Shiftable Load Scheduling in Micro-Grids

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1 Project Overview & Goal Description

Buildings are immensely energy-demanding and are expected to consume even more in the near future. The energy usage in the tertiary and residential sectors alone is responsible for approximately 50% of the greenhouse gas emissions [1]. Hence solutions that promise to modernize the electrical grid, increase reliability, and improve utilization, are of paramount importance.

Load management plays an important role in realizing the aforementioned goals, as it promises to reduce peak demand. To that end, we can utilize smart devices, which can be programmed to coordinate with each other, depending on the urgency of the task, and the current load of the grid. The focus of this project is to acclimate the student in the fields of multi-agent learning and coordination. To that end, we will consider the problem of scheduling shiftable loads, over multiple smart devices, in a micro-grid. Each device will be realized as an agent in a distributed multi-agent system. The student will study and implement various approaches for scheduling smart appliances, with the goal of reducing the peak demand on the grid.

2 Project Steps

- Get acquainted with related work (see e.g. [2], [3]).
- Implement several multi-agent coordination algorithms, and an evaluation platform.
- Empirically evaluate the properties of the implemented techniques.

3 Required Skills

Good programming skills are required (proficiency in either Java or Python).
Being passionate about the topic and good English skills are a must.

References

[1] P. Danassis, K. Siozios, C. Korkas, D. Soudris, and E. Kosmatopoulos, "A low-complexity control mechanism targeting smart thermostats," *Energy and Buildings*, vol. 139, pp. 340–350, 2017.

[2] M. Van Den Briel, P. Scott, S. Thiébaux *et al.*, "Randomized load control: A simple distributed approach for scheduling smart appliances." in *IJCAI*, 2013, pp. 2915–2922.

[3] M. Jin, W. Feng, P. Liu, C. Marnay, and C. Spanos, "Mod-dr: Microgrid optimal dispatch with demand response," *Applied Energy*, vol. 187, pp. 758–776, 2017.