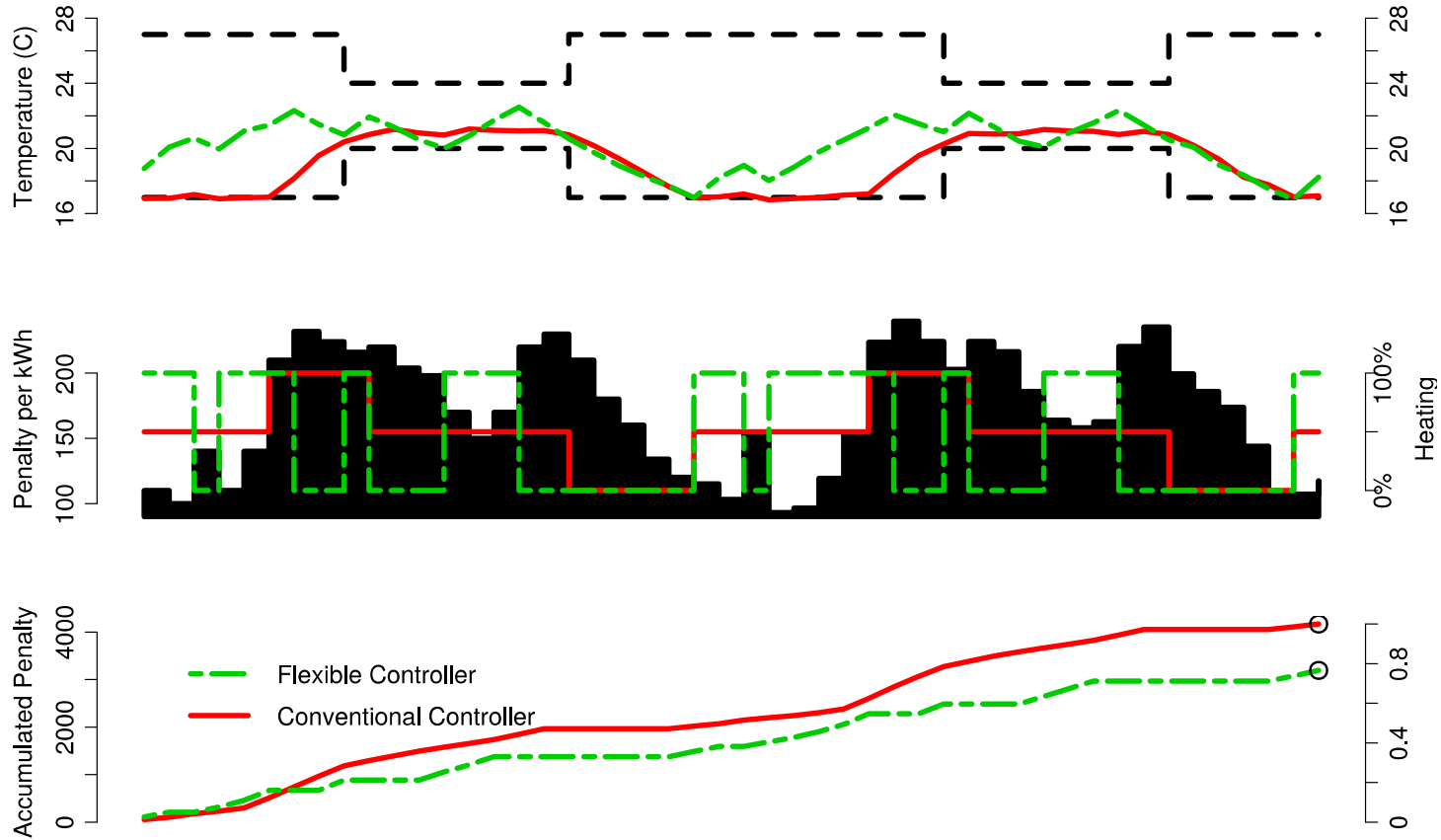


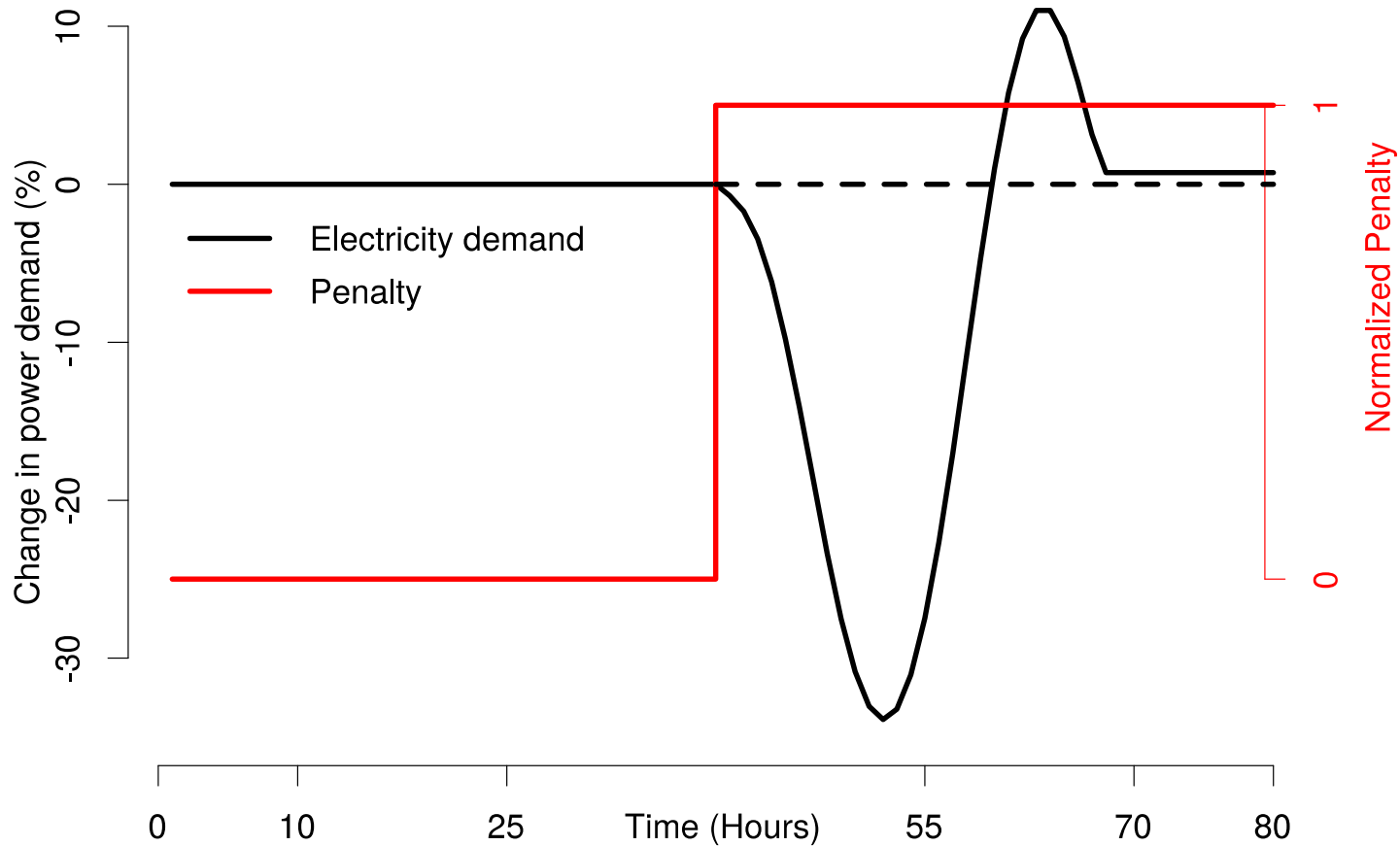
Characterizing Energy Flexibility

- Penalty based setup
- Energy flexibility characterization
- Example

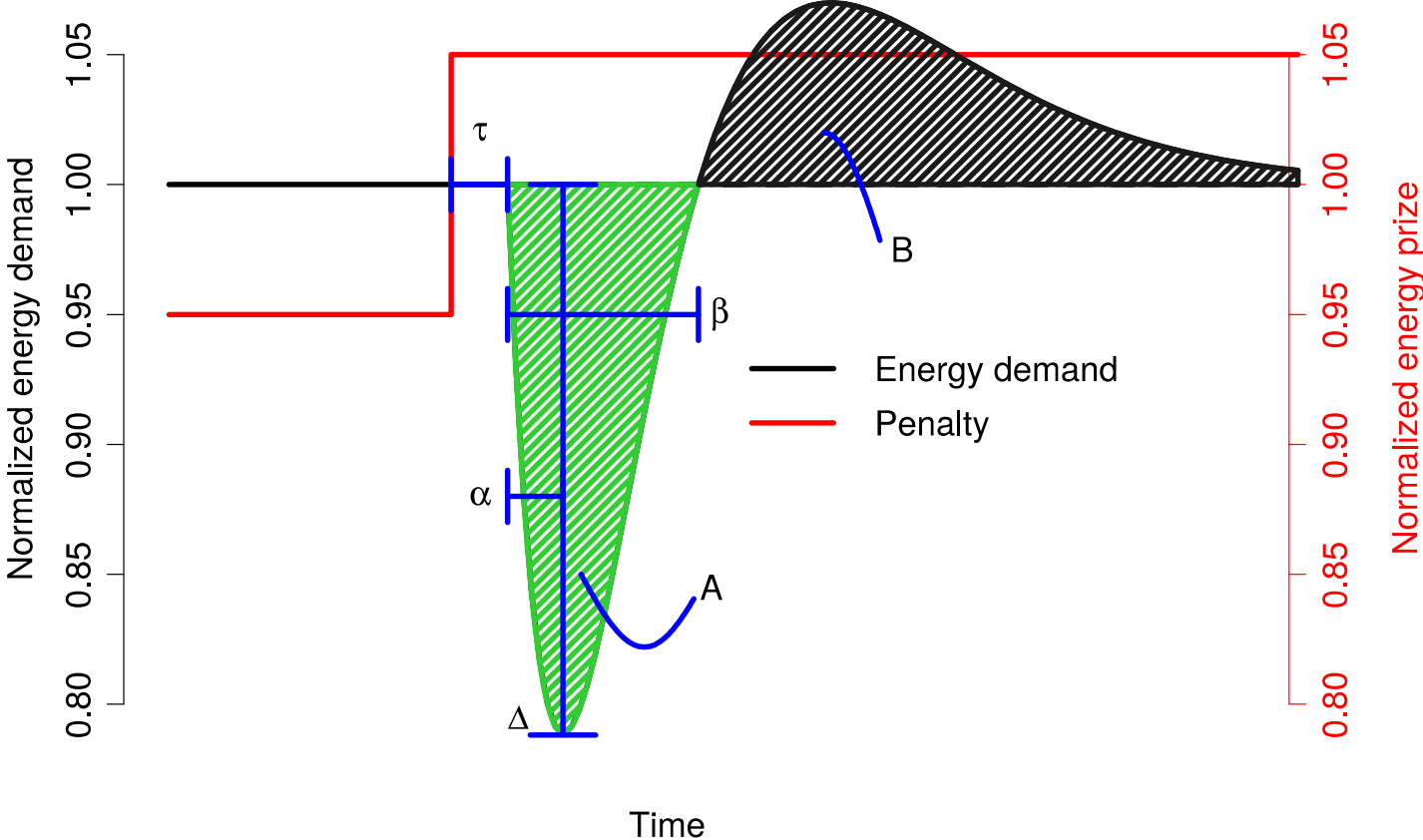
Penalty based setup



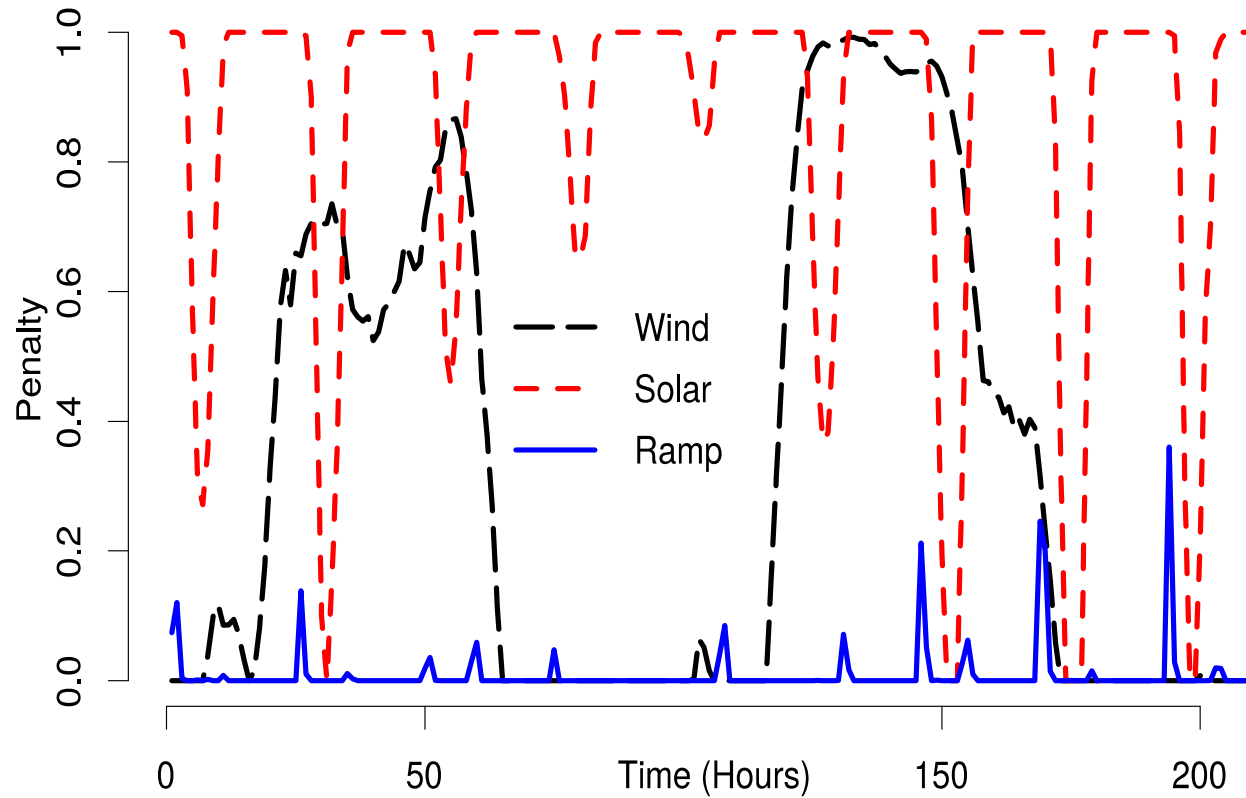
Flexibility Function of Indoor Swimming Pool



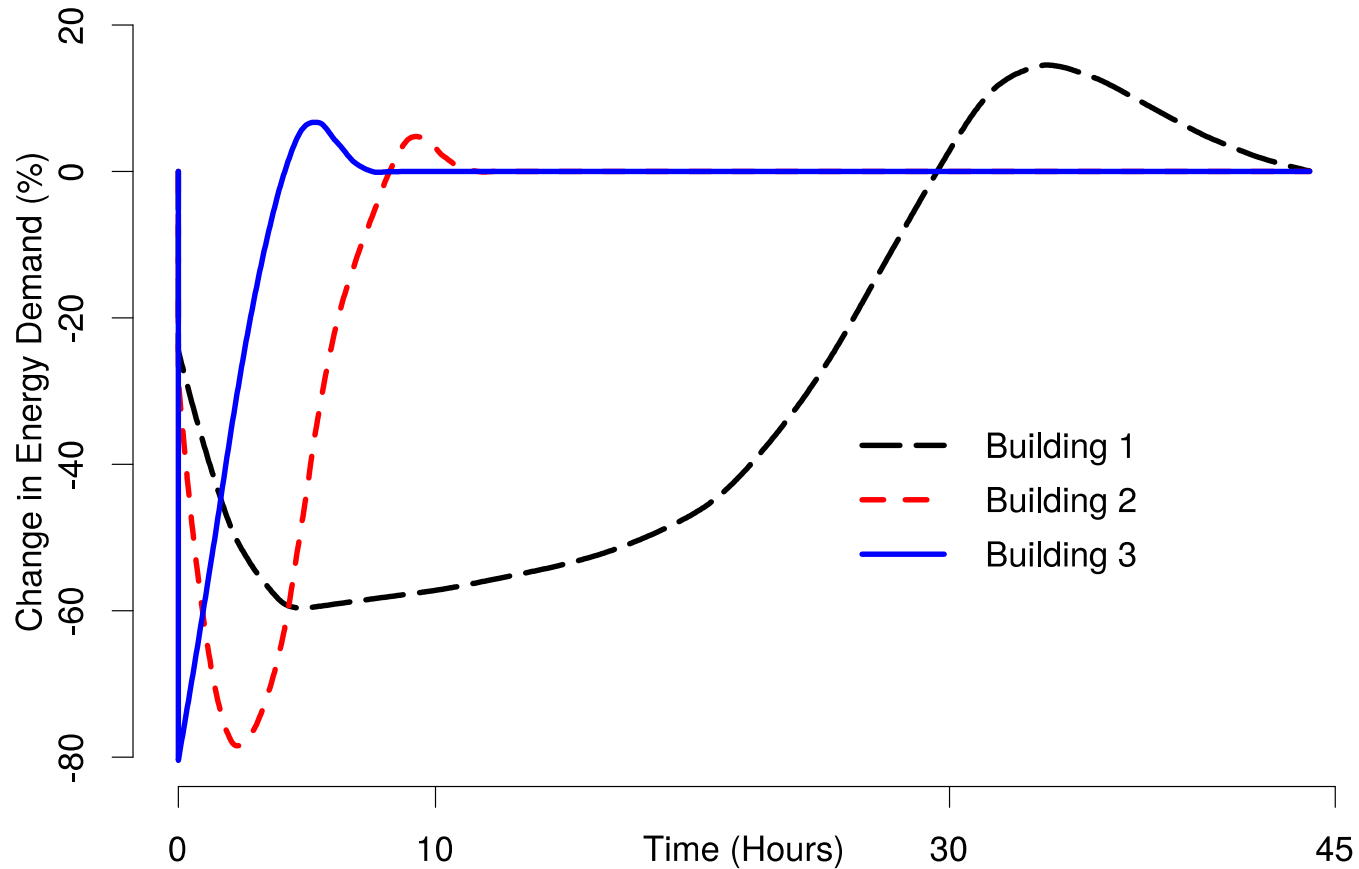
Flexibility Characteristics



Examples of Penalty signals



Examples of Flexibility Functions



Performance-based Flexibility Index



$$FI_j^i = \int_0^T Y_j^i(t) U_i(t) dt / \int_0^T Y_j(t) U_i(t) dt$$

	Wind (%)	Solar (%)	Ramp (%)
Building 1	11.8	4.4	6.0
Building 2	3.6	14.5	10.0
Building 3	1.0	5.0	18.4

Conclusions

- Qualitative analysis of Flexibility is useful
- Energy flexibility is not an ordered set
- Prices should vary according to individual Flexibility