

Future cooling and heating demand of the Swiss building stock

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Problem

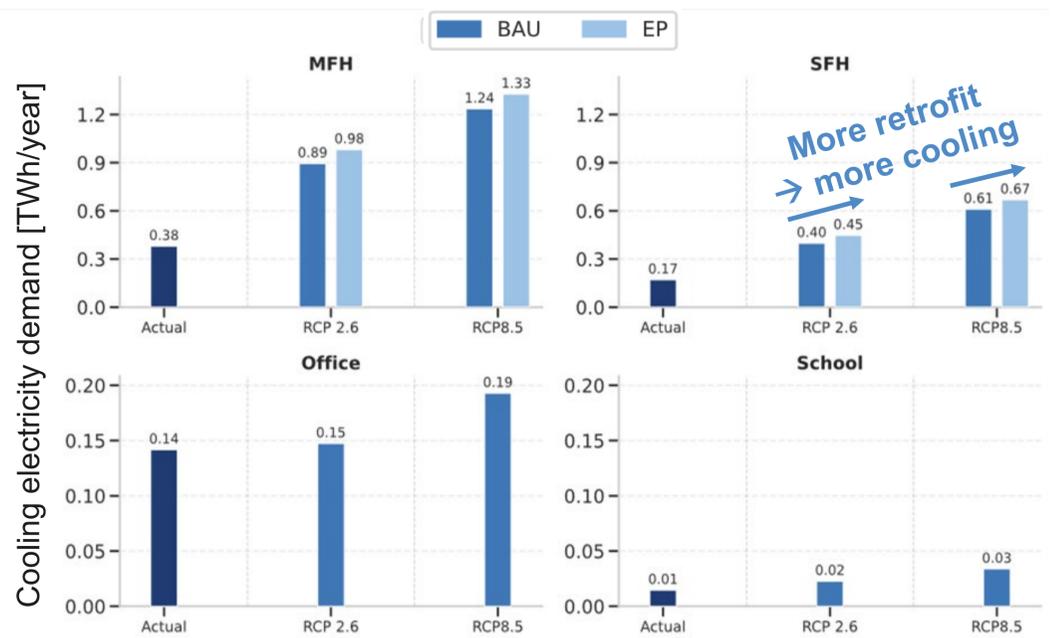
Understand **future thermal energy demand of buildings** as input for technology and policy analysis.

Goals

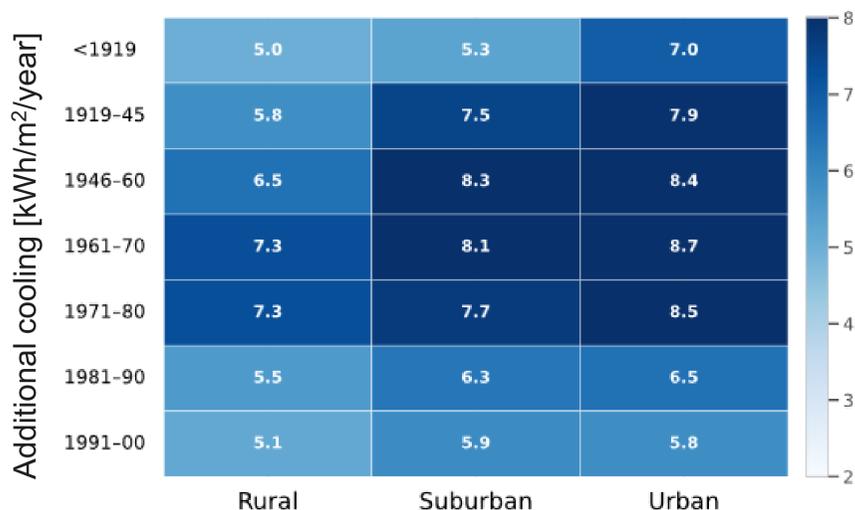
Estimate **cooling and heating demand** of Swiss residential and non-residential buildings for different **climate and retrofit scenarios**.

Method

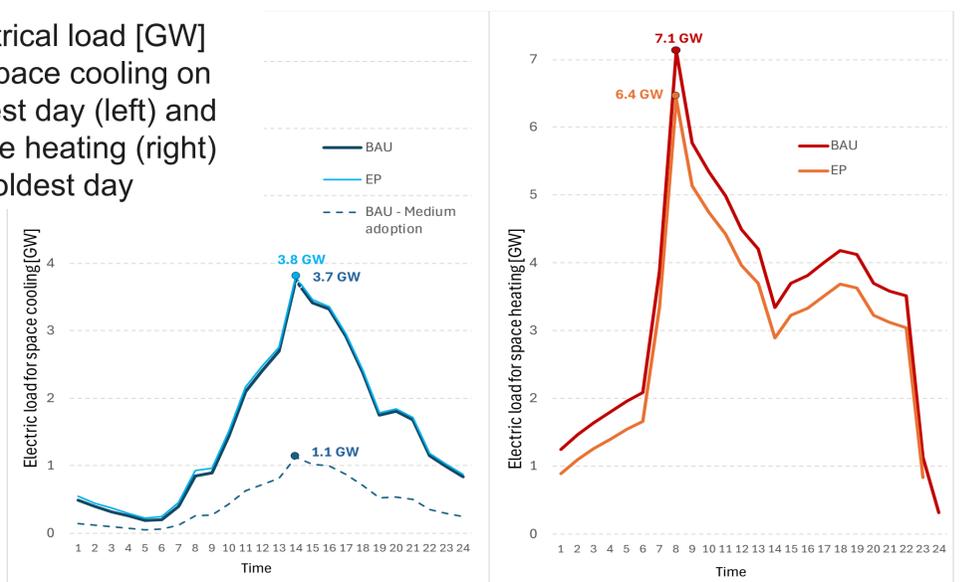
- Bottom-up building **archetypes**
- **Dynamic** (hourly) building simulation model (RC, EN ISO 52016)
- Climate scenarios **RCP2.6** and **RCP8.5**
- 2023-2050: **+20% popul., +18% ERA**
- **Energy retrofit**: 1% p.a.(BAU), 1.5% p.a. (EP)
- Scenarios **cooling adoption**: 30% (BAU) & 100% (EP)



Additional cooling due to energy retrofit (MFH)



Electrical load [GW] for space cooling on hottest day (left) and space heating (right) on coldest day



Results-1

- Building envelope **retrofit leads to increase in specific cooling needs** (on average by 5.8 kWh/m²/year; w/o consideration of ventilation).
- Additional cooling demand due to retrofit is particularly high for buildings constructed in **1950s to 1980s**.

Results-2

- **Max. cooling electricity load** reaches approx **50%** (BAU) to **60%** (EP) of **max. el. load for space heating**.
- **Winter morning peak** due to night setback represents a system challenge.
- **0.4% p.a. higher retrofit pace** (EP vs BAU) reduces max. el. load for heating by **10%**.

Results-3

- **Electricity demand for cooling** may increase substantially, i.e. by up to 120% (RCP 2.6) to 210% (RCP8.5).
- **Final energy** consumption for residential **space heating** decreases from 39.9 TWh/year in 2023 to 21.7 TWh/year in 2050 to (-57%).

Conclusions

- **Electricity demand for cooling** may grow by up to 1.5 TWh/year but does not represent a challenge for the energy system.
- National final **energy target** for heating in 2050 is **not reached** (21.7 TWh vs. 18 TWh).
- **Strategies for reducing winter morning peak** for heating need to be studied.