

### CONTEXT & MOTIVATION

- Power systems are undergoing a transformation process on both the supply and the demand sides:

	Past	Future
Supply portfolio	Centralised Controllable Predictable Fossil fuel based	Distributed Variable Unpredictable RES
Demand side	Predictable Uncontrollable	Predictable? Controllable New load categories

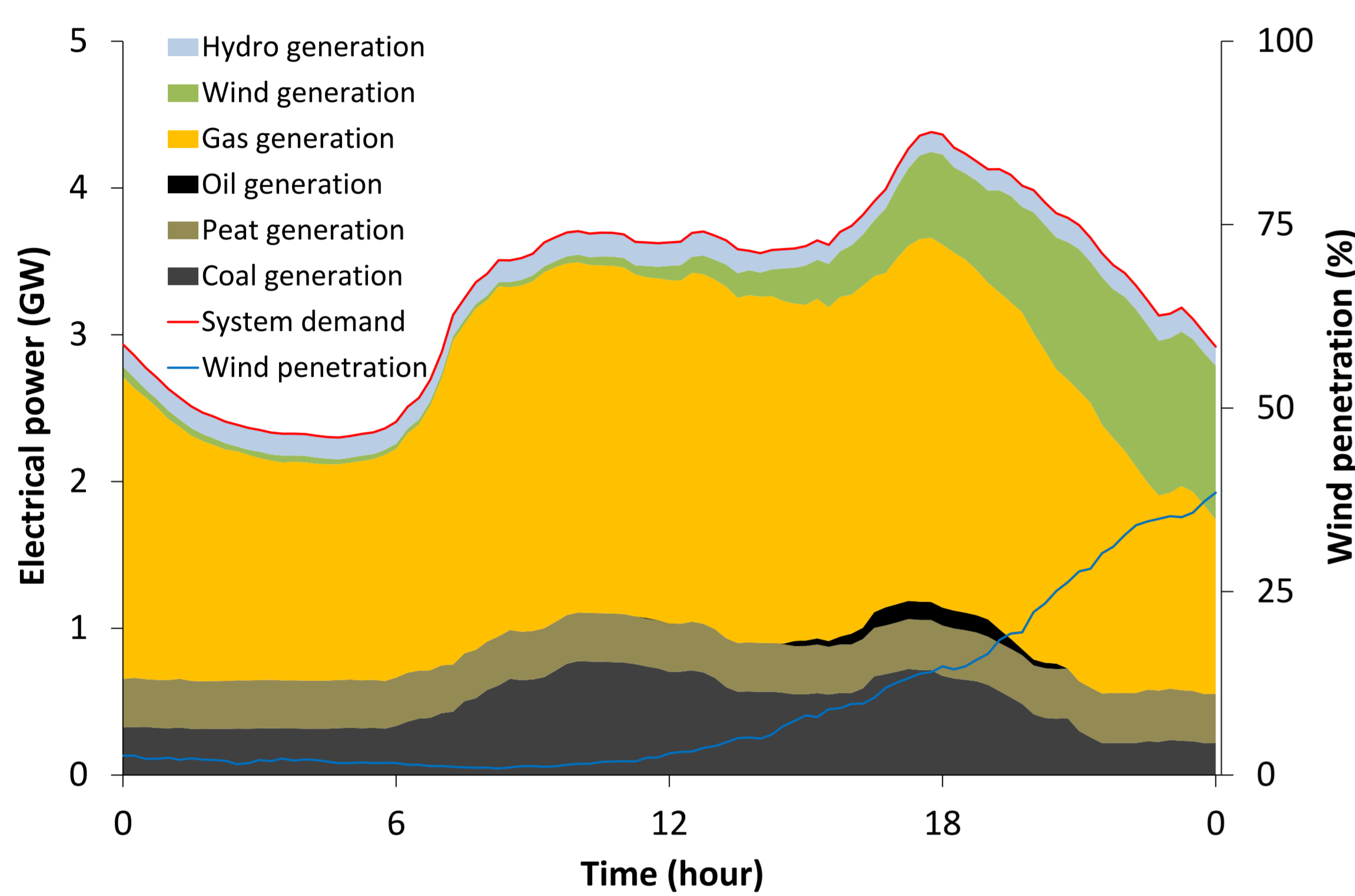


Fig. 1 RES generation – demand mismatch in Ireland (10/11/2010)

- Greater flexibility requirements → demand side participation:

- Energy efficiency
- Peak and off-peak management
- Ancillary services (regulation, reserve)

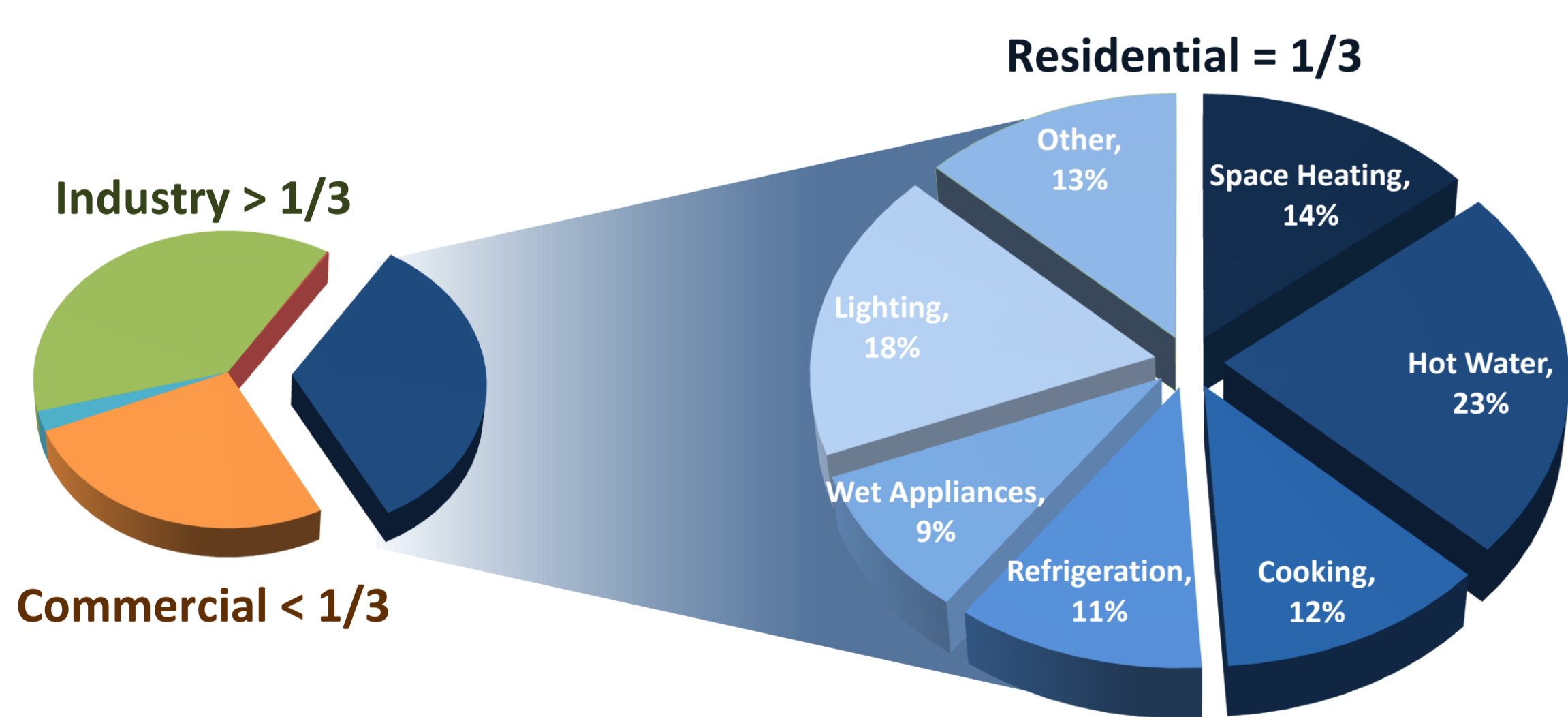


Fig. 2 Electricity consumption in Ireland

### OBJECTIVES

How much flexibility is embedded within Irish residential building electrical loads?

- Development of archetype building models representative of Irish households using EnergyPlus
- Demand modulation capability assessment for each archetype model, constrained by the comfort of occupants, the building thermal behaviour and economics (cost savings, demand elasticity)
- Correlation of outputs from each dwelling classification and scaling up to national dwelling stock scale

### METHODOLOGY & RESULTS

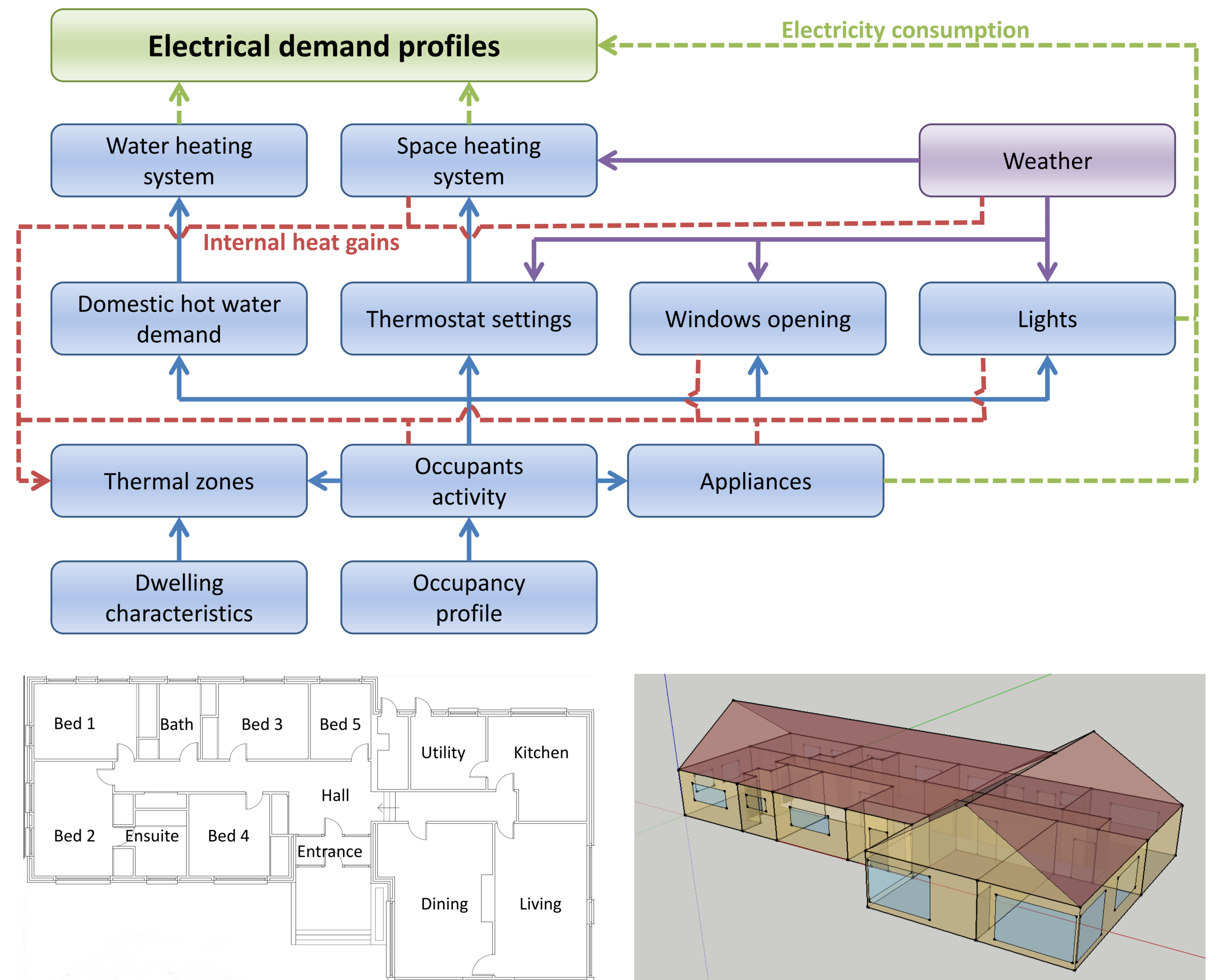


Fig. 3 Single-storey detached house and thermal zones (≥4 residents dwelling)

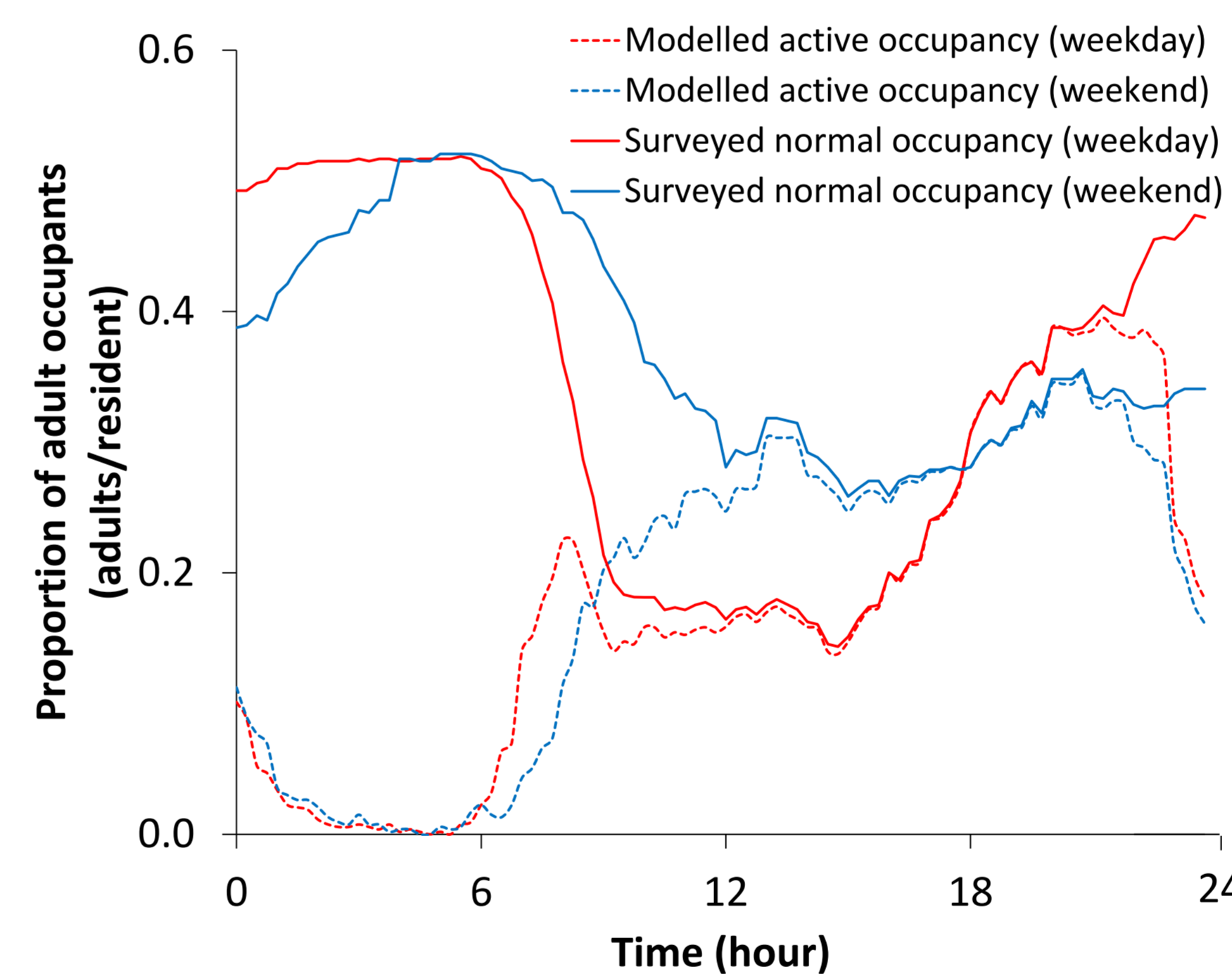


Fig. 4 Daily occupancy profiles (≥4 residents dwelling)

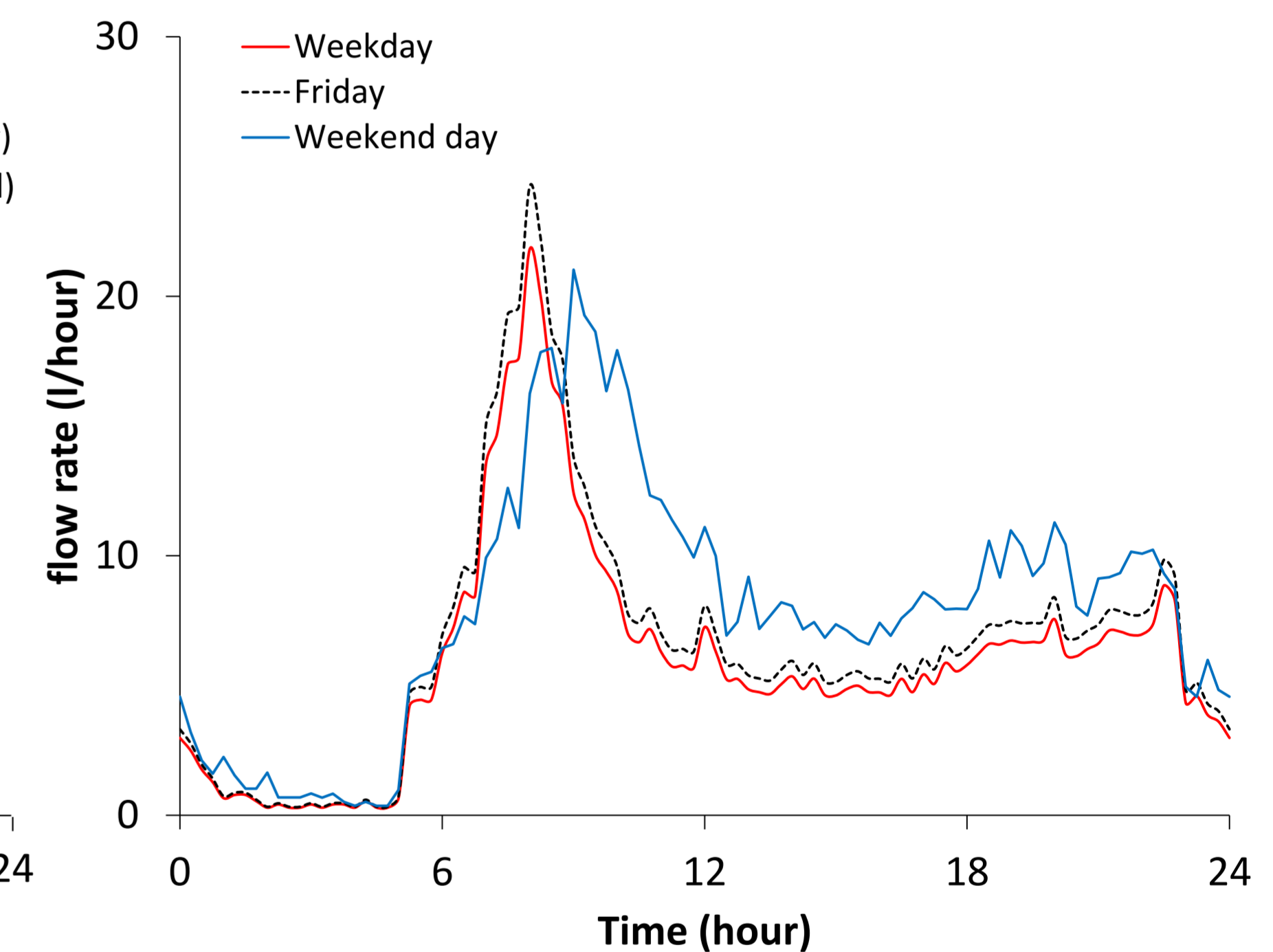


Fig. 5 Daily DHW flow rates (≥4 residents dwelling)

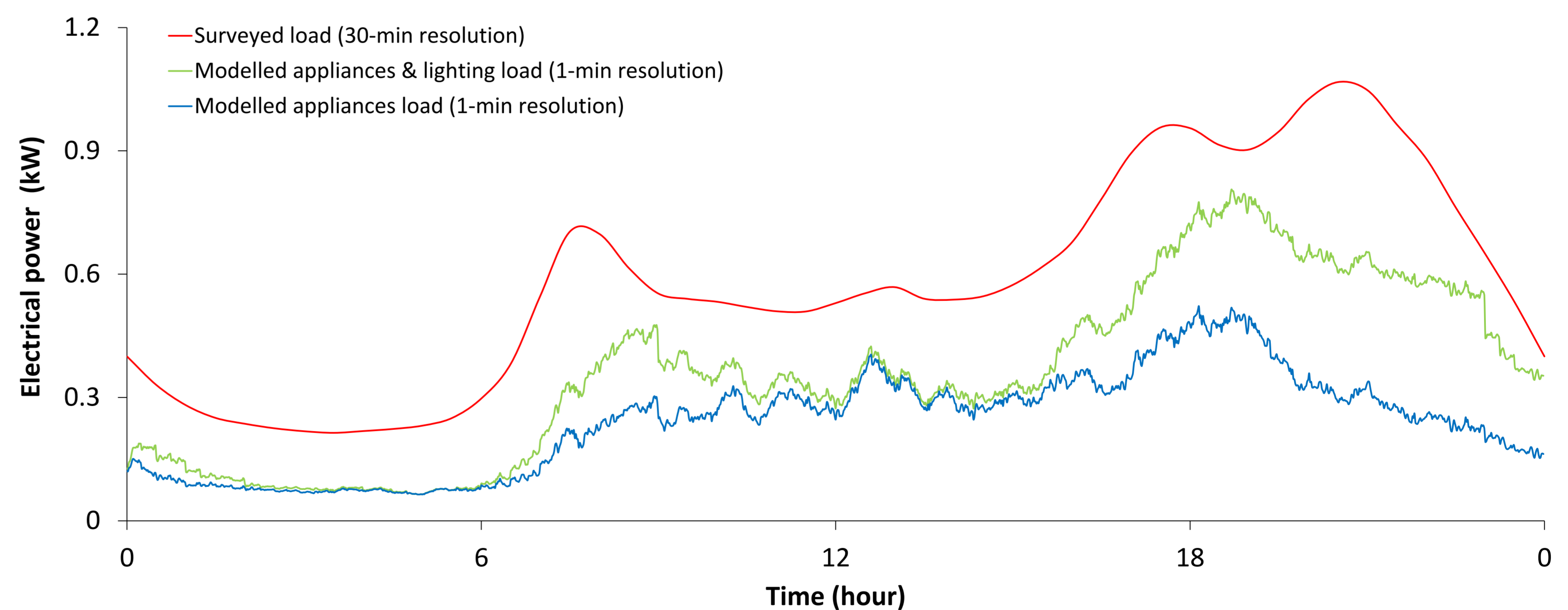


Fig. 6 Daily power consumption (weekday, ≥4 residents) / surveyed profile VS modelled profile

### FUTURE WORK

- Complete archetype building models
- Validate archetype building load profiles against real data
- Peak management capability assessment for each archetype model

### ACKNOWLEDGEMENT

This work was conducted in the Electricity Research Centre, University College Dublin, Ireland, which is supported by Bord Gáis Energy, Bord na Móna Energy, the Commission for Energy Regulation, Cylon Controls, EirGrid, Electric Ireland, the Electric Power Research Institute (EPRI) (US), Energia, ESB International, ESB Networks, Gaelectric, Intel, SSE Renewables, and United Technologies Research Centre, Ireland (UTRCI).

Olivier Neu is supported by Science Foundation Ireland under Grant Number SFI/09/SRC/E1780.