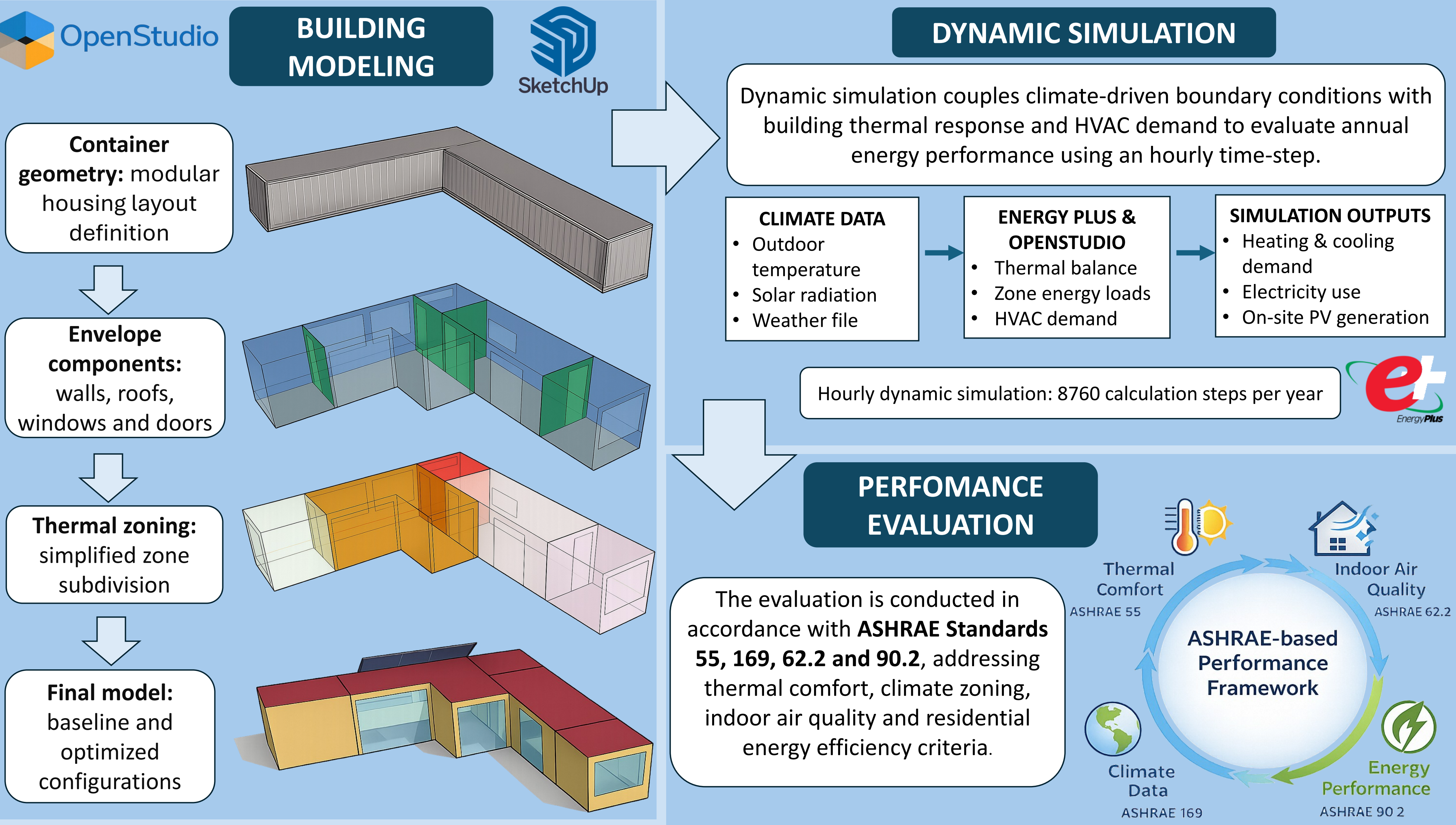


Towards Net-Zero Modular Housing: Energy Simulation and Photovoltaic Self-Sufficiency in Shipping Container Architecture

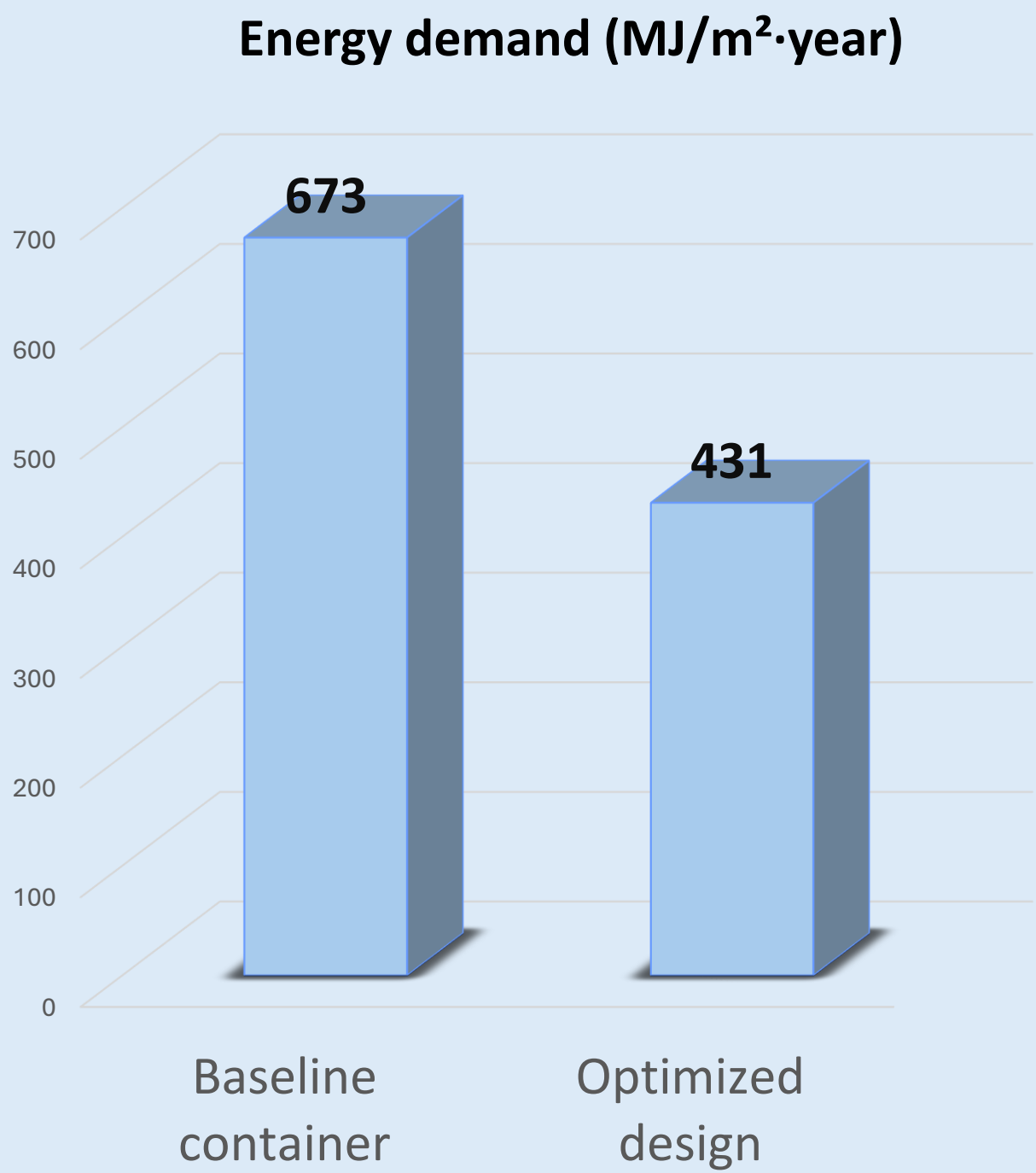
Submitted by Rim El Hichou El Maya

INTRODUCTION

- Modular container housing enables rapid, low-carbon construction but presents significant thermal and energy performance challenges.
- Dynamic energy simulation and photovoltaic integration are key tools to assess and improve Net-Zero potential under Mediterranean climate conditions.

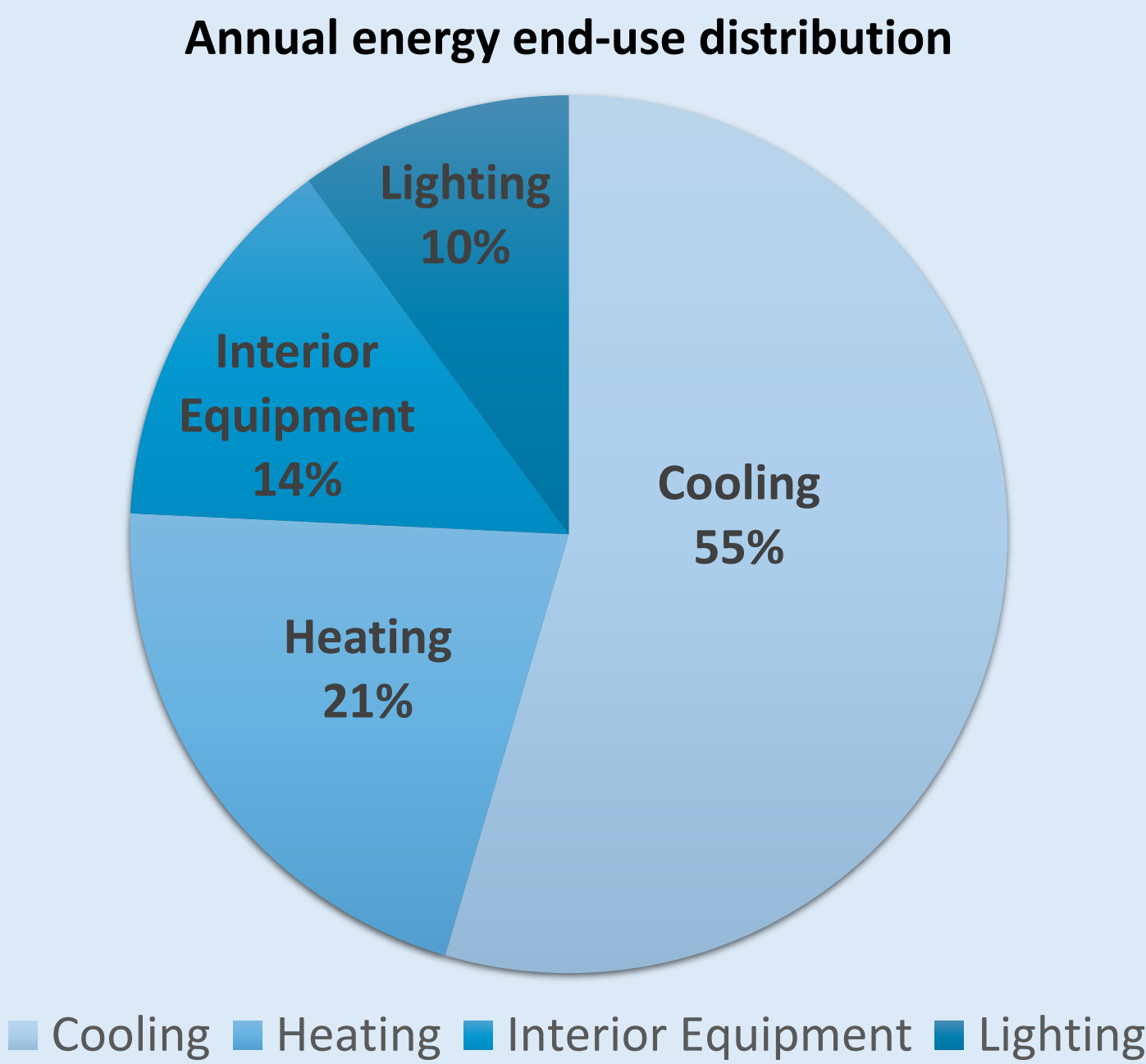


RESULT 1 : Energy Demand Reduction



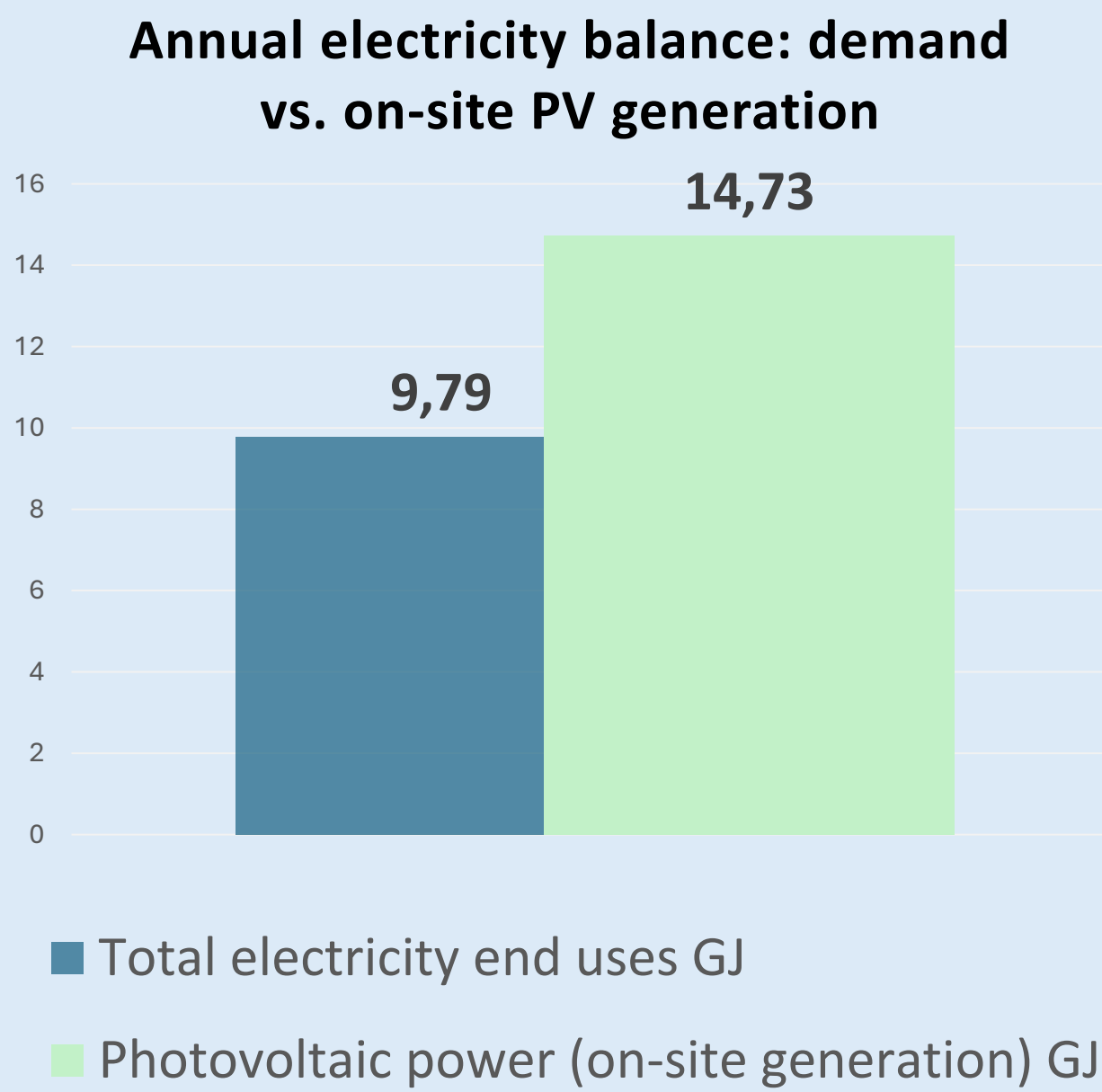
Envelope-driven design strategies reduce annual energy demand by more than one third.

RESULT 2: Annual Energy End-Use Distribution



Mediterranean climate conditions fundamentally shape the building's energy behaviour, leading to a cooling-dominated HVAC demand.

RESULT 3: PV Contribution to Net-Zero Balance



On-site photovoltaic generation offsets a significant share of the annual electricity demand, enabling a near Net-Zero energy balance.

CONCLUSION

- Simulation-driven design reduces container housing energy demand by ~36%.
- Cooling-dominated behaviour highlights the relevance of envelope optimization and solar control strategies in Mediterranean climates.
- Photovoltaic integration enables near Net-Zero Energy performance.

