**Openvolt Test API**

**Goal**

A commercial building in the UK (Stark Industries UK HQ) consumes electricity from the National Grid. Write a programme in a language of your choice that calculates:

1. The monthly energy consumed by the building (kWh)
2. The monthly amount of CO2 (kgs) emitted by the electricity generated for the building. Use half hourly readings from data sources to calculate this
3. The monthly % of fuel mix (wind/solar/nuclear/coal/etc) used to generate the electricity. Again, use half hourly readings to calculate weighted average

The timeframe is for the month of January 2023  
‍  
Resources

1. The Openvolt API ([docs.openvolt.com](https://docs.openvolt.com/)). The building has one electricity meter with a meter\_id of "6514167223e3d1424bf82742" Use x-api-key "test-Z9EB05N-07FMA5B-PYFEE46-X4ECYAR" for API calls
2. Official Carbon Intensity API from the National Grid  (link to [API)](https://carbon-intensity.github.io/api-definitions/#carbon-intensity-api-v2-0-0)

**Approach**

Build application that can take flexible start and end dates and produce a report for a specific customer with separate summaries for each meter.

Retrieve a list of meters for the customer and/or specific meter id from Openvolt. (get\_meters)

Retrieve a list of Carbon Factors which detail the CO2(g) production for the various fuel types per kWh from National Grid (get\_carbon\_emission\_factors)

Retrieve a list of consumption kWh’s for each meter per half hour interval from Openvolt (get\_meter\_interval\_data)

Retrieve a list of fuel generation percentages from National Grid for each half hour period and align with the meter readings from OpenVolt. (get\_generation\_mix\_data)

Create a new combined report giving the total kWh consumed per meter per half hour interval with a breakdown showing the kWh produced per fuel type. (get\_consumption\_source\_report).

Total this report to give us a kWh summary that will satisfy point 1 & 3 of our goal

Create a new combined report giving the total CO2(g) consumed per meter per half hour interval with a breakdown showing the CO2(g) produced per fuel. (get\_carbon\_emissions\_report)

Total this report to give us a breakdown in % of the total CO2(kg) produced for the period satisfying point 2 of our goal

**Assumptions**

* Meter\_id is unique for every meter across every customer (unlike meter\_number)
* The Carbon Factors CO2 production data provided by the National Grid breakdown the “Imports” and “Gas” into more granular categories, which don’t align to their Generation Mix categories. For this use case I’m just averaging these figures into the more generic categories but obviously would expect a more structured approach in a production environment.
* Initially the Generation Mix dataset is attempting to use a postcode pulled from meter address to get regional data, this isn’t robust (auth issues but also if Outcode can’t be detected from address string) so implicitly falls back to the national dataset if it fails. Per region is in beta with National Grid so likely something that would be made more robust (on both sides) in future.
* Interval identifier does cater for a per minute granularity but for now I’m only enabling dates/day level from the command line (which is fine for the Goals above)

**Validation**

* To validate my results, I’ve added an “-output” flag to the python version which will produce 4 separate csv files when invoked. JS version matches Python figures, so this covers both
* Files
  + **{prefix}\_{meter}\_\_meter\_interval.csv**
    - Shows all meter consumptions values per interval for validation
    - Sum the total column to confirm total consumption matches Goal 1
  + **{prefix}\_{meter}\_\_generation\_mix.csv**
    - Shows % of production per fuel per interval for validation
  + **{prefix}\_{meter}\_\_**\_**consumption\_source.csv**
    - Shows breakdown of kWh produced per interval per fuel type for validation
    - Sum each fuel column and use that total to calculate percentage against overall total and confirm it matches Goal 3
  + **{prefix}\_{meter}\_carbon\_emissions.csv**
    - Shows breakdown of CO2(g) per interval for validation
    - Sum the total column and divide by 1,000 to confirm Goal 2

**API’s Used**

* OV List of Meters https://api.openvolt.com/v1/meters
* OV Meter Interval Consumption https://api.openvolt.com/v1/interval-data
* NG Carbon Emissions https://api.carbonintensity.org.uk/intensity/factors
* NG generation mix
  + National) https://api.carbonintensity.org.uk/generation/
  + (Regional by postcode) https://api.carbonintensity.org.uk/regional/intensity/