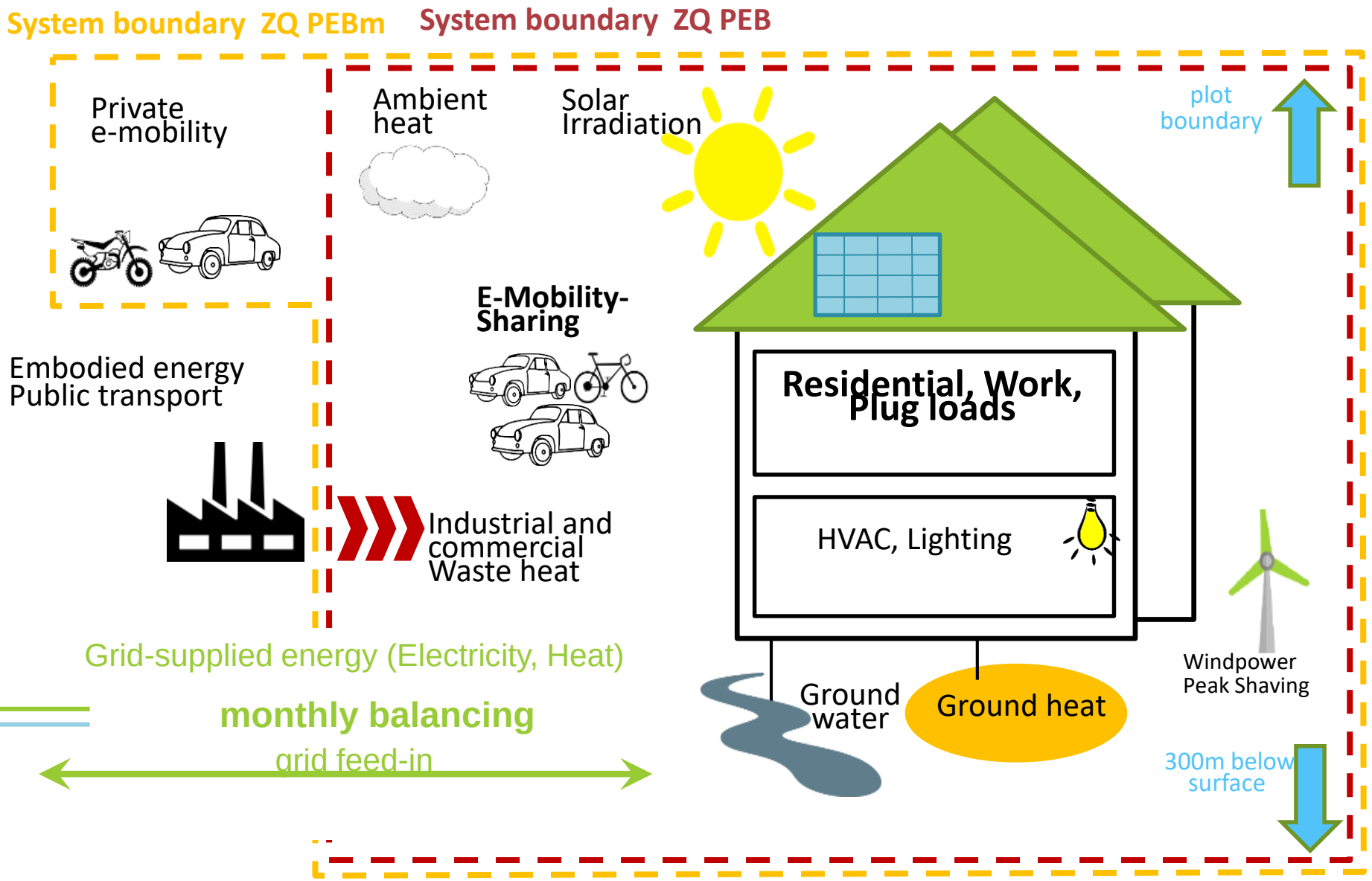
Results of explored districts: Leibold et al. 2019

System boundaries and frameworks:

- (Schneider, S., Bartlmä, N., Leibold, J., Schöfman, P., Tabakovic, M., Zelger, T., 2019. New Assessment Method for Buildings and Districts towards "Net Zero Energy Buildings" Compatible with the Energy Scenario 2050. Presented at the REAL CORP 2019, Karlsruhe.)
- (German conference paper Schneider et al. 2020)

System boundaries *Zukunftsquartier*

- Includes all onsite energy services
- Monthly conversion factors for emissions and primary energy
- Includes offsite Peak shaving
- Includes exported energy (PE-substition)

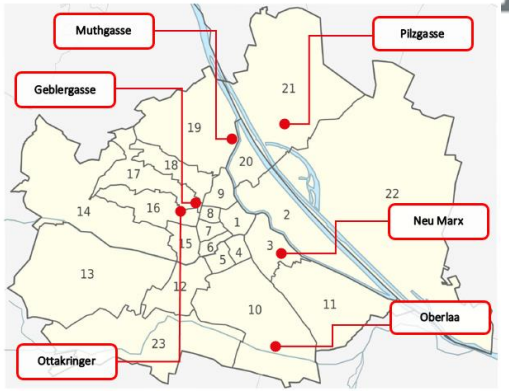


Zukunfts Quartier

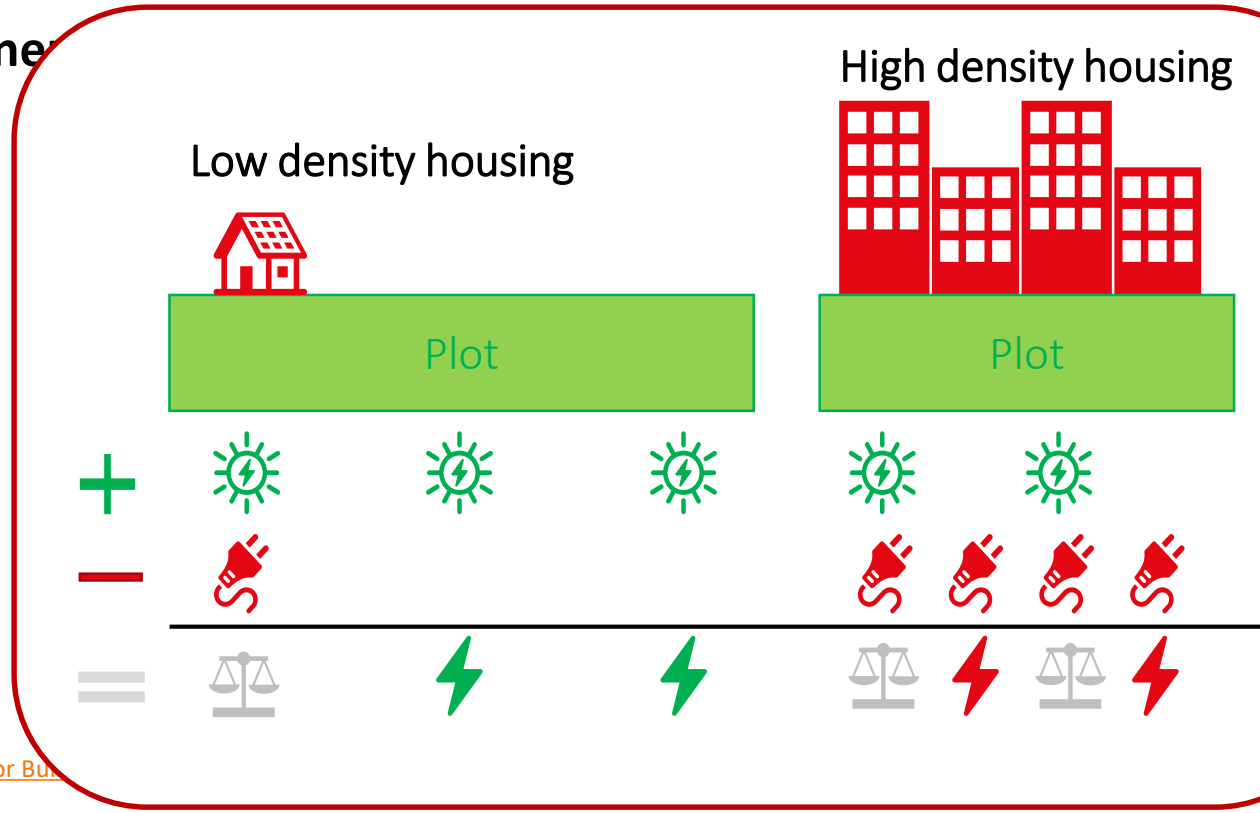
Exploration of "Future Districts" in Vienna

July 2018 – June 2019 (Completed)

6 exploration sites in Vienna (25 – 40 000 m² mixed use)



- Proposition of PED definition & system boundaries
  - Includes **Mobility** (location efficiency) and **User ene**
    (usage mix synergies)
  - **Balance Targets depend on density**
    (efficient use of the valuable estate settlement area)



Final Project Report (German)
Results of explored districts: Leibold et al. 2019
System boundaries and frameworks:

- (Schneider, S., Bartlmä, N., Leibold, J., Schöfman, P., Tabakovic, M., Zelger, T., 2019. New Assessment Method for Bu
  Buildings" Compatible with the Energy Scenario 2050. Presented at the REAL CORP 2019, Karlsruhe.)
- (German conference paper Schneider et al. 2020)

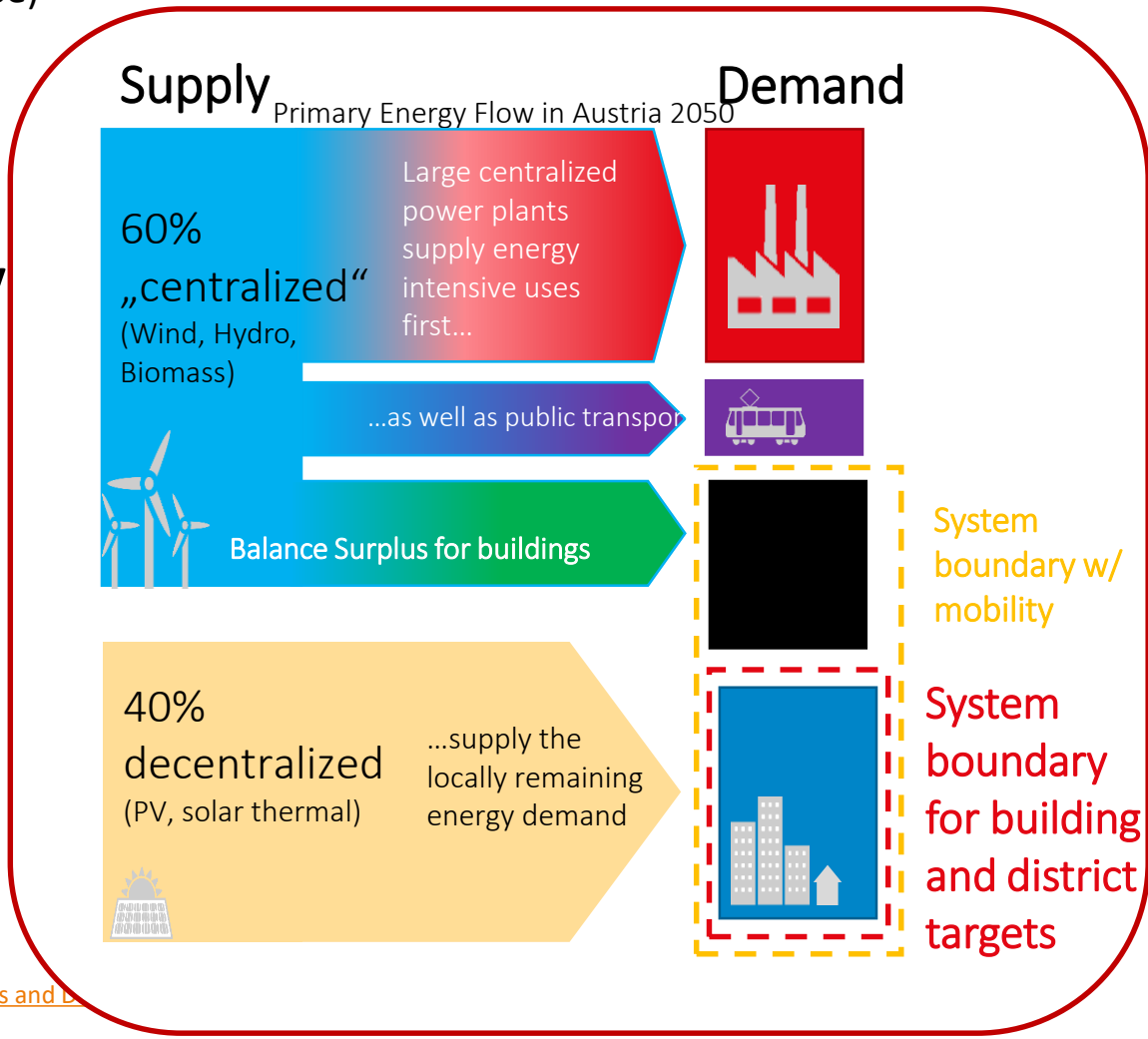
Zukunfts Quartier

Exploration of "Future Districts" in Vienna

July 2018 – June 2019 (Completed)

6 exploration sites in Vienna (25 – 40 000 m² mixed use)

- Proposition of PED definition & system boundaries
  - Includes **Mobility** (location efficiency) and **User energy** (usage mix synergies)
  - **Balance Targets depend on density** (efficient use of the valuable estate settlement area)
  - Connection to **national climate neutrality and sectoral scenarios**



Final Project Report (German)

Results of explored districts: Leibold et al. 2019

System boundaries and frameworks:

- (Schneider, S., Bartlmä, N., Leibold, J., Schöfman, P., Tabakovic, M., Zelger, T., 2019. New Assessment Method for Buildings and D… Buildings" Compatible with the Energy Scenario 2050. Presented at the REAL CORP 2019, Karlsruhe.)
- (German conference paper Schneider et al. 2020)

Zukunfts Quartier

Exploration of "Future Districts" in Vienna

July 2018 – June 2019 (Completed)

6 exploration sites in Vienna (25 – 40 000 m² mixed use)

Proposition of PED definition & system boundaries

- Includes **Mobility** (location efficiency) and **User energy services** (usage mix synergies)
- **Balance Targets depend on density** (efficient use of the valuable estate settlement area)
- Connection to **national climate neutrality and sectoral scenarios**
- Flexible use of **onsite and offsite RES** w/ thermal and electrical storage

Final Project Report (German)
Results of explored districts: Leibold et al. 2019
System boundaries and frameworks:

- (Schneider, S., Bartlmä, N., Leibold, J., Schöfman, P., Tabakovic, M., Zelger, T., 2019. New Assessment Method for Buildings and Districts towards "Net Zero Energy Buildings" Compatible with the Energy Scenario 2050. Presented at the REAL CORP 2019, Karlsruhe.)
- (German conference paper Schneider et al. 2020)

Zukunfts Quartier 2.0

Demonstration "Future District" in Vienna

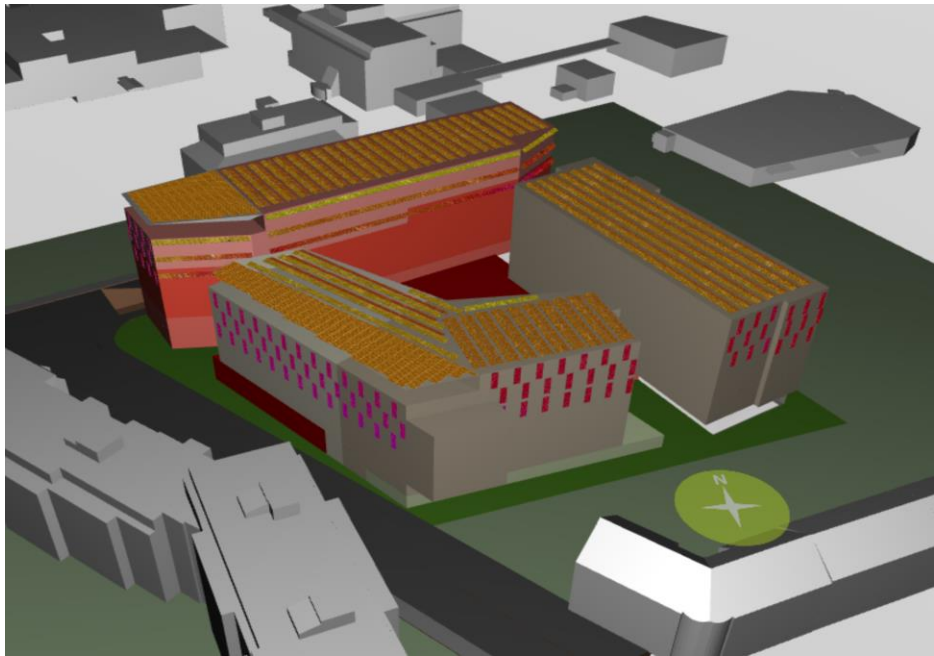
July 2019 – November 2021 (In progress)

30 000 m² Residential/Office/Commercial in Vienna

Website

- 25-30 kWh PV /m²useable floor area, (approx. 30 kWp/m²floor area)
- 70% self-utilization rate
  - Boreholes + Heatpumps + thermally activated concrete core
  - Buffer tanks

    90% self-utilization with Hydrogen Storage
- Grid supportive storage management
  - Inclusion of Offsite RES peak shaving



3 Pillars for a future-proof, climate neutral district

Utilization of local renewables

- ***Solar***: Thermal , PV
- ***Heatpumps*** w/ ambient heat (ground, water, air)
- Local ***waste heat*** from cooling, waste water and processes

Energy Efficiency

- ***Thermal hull***: passive house vs austrian building code
- ***HVAC***: Low-temp heating, heat recovery ventilation
- ***Demand***: eff. Lighting, appliances

PED

Energy Flexibility

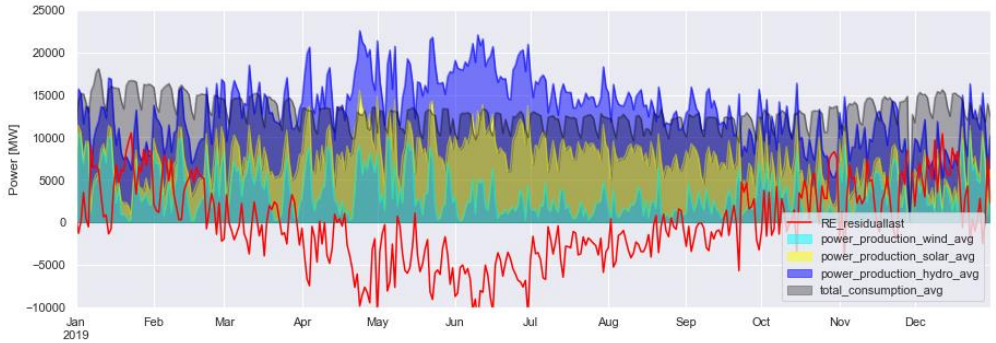
- ***Thermal storage:*** Buffer tank, **TABS**, boreholes
- ***Electric storage***: DSM, (batteries, e-cars)
- **USER flexibility**: room temp

Flexible User comfort in hourly carbon-free districts

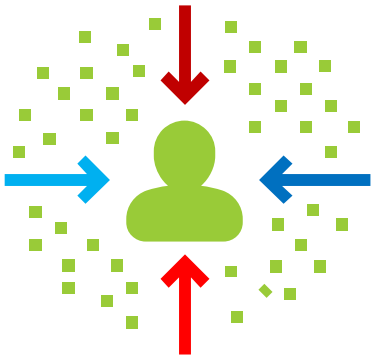
September/2019 - August/2021 (In progress)

3 Example Districts in Austria
Website: https://www.fluccoplus.at/

- Detailed climate-neutrality concepts need **hourly carbon emissions** of future energy grid
  - Annual Energy and emission balance is insufficient



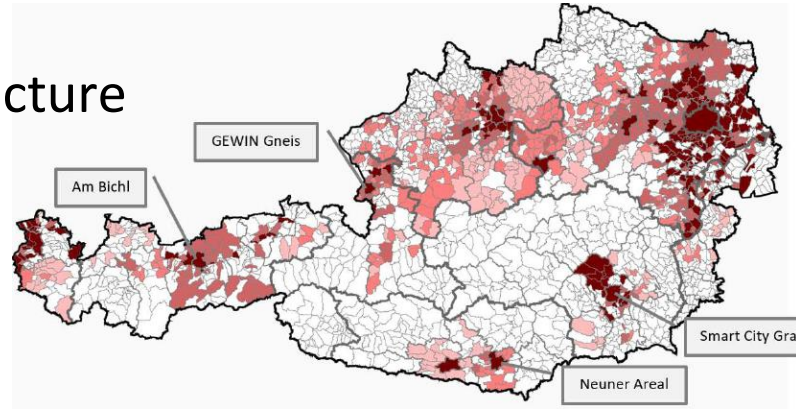
- Detailed climate-neutrality concepts need **user support and flexibility**
  - Are they OK with oscillating indoor temperatures?



Recommendations for "Future Districts" in Planning, Implementation and Quality Assurance

May/2020 – April /2021)(In progress)

4 Example Districts in Austria's mayor cities



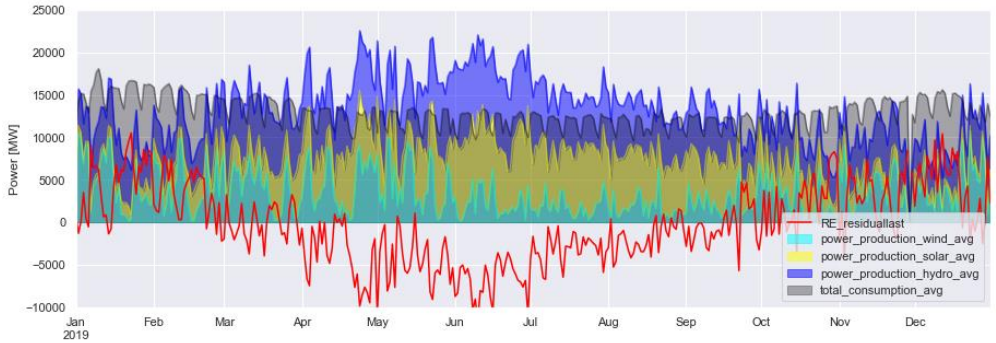
- Define energy and emission targets before city building and architecture competitions
  - Architects will find enough space for PV
- Reach out to public utility companies
  - Economic feasibility relies on sensible grid connection deals

Flexible User comfort in hourly carbon-free districts

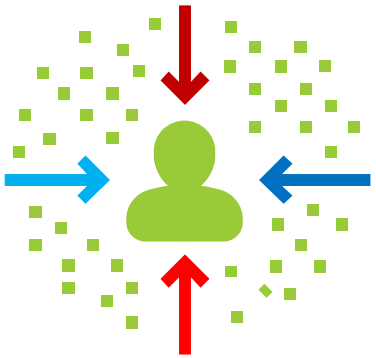
September/2019 - August/2021 (In progress)

3 Example Districts in Austria
Website: https://www.fluccoplus.at/

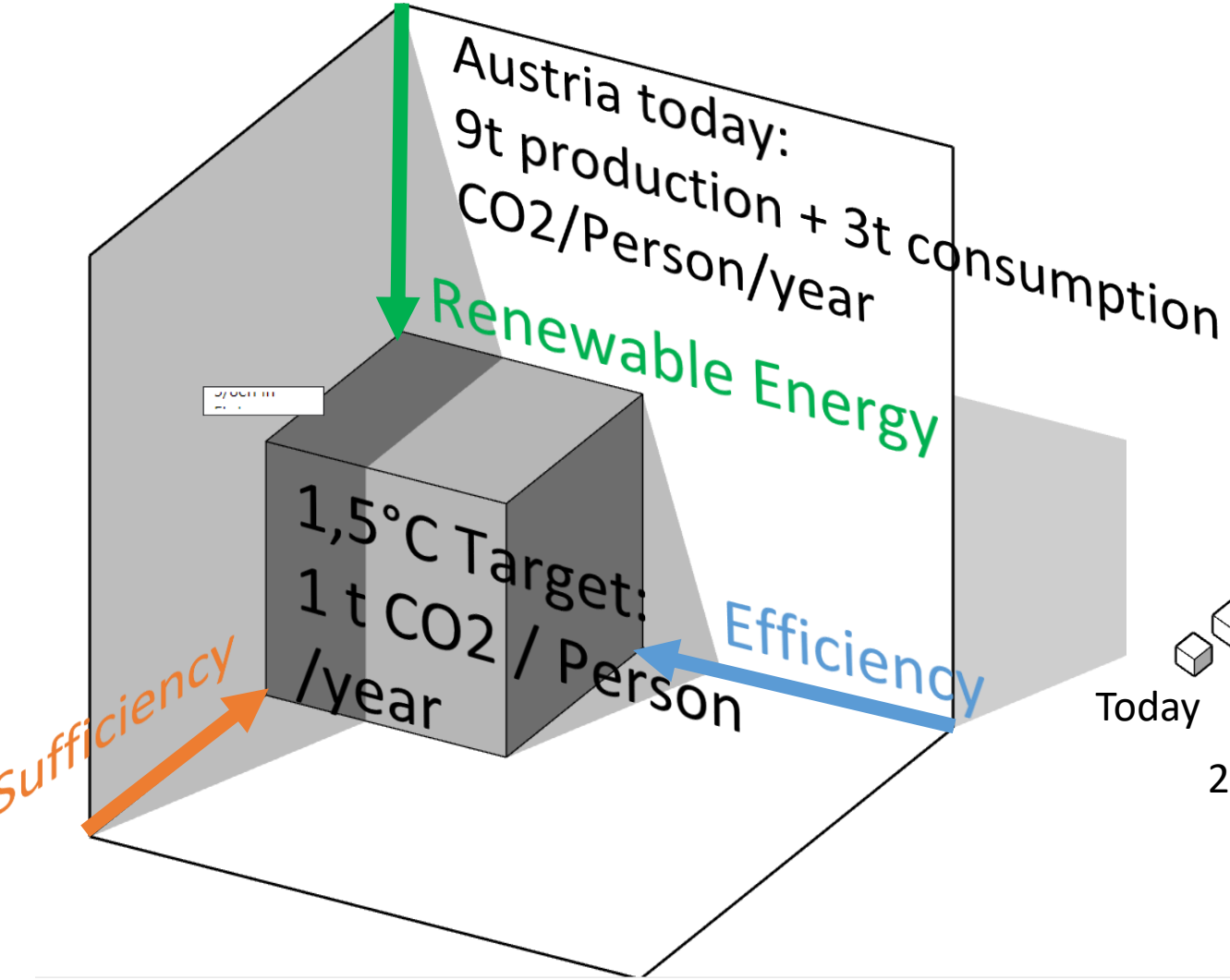
- Detailed climate-neutrality concepts need **hourly carbon emissions** of future energy grid
  - Annual Energy and emission balance is insufficient

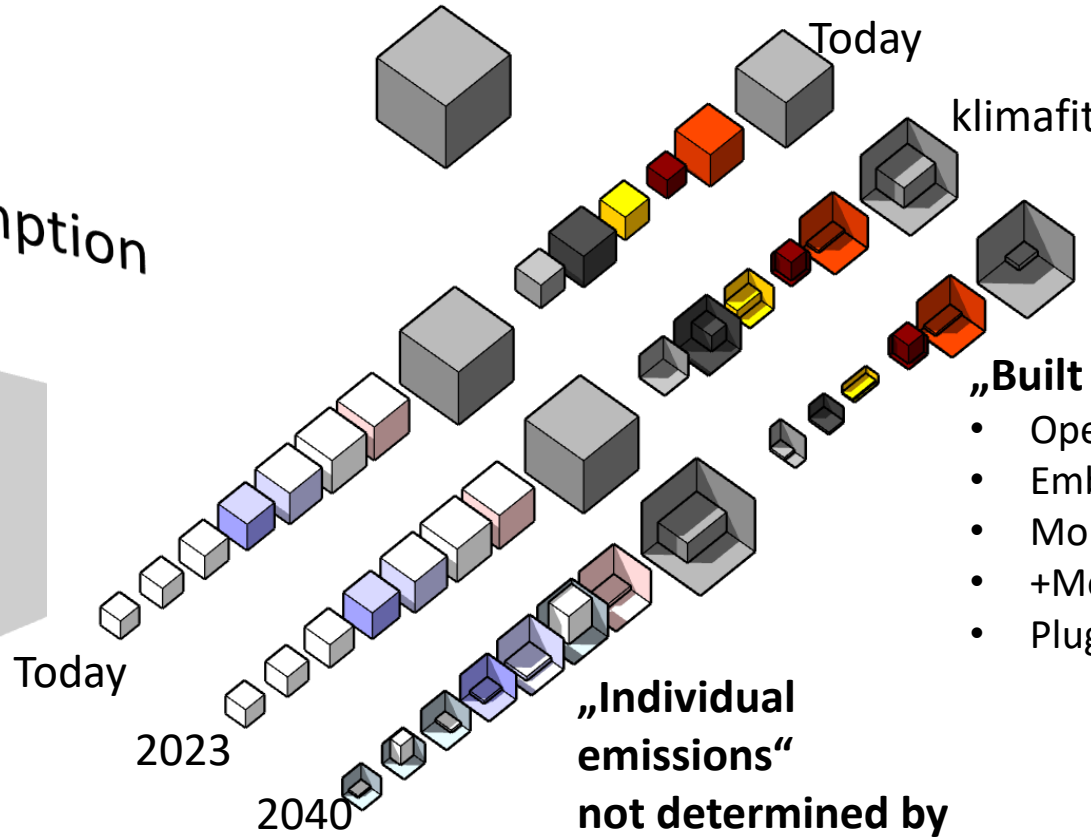


- Detailed climate-neutrality concepts need **user support and flexibility**
  - Are they OK with oscillating indoor temperatures?



What is a „climate fit“ and „future proof“ building or district?
Connect personal and „built“ emission **targets**





„Built emissions“:

- Operation
- Embodied Energy
- Mobility
- +Mobility embodied
- Plug loads

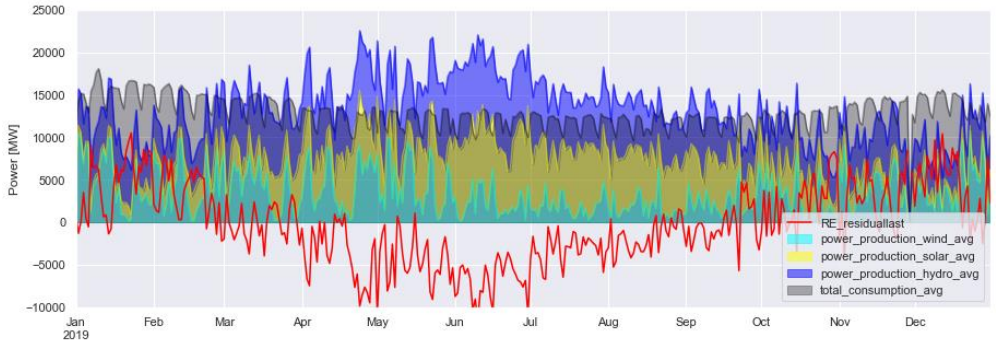
„Individual emissions“ not determined by district

Flexible User comfort in hourly carbon-free districts

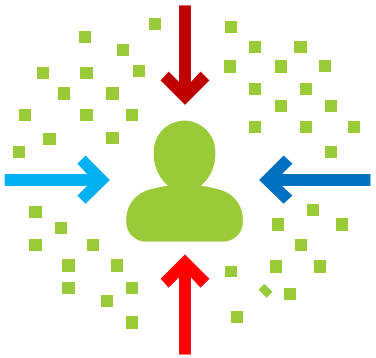
September/2019 - August/2021 (In progress)

3 Example Districts in Austria
Website: https://www.fluccoplus.at/

- Detailed climate-neutrality concepts need **hourly carbon emissions** of future energy grid
  - Annual Energy and emission balance is insufficient



- Detailed climate-neutrality concepts need **user support and flexibility**
  - Are they OK with oscillating indoor temperatures?



Thank you for your attention!

Simon Schneider

Competence team for liveable Positive Energy Districts
Research group Sustainable buildings and cities
Simon.schneider@technikum-wien.at
Simonschaluppe.org

Further Information

Project Zukunftsquartier

Projekct Zukunftsquartier 2.0

FH Technikum @

res.technikum-wien.at/kolpeq/ www.technikum-wien.at/forschung/forschungsschwerpunkte/

Team

- Nadja Bartlmä (IBRI)
- Jens Leibold (FHTW)
- Simon Schneider (FHTW)
- Petra Schöfmann (UIV)
- Momir Tabakovic (FHTW)
- Thomas Zelger (FHTW)

Zukunfts Quartier 2.0

FFG Forschung wirkt.

klima+ energie fonds

HaCon

BÖHM

SUBA

Zukunfts Quartier

urban innovation vienna

Institute of Building Research & Innovation ZT-GmbH

BEYOND2020 NOV 2-4

WORLD SUSTAINABLE BUILT ENVIRONMENT ONLINE CONFERENCE