

Participation of customers in Active Demand Side Participation programs under different pricing schemes

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Introductions

It is known that higher operational flexibility in the electricity markets is required with the implementation of new technologies and penetration of renewable resource. These changes are associated with a shift towards more flexible network operation. A particular emphasis is an expectation that this operational flexibility will be coming from the active demand side engagement. This research outlines an approach that enables consumers take part in Active Demand Participation program and help them decide how to schedule various appliances within the household. A scheduling tool that enables participating customers to automatically respond to the inflow price signals that may vary during a day is presented.

Consumer-based Scheduling Tool

- Different from the external direct load control method
- An intelligent tool which could help consumers rescheduling their home appliances in individual households automatically
- On the basis of consumers' preferences and predefined daily electricity consumption patterns



Research Methodology

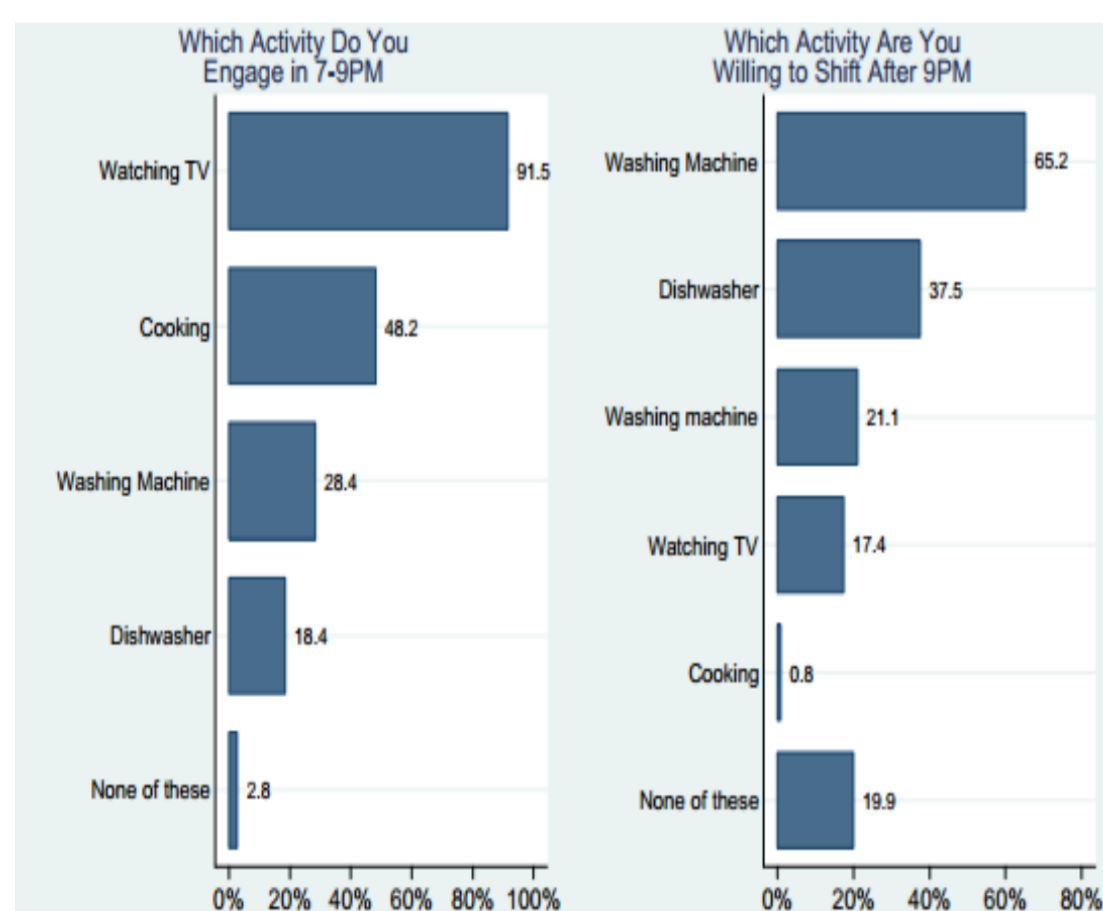
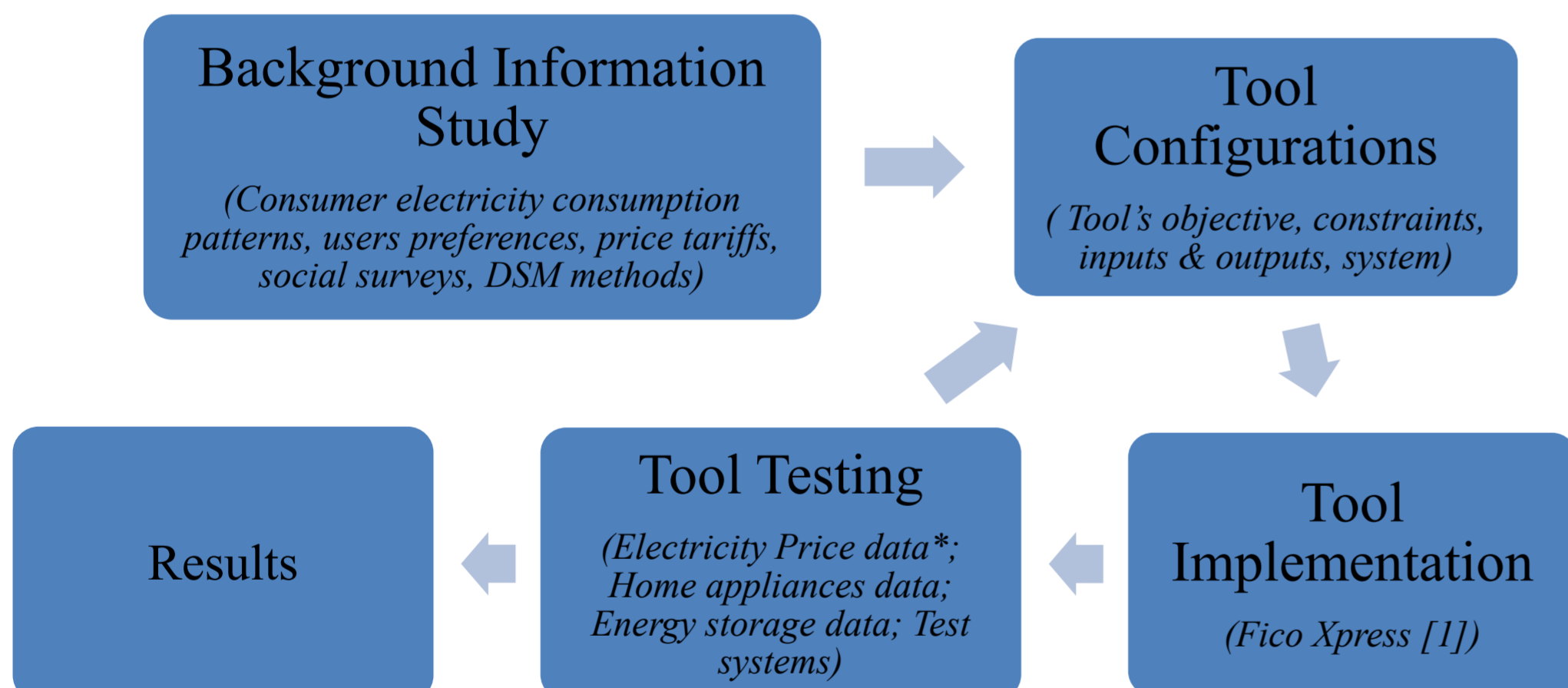


Figure 1. EPRG survey on potential load shifting. [2]

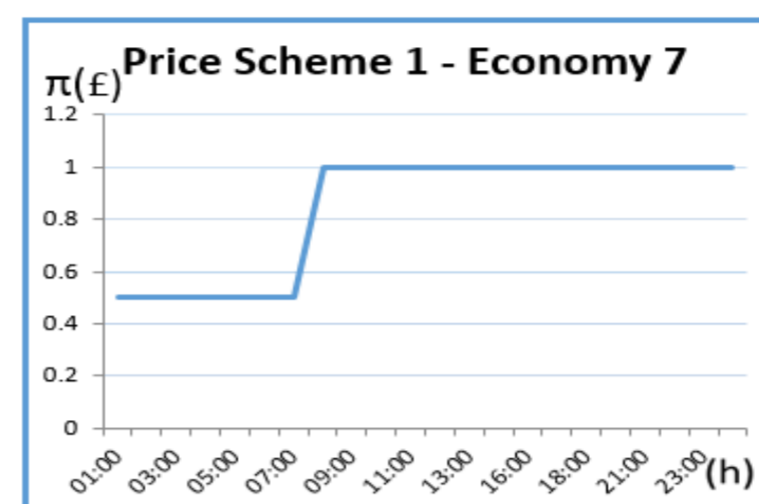
Mathematical Formulation

Minimize
(End-user's energy payments)

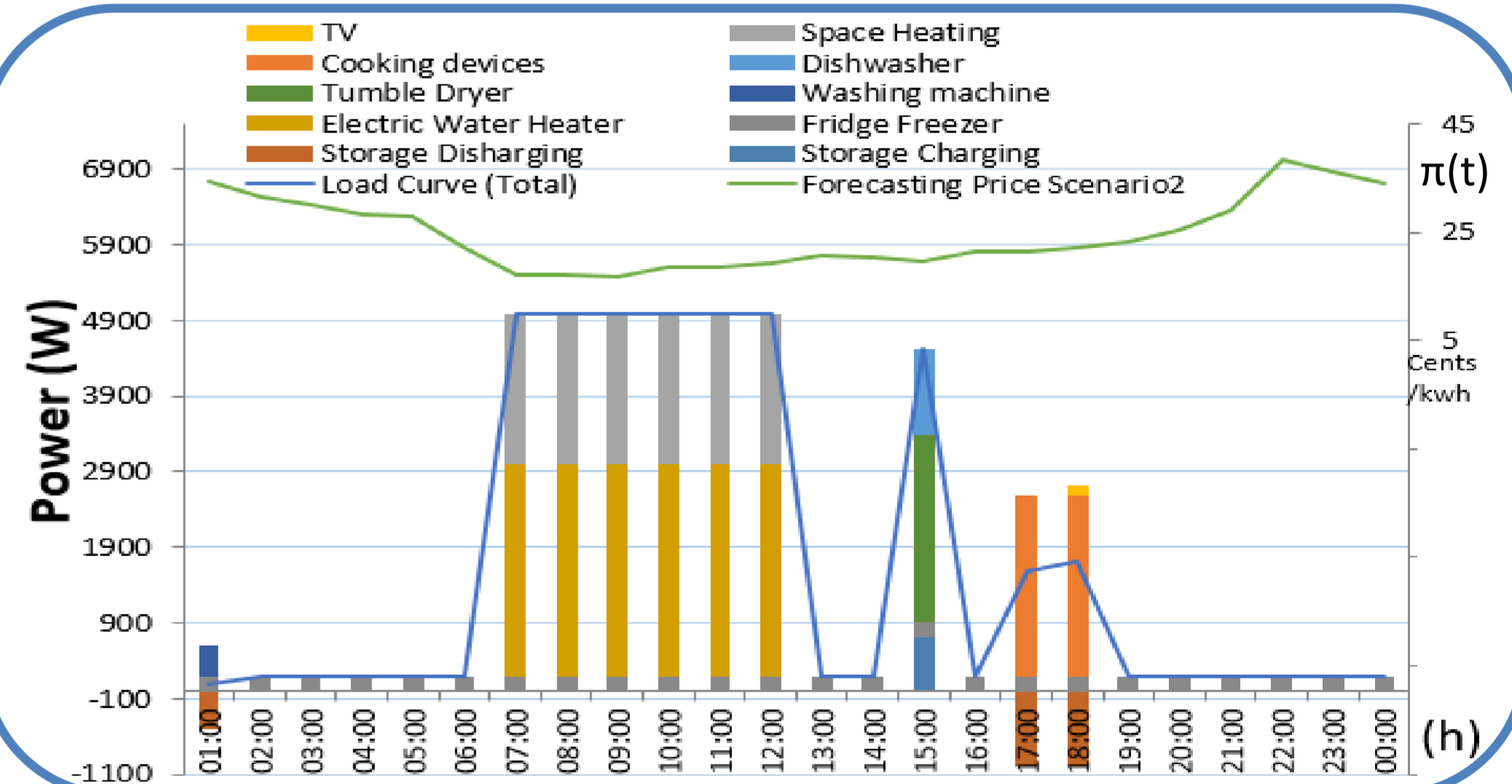
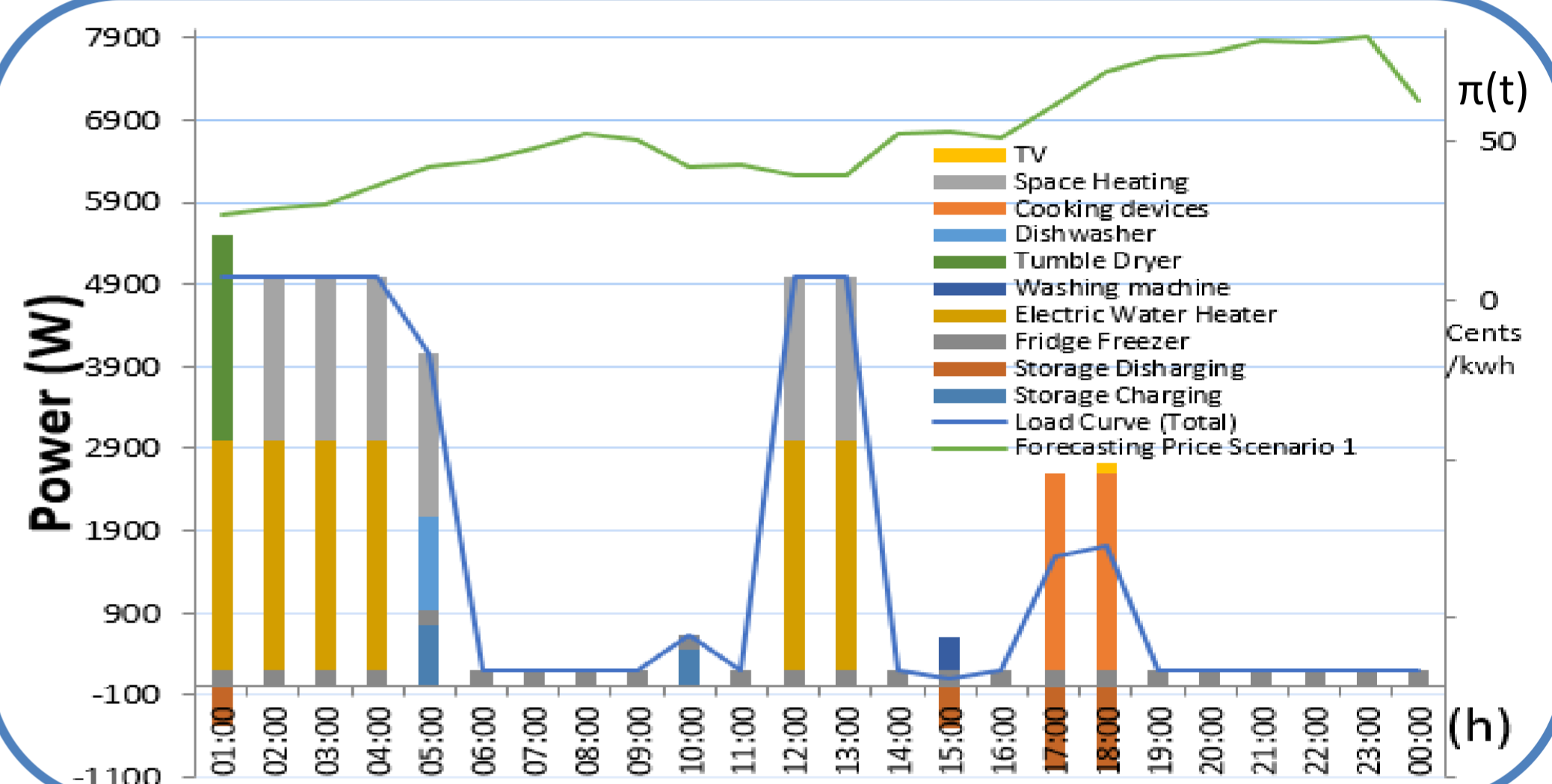
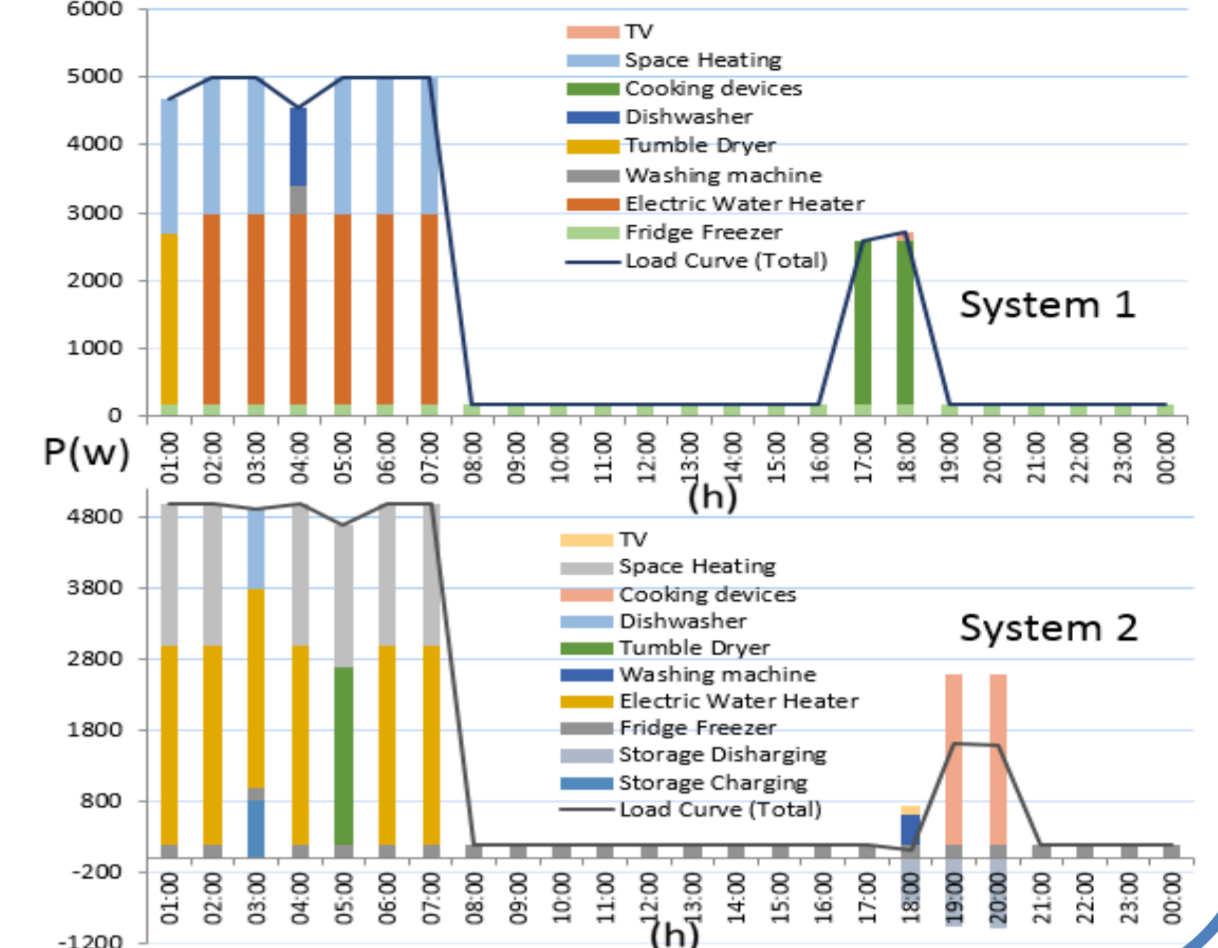
Subject to:
Household constraints
Home appliances constraints
Energy storage constraints

*The electricity price data include predetermined Time of Using price tariffs, forecasted Real-Time Pricing tariffs by means of ARIMA time series model analysis.

Price Plan 1



Results



Conclusions

The consumer-based demand side management tool helps active participation consumers changing their electricity consumption patterns corresponding to different price notifications intelligently. Moreover, the tool succeeds in achieving its goal in energy bill savings and fulfills consumers' needs at the same time.

Future Work

- Expand the system of the tool, e.g. more home appliances, different types of energy storage devices (EVs), etc.
- Add more flexibility and stochasticity to achieve dynamic control

References

- [1] Fico Xpress [Online] Available: <http://www.fico.com/en/products/fico-xpress-optimization-suite/>
- [2] L. Platchkov, M. G. Pollitt, D. Reiner, I. Shaorshadze, "2010 EPRG Public opinion survey: policy preferences and energy saving measures," Cambridge, Electricity Policy Research Group, Faculty of Economics, University of Cambridge.