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Objectives - Challenges

The Drahi-X building at Ecole Polytechnique will be equipped with photovoltaic roof-top installation and a battery storage system. Analysing consumption data from the building and production data from the solar panels, we aim to understand load demand variability and potential flexibility in the building. Through qualitative analysis we also aim to identify human behaviour that can be changed to improve consumption flexibility in order to better match production and increase self-consumption.

Data available for the Drahi-X Optimization



The 7 Zones at the Drahi-X Innovation Building

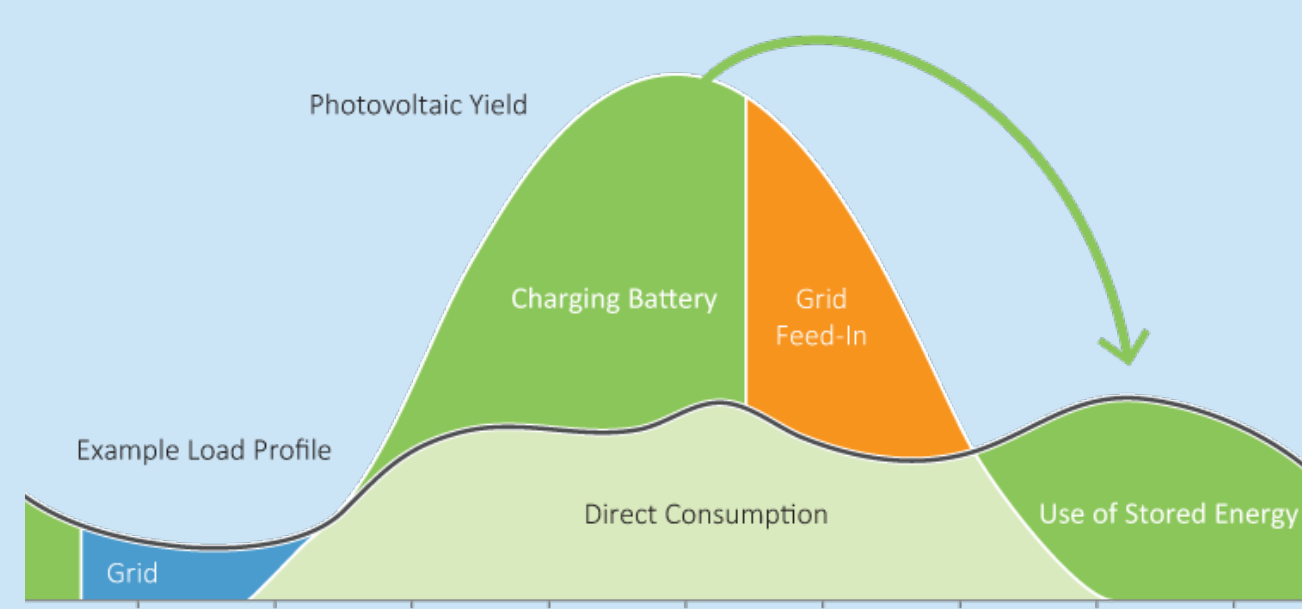


1 year of minute data:

- Building consumption data from all zones (kWh)
- Photovoltaic production (kWh)
- Air temperature (°C)

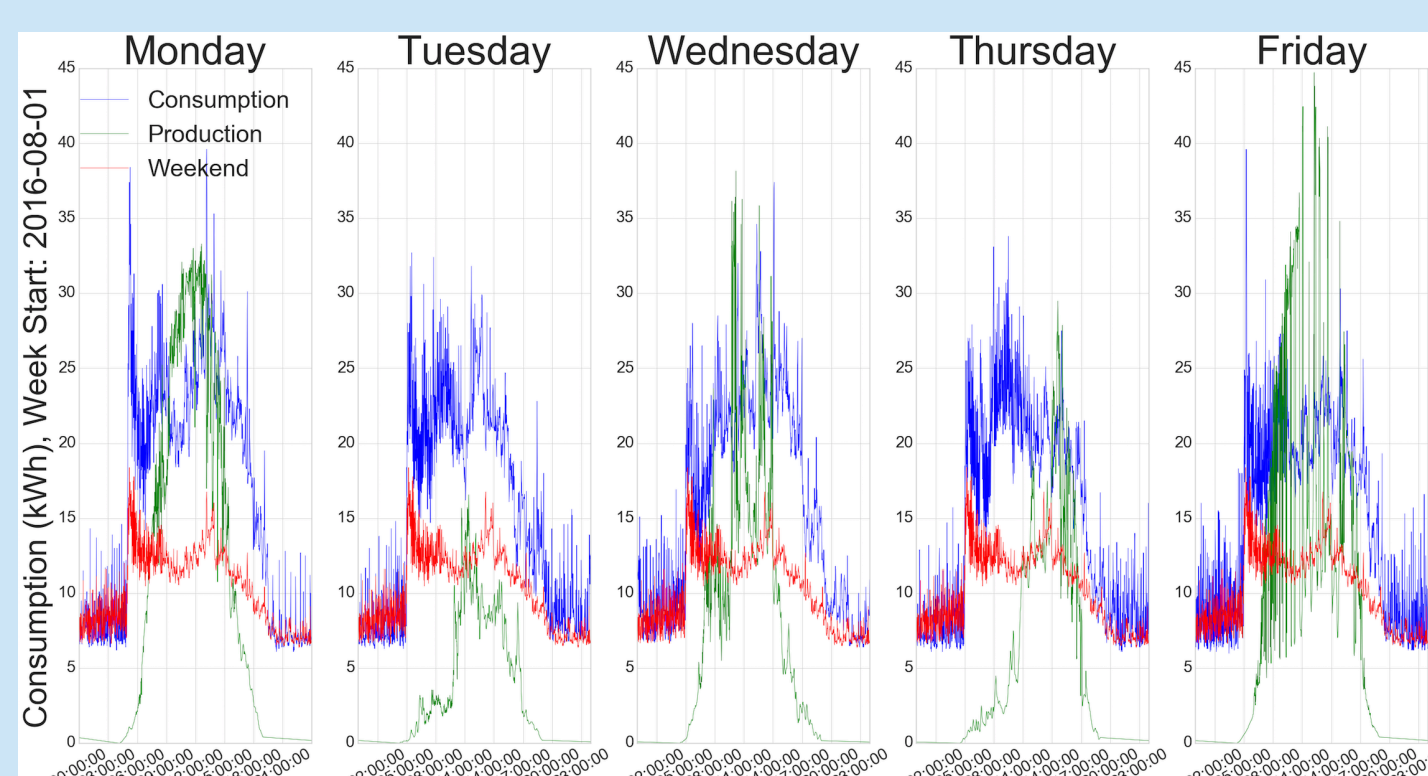
Flexible Consumption

Flexible production and consumption



Flexible consumption is the amount of PV production or load demand that can be shifted by storing surplus PV production in batteries and releasing at a later time, or by changing the time of demand.

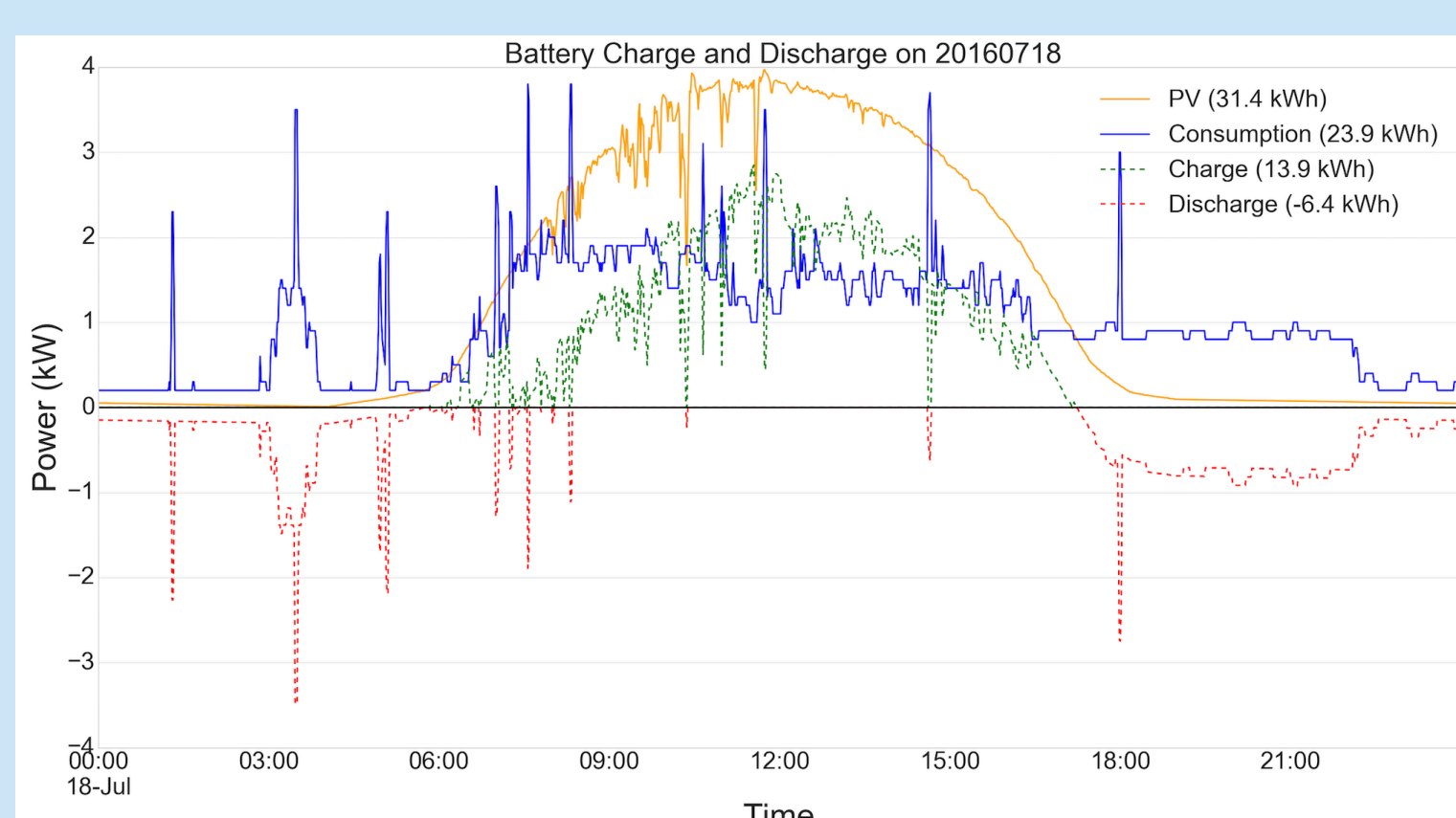
Establishing flexible consumption



The goal is to optimise for self-consumption by minimising electricity taken from the grid. It is then necessary to identify the amount of production and load that can be shifted to synchronize with PV production.

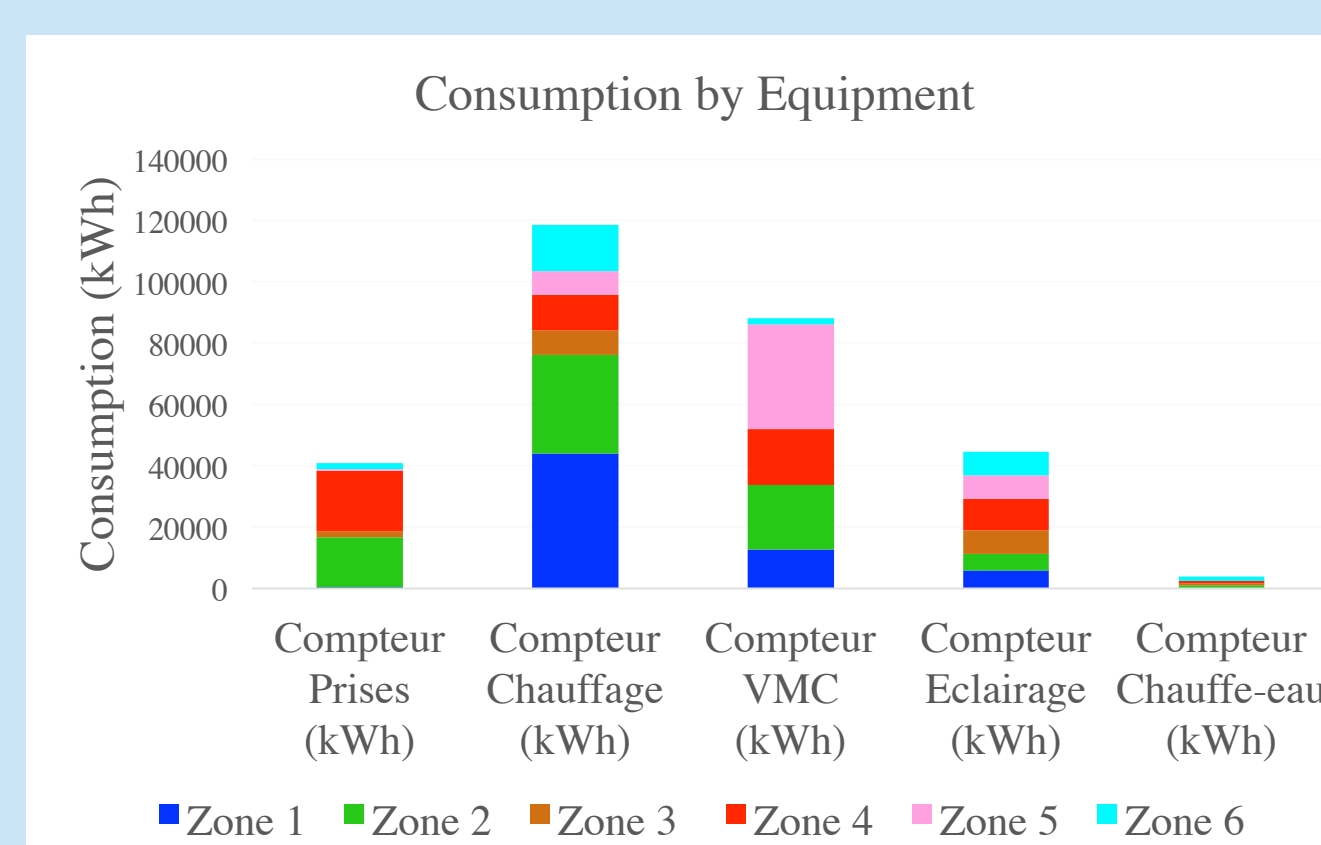
- Identification of flexible electricity consumption
- Determine the incentives to achieve load shifting
- Determine the amount of consumption that can be shifted by a change in behaviour
- Determine the amount of consumption that can be shifted by technical means

Battery Modelling



When loads are considered critical there is no room for optimisation. Therefore optimisation requires the identification of loads that can be curtailed or rescheduled.

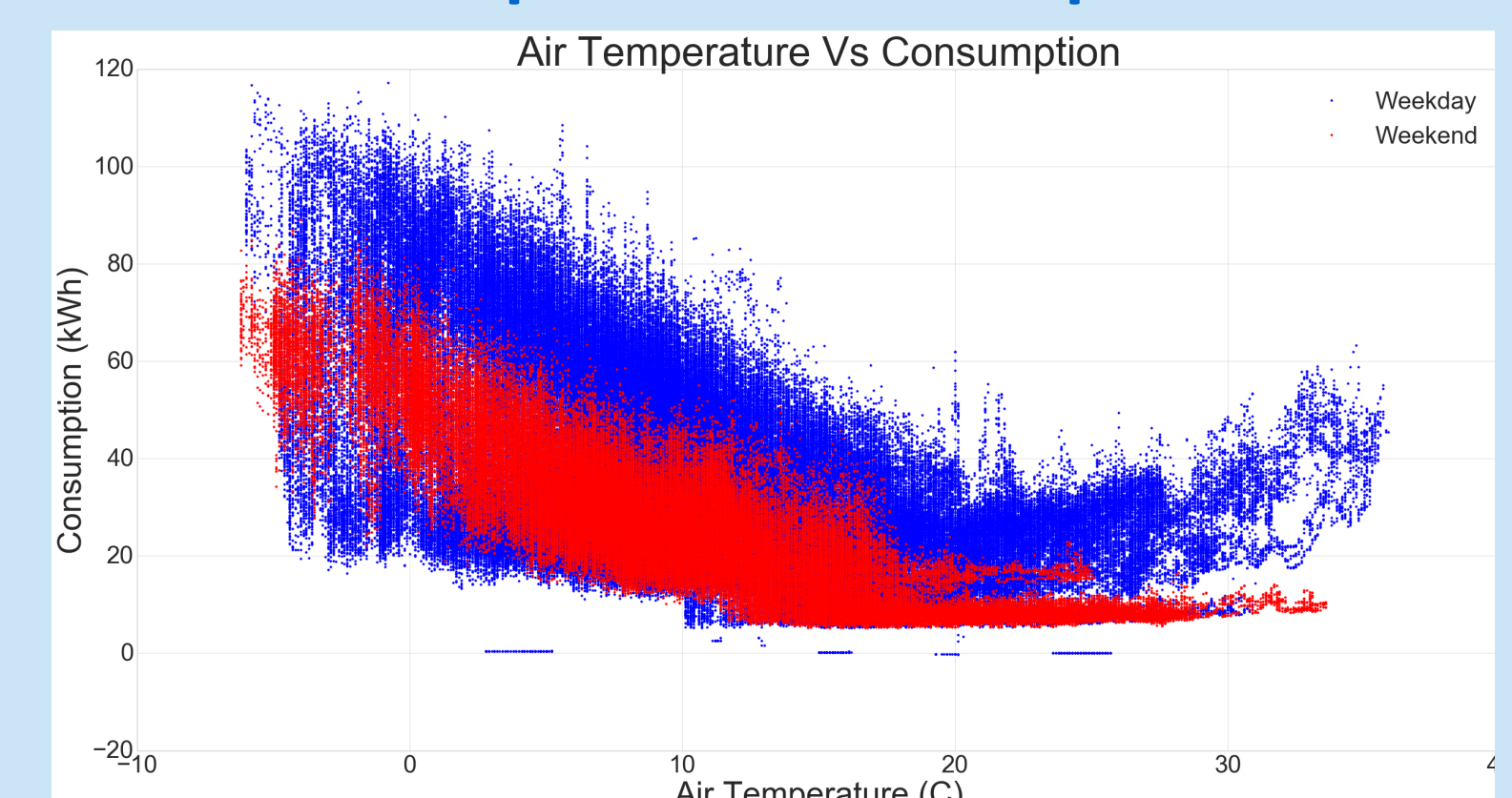
Disaggregated consumption



Understanding building equipment:

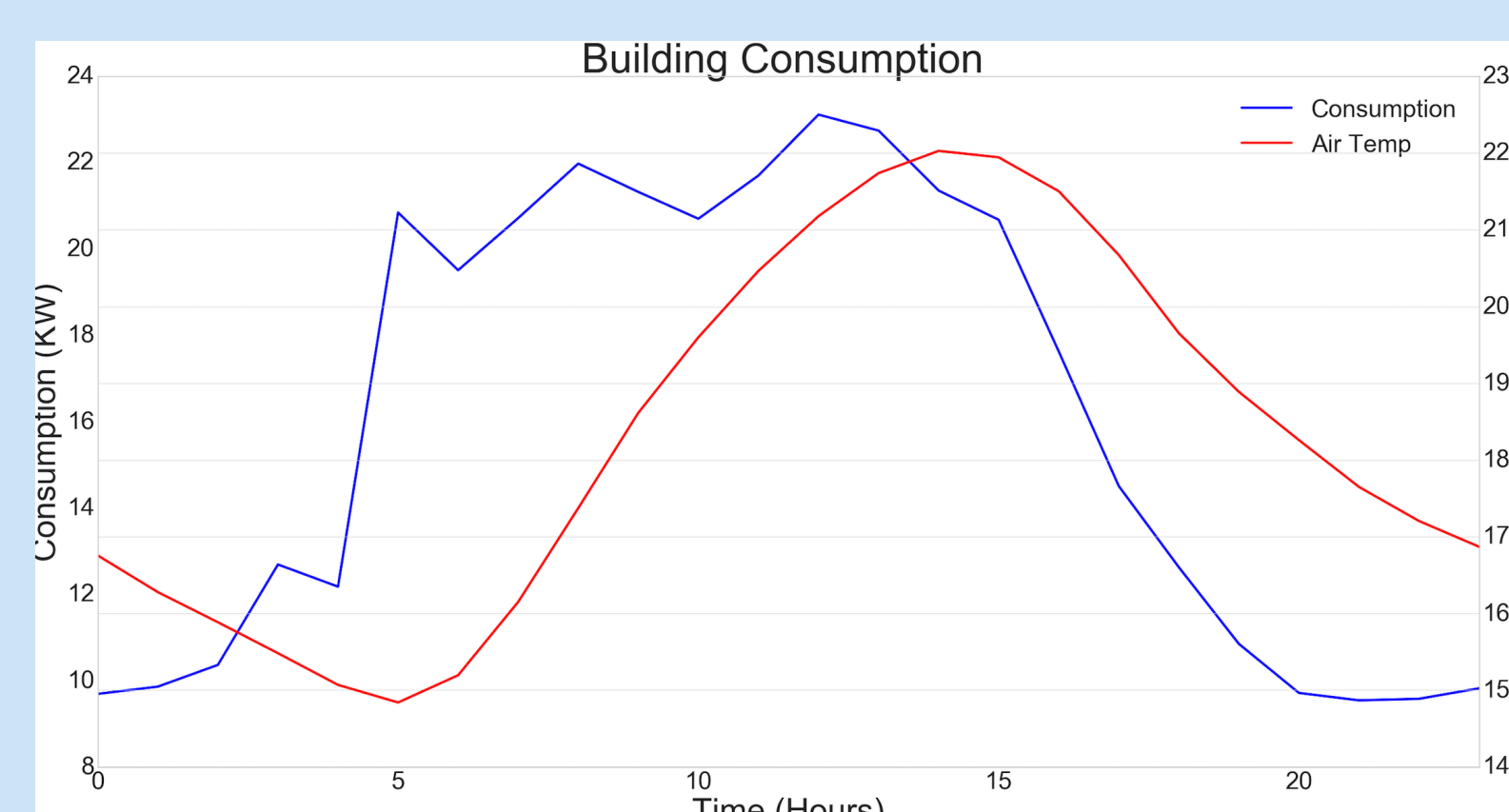
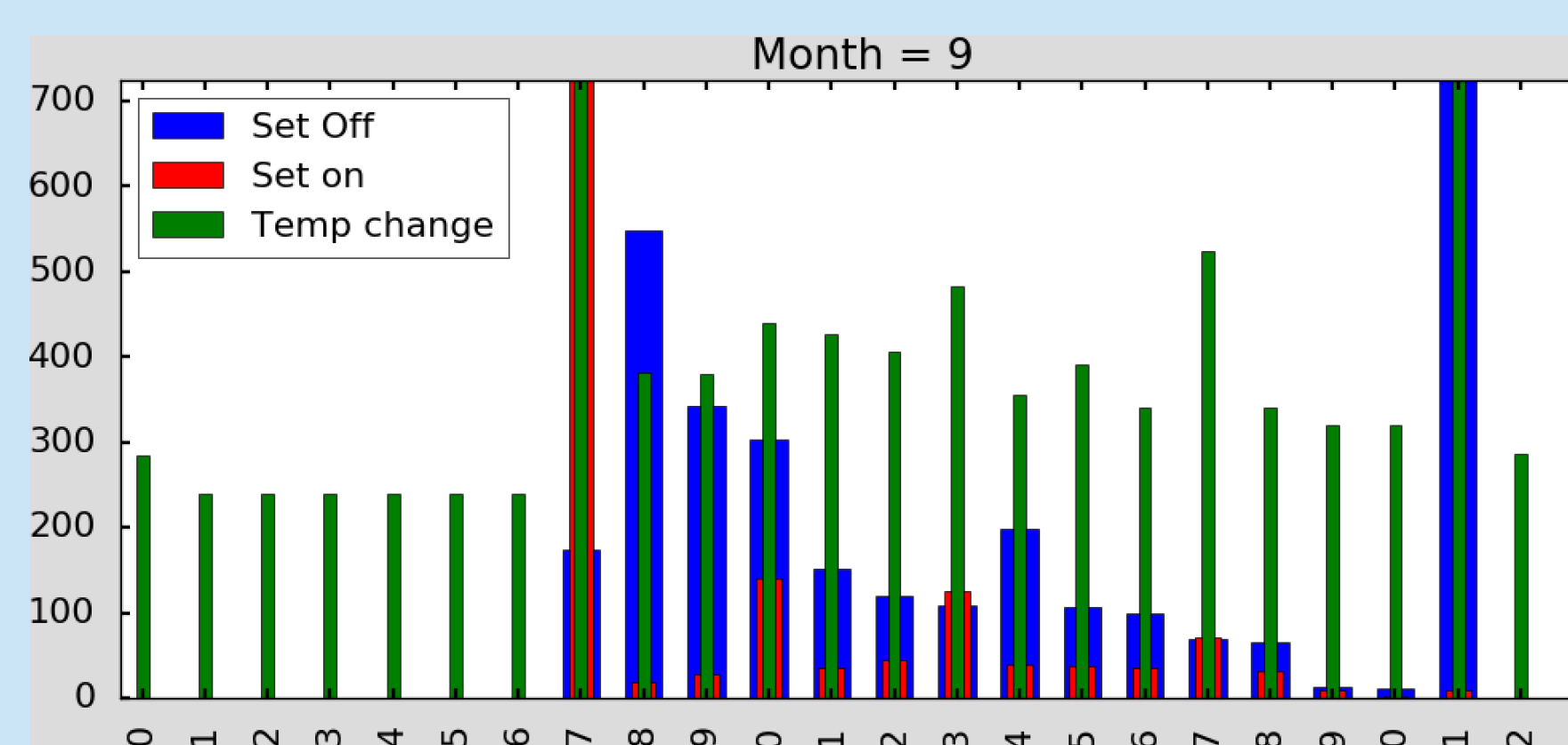
- Identify critical loads – essential to buildings operation
- Curtailable loads – loads that can be temporarily reduced
- Reschedulable loads – loads which can be rescheduled

Consumption Vs Air Temperature



- The biggest consumer of electricity at the Drahi-X building is the heating and cooling system
- To reduce load from heating and cooling systems it is necessary to understand the relationship between outside temperature and consumption

Monthly temperature commands



- Data from the heating and cooling systems reveal human interaction and behavioural patterns with temperature
- It shows when the system is switched on/off and when a temperature change is demanded
- Reduced consumption is possible by optimising the heating and cooling system using behavioural knowledge
- Real time alerts informing users of consumption peaks and curtailable/rescheduling possibilities can improve self-sufficiency

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