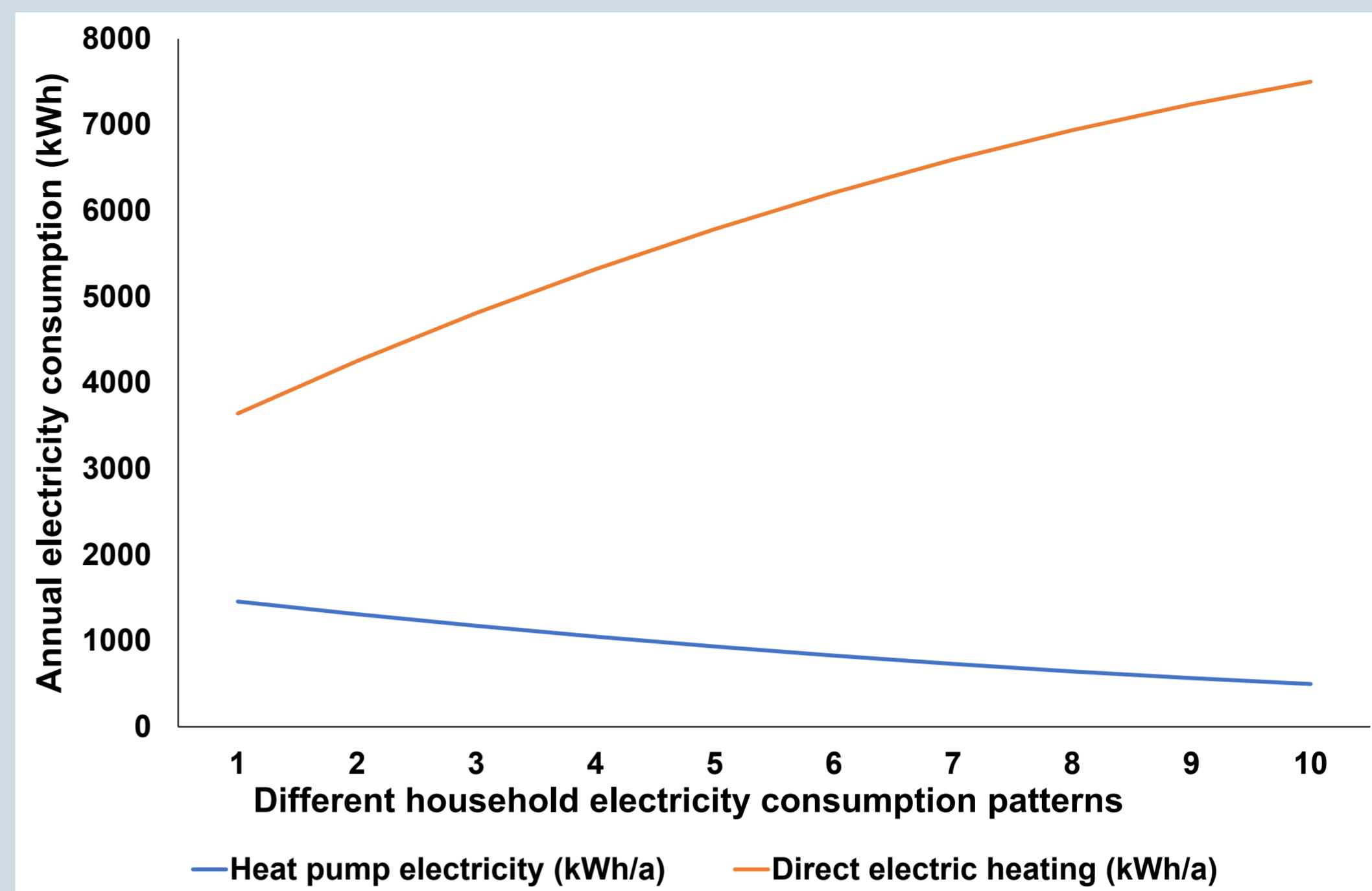
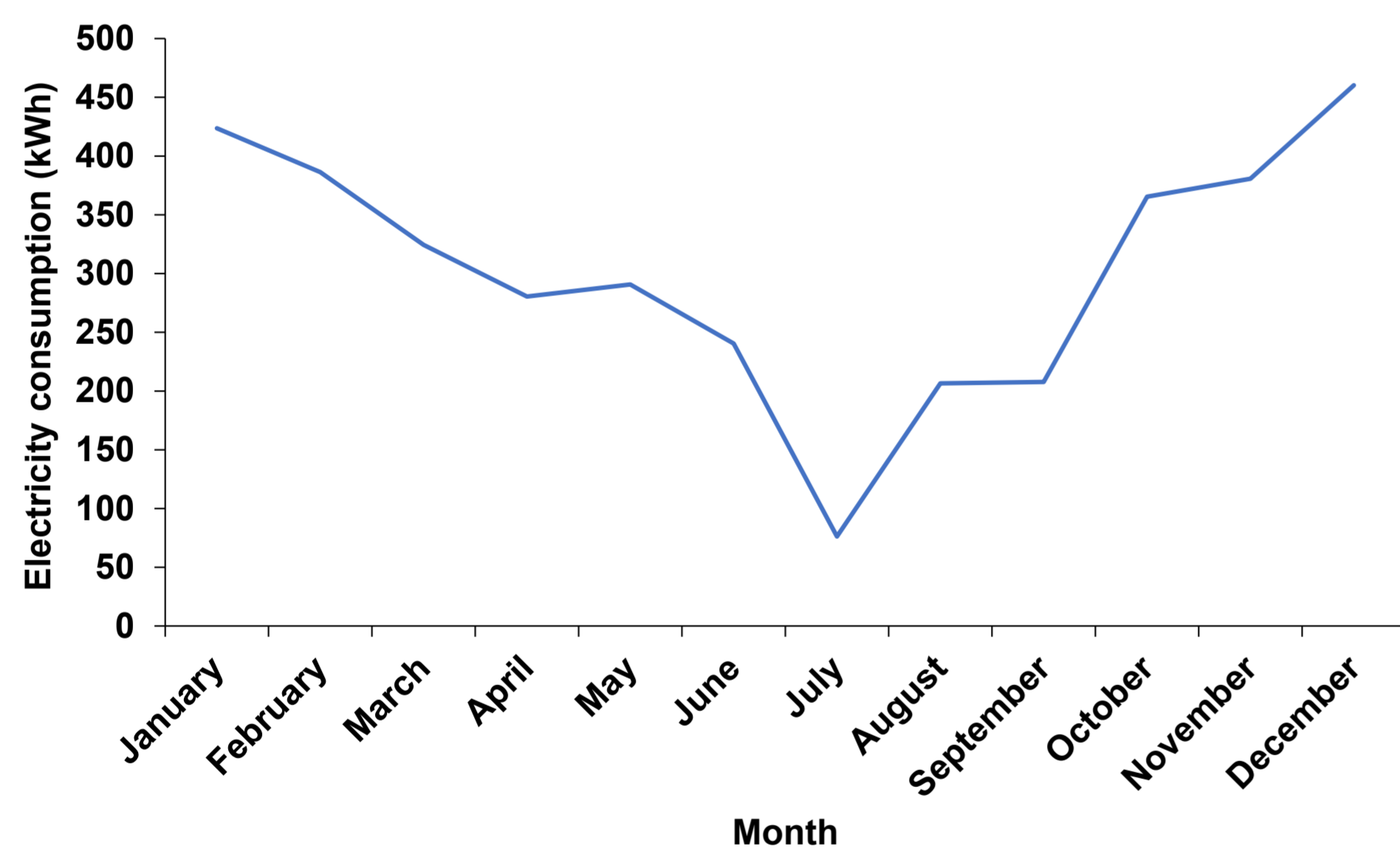


Implications for energy labeling:

- Increasing household electricity consumption alters heat pump operation: both total operating time and its distribution across COP conditions
- This modifies the heating balance: the share between heat pump output and internal heat gains shifts
- Energy performance depends on how this balance is accounted
- Different valid calculation methods may result in different **energy labels for the same building.**



Household electricity consumption profile used in the analysis



Real hourly electricity data used as input and scaled across scenarios

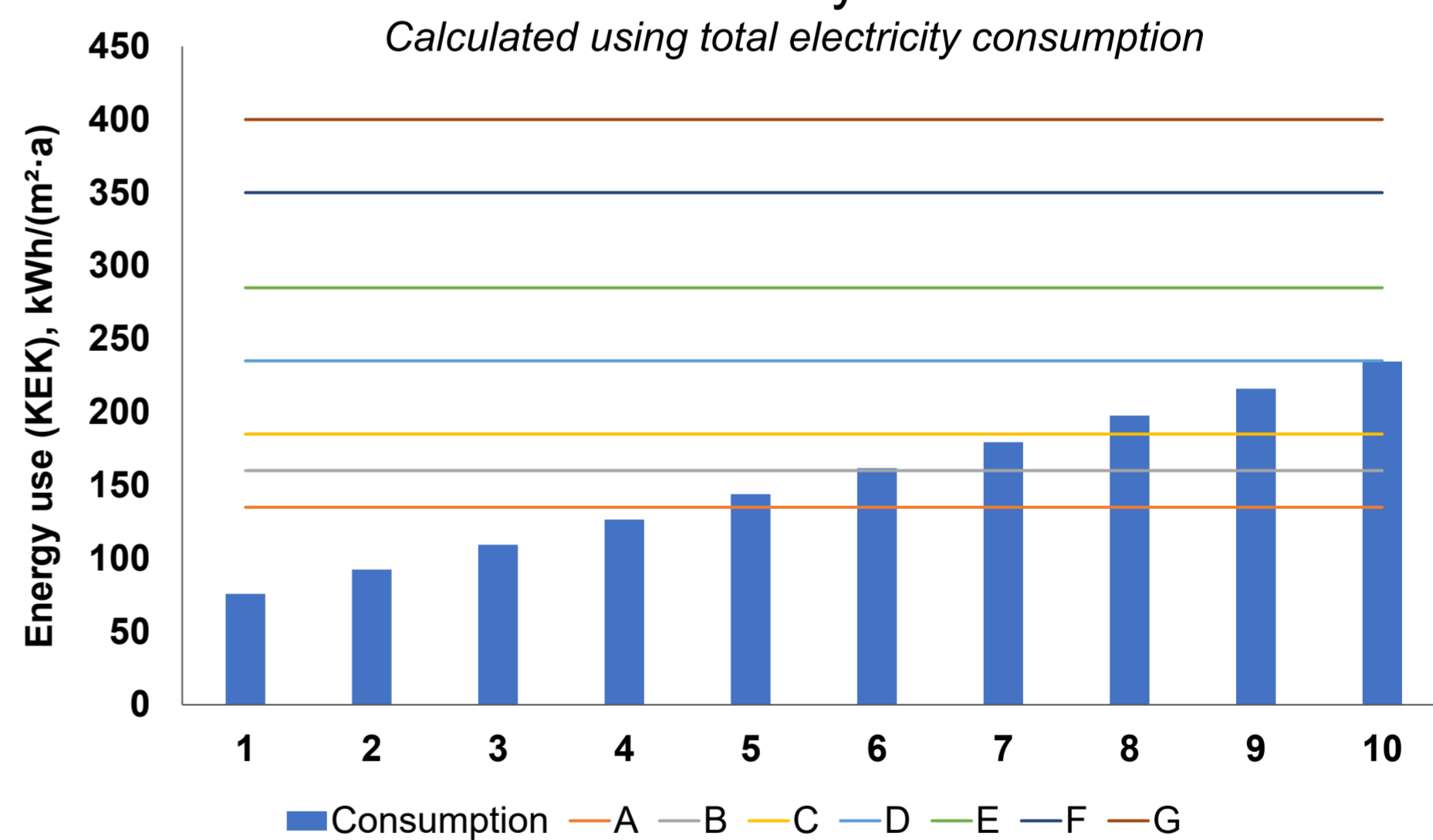
Method

A simplified hourly heat balance model was used to simulate space heating demand under varying electricity consumption scenarios.

- Identical building (100 m², fixed envelope and climate)
- Air-to-water heat pump (temperature-dependent COP)
- Measured hourly electricity profile (internal heat gains)
- Electricity consumption scaled (×1.2–2.0)
- KEK-based energy classification applied

Energy labels under different calculation approaches for the same building

Energy label worsens with increasing household electricity use



Energy label improves with increasing household electricity use

