Hack the electron – Stream A

Get your hands on our electricity consumption dataset and design new services to increase efficiency and quality of life for millions of electricity customers

General Challenge

We challenge you to think, design and prototype services around the smart meter which will create value for residential customers. These services can be provided by the DSO itself or by other market agents.

You will have access to a dataset with load metering data from a section of the distribution grid with hundreds of different final customers (two years of data with 15-minute granularity). Some of these customers live in single/individual houses, others live in flats in three different building typologies.
You will also have access to additional information about each customer, like, for instance, contracted power.

For this challenge we have prepared a representative dataset which is a simplification of what you can observe in the real word. This means that you may find incomplete timeseries, errors and inconsistencies in the data.
Your services should be able to deal with these issues or they won't be able to deliver results in the real world. Feel free to identify the challenges that you find while developing your solutions and show us how you solved/managed them.

Inputs of the challenge

Data for the challenge will include the following files:

i) *Energy Meter Data (load_pwr.csv)*:

File with meter ID and associated load curve (for 216 different meters)

Field Name	Description
Day	Reference day of the data. Format: "YYYY-MM-DD"
15-minute timestamp	Reference 15-minute timestamp. Format: "HH:MM:00"
Meter_0	Average 15 min power value for the first Meter [W]
...	
Meter_215	Average 15 min power value for the last Meter [W]

ii)

File with meter ID and associated load curve for the Common Services (e.g. garages, stairway areas) – see section v).b for more detail

Field Name	Description
Timestamp	Time stamp of the Common Services of the building. Dataset from 10/01/2016 to 10/01/2018. Format: "DD/MM/YYYY HH:MM".
Meter 216	Average 15 min power value for the Medium size building [W]
Meter 217	Average 15 min power value for the Large size building [W]
Meter 218	Average 15 min power value for the Small size building [W]

iii) *Photovoltaic Generation Data (pv_pwr.csv)*

File with meter PV Generation Load Curves. This timeseries doesn't include system losses (e.g. Inverter). As a reference system losses are typically around 14%. Feel free to use other assumptions as long as you justify them.

Field Name	Description
Timestamp	Time stamp of the PV Power. Dataset from 10/01/2016 to 10/01/2018. Format: "DD/MM/YYYY HH:MM".
PV Power	Power generated by each panel (270W peak power) [W]

iv) *Smart Meters index data (dataset_index.csv)*

File with contract related data.

Field Name	Description
meter_id	ID of the meter (associated to a consumption location). Format: "Meter_###"
tariff	Single tariff, Time of Use – Two Periods, Time of Use – Three Periods
n_phases	Number of phases in the contract. Format: mono-phase [M]; triple-phase [T]
ctrct_pw	Contracted power [kVA]

v) *Support Data (HackTheElectron Dataset Support Data.xlsx):*

a. Sheet: "PV_Storage_Transformer_Info"

i. PV Panel info
   1. Peak power [W]
   2. PV Panel Area in square meters [sqm]
   3. Fixed Costs to install one panel [eur]
   4. Variable Costs per panel. Consider the panel, inverter and other related costs included in this value [eur]
   5. Dimensions (Height, Width, Depth) [mm]

ii. Energy Storage
Two typologies of storage are presented Type A and Type B. For each the following information is provided:
   1. Capacity [Wh]
   2. Power [W]
   3. Cost (including installation) in Euros [eur]

iii. Land Rent Cost
If your Business Case requires an area greater than the rooftop of the building (or the rooftop is not a suitable place for its implementation), you should pay a rent for the "extra" land usage.
   1. Cost per square meter per year in Euros [eur/sqm/yr]

iv. Secondary substation transformer rated Power
   1. Power [kVA]

b. Sheet: "Building Info"

i. Average Building and load values

Three typologies of buildings are presented: Small, Medium and Large. For each, the following information is given:
   1. Number of floors in the building
   2. Number of flats in the building
   3. Average load of the building in Portugal [MWh]
   4. Maximum number of PV panels installable in each building typology.

ii. List of clients allocated to a Small, Medium and Large building

A list of clients and ancillary services allocated to each building type is provided, with the following information:
   1. Meter ID for the Ancillary Services for each type of building.
   2. Meter ID for the Clients in each type of building.

You can create more buildings if you wish, by selecting individual consumption profiles to fit any of the described typologies.

c. Sheet: "Regulated Tariffs ERSE"

Prices for the several types of tariffs for the regulated market, including:
   1. Power cost per day for the different levels of contracted power
   2. Energy cost per kWh per tariff type and time-of-use
   3. Time-of-use information

These tariffs are for the regulated market and should be considered as a baseline. Other tariffs can be used if adequately justified.

d. Sheet: "Regulated Tariffs ERSEnon_table"

The same information in the "Regulated Tariffs ERSE" sheet in a non-tabular format, that may be easier to use.

e. Sheet: "Holidays & Daylight-Saving Time"

i. List of national and Lisbon holidays
   1. Date
   2. Name
   3. National/Local

ii. Daylight Saving Time (Summer/Winter)
   1. Daylight Saving Time Dates

Notes:

- The data specified here is meant to help you develop your solution. Feel free to select which information should be used for your particular business case.
- The PV generation dataset was interpolated from PVGIS data for Lisbon, and represents an estimation of the power generated per PV panel per 15 min.
- If there is surplus energy generated and injected in the DSO grid, it will not be remunerated.
- Energy = Power x Time
- Consider the support data as baselines. If you want to use other assumptions, you can do so as long as you justify their rationale. Additionally, feel free to develop a sensitivity analysis over the economic assumptions to validate/support your business case(s).

The data will be available in the Microsoft Azure link provided to all the participants.