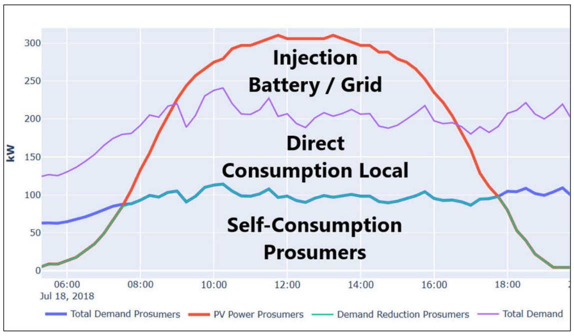
Justin Lydement

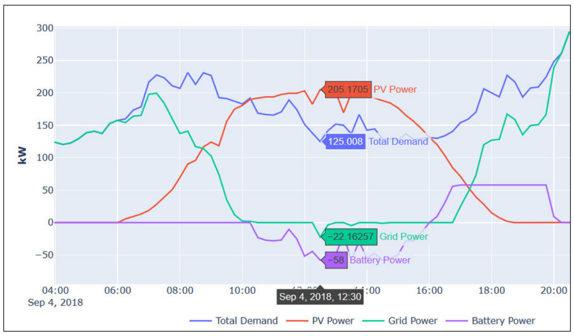
Student	Justin Lydement
Examiner	Prof. Dr. Benno Bucher
Co-Examiner	Reto Kluser, Infrastruktur Zürichsee AG, Meilen, Zürich
Subject Area	Energy and Environment
Project Partner	Infrastruktur Zürichsee AG, Meilen, Zürich

LOCAL STORAGE OF ELECTRICAL ENERGY

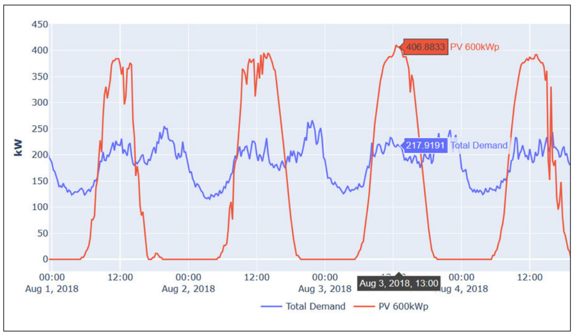
“RESEARCH PROJECT 1, MASTER OF SCIENCE IN ENGINEERING MSE”



Different Categories of Energy Flows
Own presentment



Instance where the battey charging power has reached its maximum
Own presentment



Selection of total demand and PV power 600kWp
Own presentment

Introduction: In this work, simulations of the yearly power flows for a whole neighbourhood situated in Meilen ZH are presented. The simulations incorporate the analysis of different battery systems with increasing levels of installed PV capacity up to 600kWp.

The simulations are run in the program PyPSA python for power systems analysis. The program is open source used for optimising modern power systems with wind, PV as well as conventional generators and storage.

The simulations are setup as to increase the self-consumption of the locally produced PV power. This is achieved by firstly storing the surplus power that is produced by the PV in the battery systems. In addition, the battery systems serve a second purpose of peak shaving, i.e. reducing the maximum demand drawn from the grid by discharging the batteries at times of peak demand.

Result: An overview of all the simulations is presented with losses, cycles and the source of energy for charging the battery. This shows that the grid can approximately take the double of the PV capacity up to 300kWp and still has a self-consumption ratio of 98.9% without the need for a battery system.

The impact of the different levels of PV capacity to the profit of the energy provider are featured, which finds that a higher level of PV is more profitable if all surplus power can be sold on as Regional Solar Energy. A cost analysis of the battery systems under the service of peak shaving for all battery systems is presented.

Conclusion: The report finds that all the battery systems examined at today's prices are not financially viable. With an expected drop in battery prices in the future these smaller grid battery systems (58 - 223kW) will become economical. Some larger battery systems operational in Switzerland are already cost effective. The conclusion considers these last facts and recommends that the energy service provider either waits for the price of batteries to fall or should think about a larger system on different part of the grid with higher peak demand, which can also provide additional services.