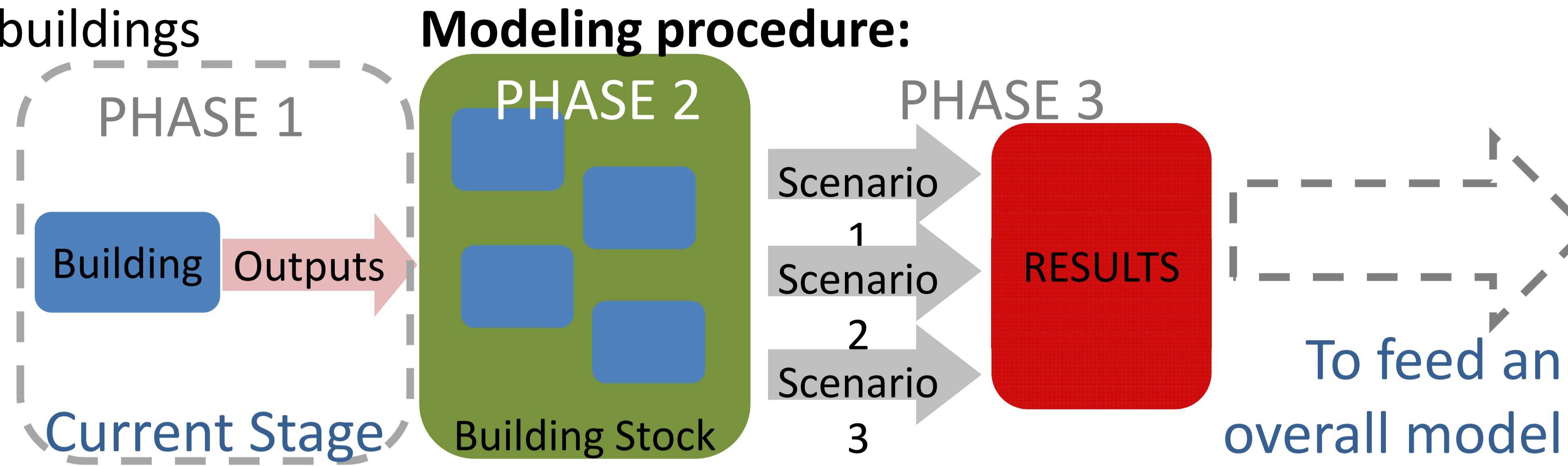


Modeling energy efficiency scenarios for the European building stock

AIM. The study seeks to find a method to simulate energy efficiency strategies for the European building stock up to the year 2050. Energy efficiency strategies should include both retrofitting and lifestyle (management) measures. The aim is to develop a simple model which can be applied to a stock of buildings



Part of the AGS Pathway project

- Produce scenarios up to 2050 that can lead to a sustainable heat and power sector across Europe
- Analyse how the European energy system can be transformed to be more sustainable (targets on efficiency, CO₂ emissions and renewable energy)

SUMMARY

- The model is developed in MATLAB/Simulink
- It is based on the thermal constant: $tc = TC/K (h)$
- Allows detailed management
- Rough or detailed consideration of transmission and radiation loads (Figure 1)

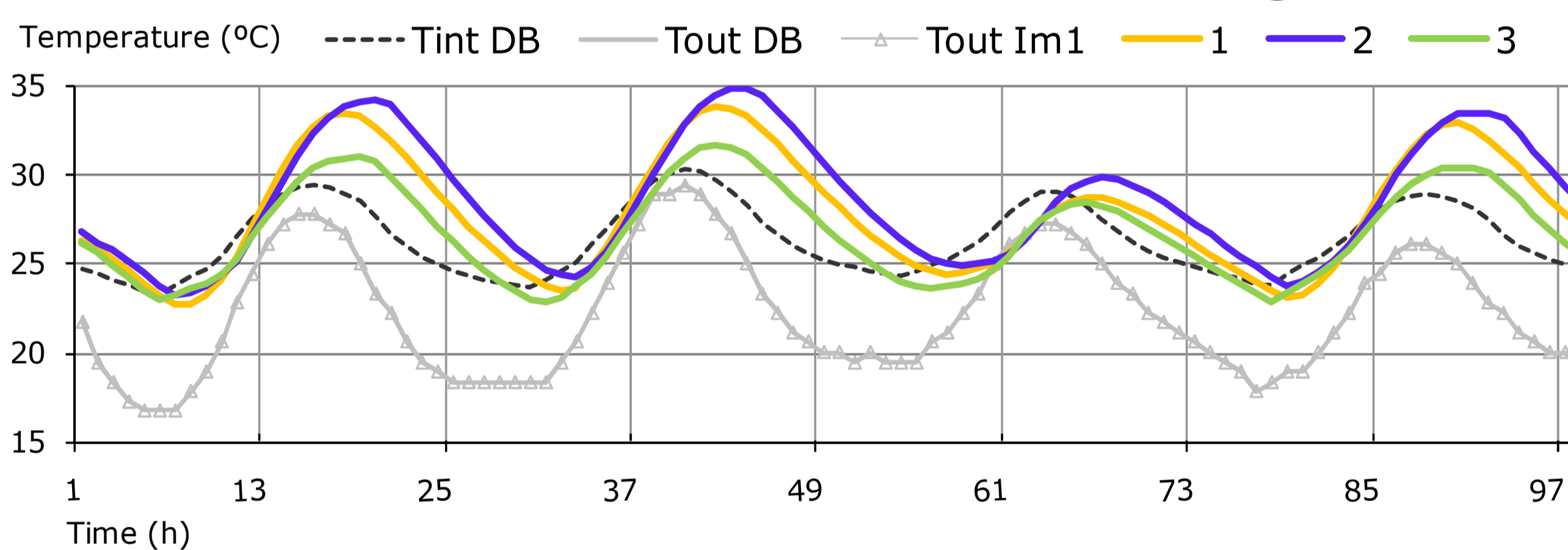


Figure 1 (above). Comparison of calculated indoor temperatures for building O1 according to the different models 1, 2 and 3.

The model has been validated for two reference buildings: an office building (O1) located in Barcelona, Spain and a residential building (R2) in Köping, Sweden. Calculated indoor temperatures for O1 are not in a full agreement with measurements due to uncertainties in some of the input values (Figure 1); however, calculated consumption for heating fits the measured indexes for this kind of building and region (Figure 5).

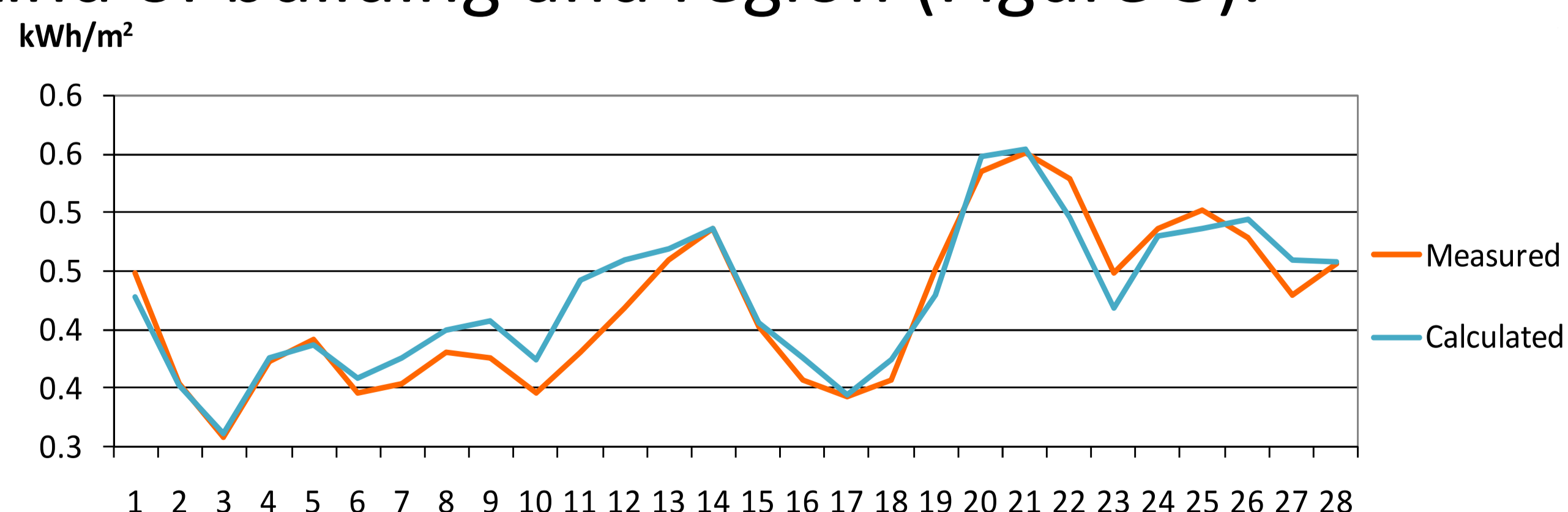


Figure 2. Comparison of calculated and measured daily consumption during February 2002 for building R2.

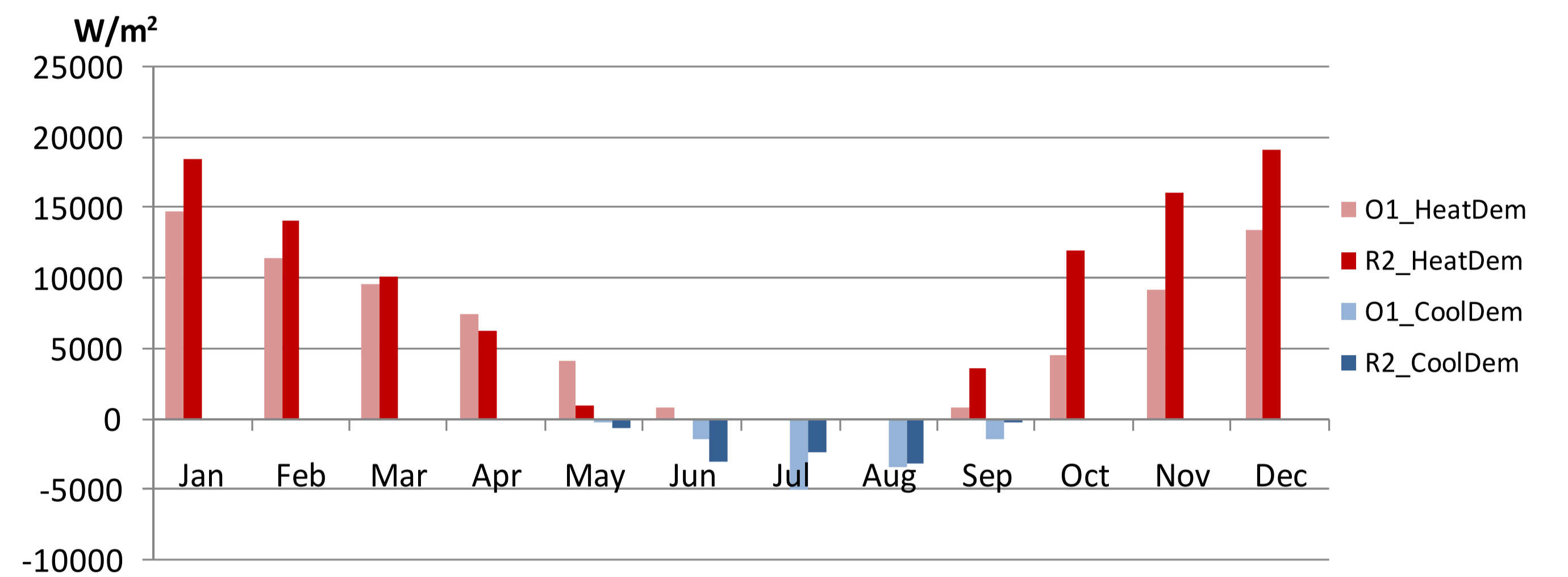
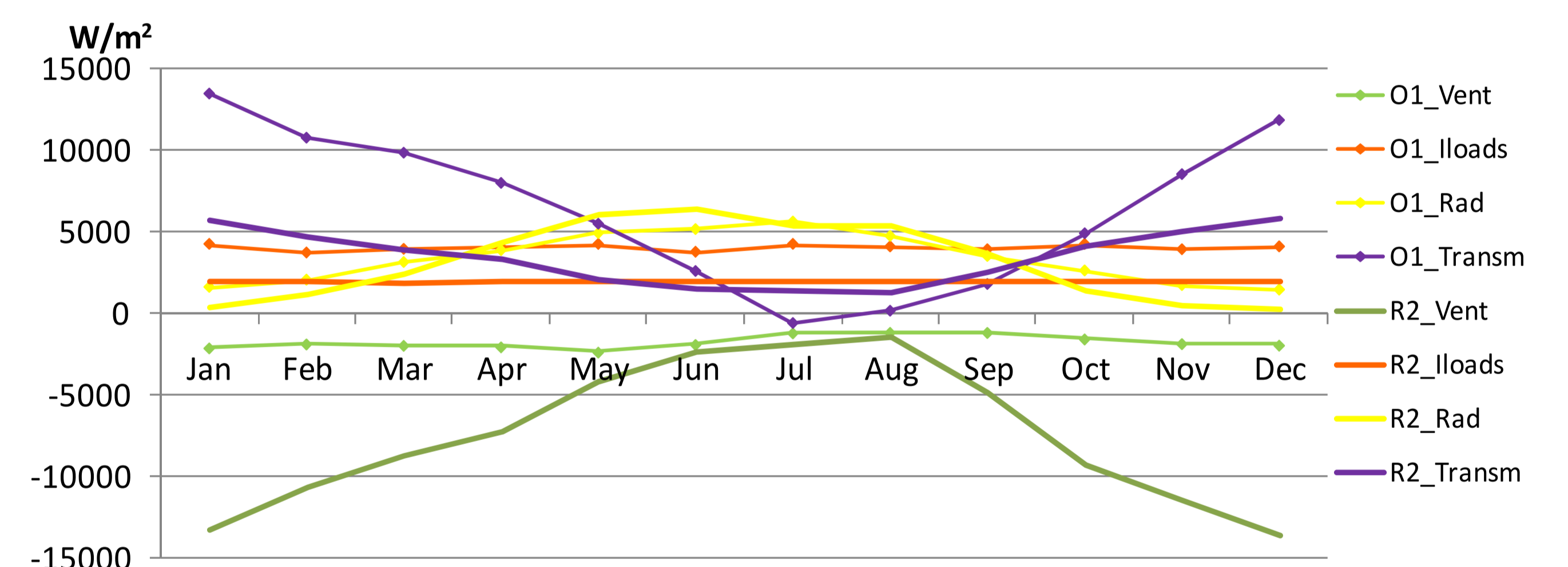


Figure 3 (above). Calculated demand for buildings O1 and R2.

Figure 4 (below). Calculated contribution of ventilation, internal loads, radiation and transmission to the cooling and heating demand, for the same buildings.



Calculated results for building R2 show a good agreement with measured data: measured consumption in 2002 was 97.4 kWh/m²year, and calculated demand is 101.6 kWh/m²year (Figures 3 and 4).



Figure 5. Calculated consumption for heating for O1 (76.6 kWh/m²y) fits the range of measured indexes (49.6 to 85.4 kWh/m²y). Available at: www.upc.edu/sirena.

FURTHER WORK. Validation for a building stock and for different future scenarios.

- French residential building stock: energy data available for the complete building stock based on databases and from literature
- Swedish residential buildings or Spanish educational buildings: limited number of buildings where energy consumption and indoor temperatures have been measured

