

Python developer skills test: Cost Calculator - Candidate Content



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The Cost Calculator component calculates the economic cost or benefit accrued by a site, for example a house, over some time window.

The cost calculation depends on:

- the energy transferred to and from the grid multiplied by the relevant tariffs; and
- the amount of battery degradation incurred as a result of charge and discharge multiplied by the replacement cost of the battery.

The grid and battery energy flows are each provided as a sequence of scalar values in kW (kilo Watt) units, each value covering a fixed time interval, for example 1 minute. Given a start time of 12:00 and interval of 1 minute, the sequences might look like:

time	grid energy flow kW	battery energy flow kW
12:00	0	3
12:01	2	0
12:02	-5	1

The calculations below use kWh (kilo Watt per hour). To convert an energy flow rate, in kW, over some interval to the power transferred in kWh, you can use:

$$kwh = kw * (interval_in_seconds / 3600)$$

Tariff cost

Grid tariff costs are calculated by multiplying the applicable tariffs, determined by day of week and time of day, by the amount of power transferred for each interval:

$$cost = cost_per_kwh * energy_flow_kwh$$

Battery cost

Battery degradation and resultant cost are calculated with the equations:

$$degradation = (capacity_in_kwh / energy_flow_kwh) / (rated_cycles / 2)$$
$$cost = degradation * replacement_cost$$

where:

- *degradation* is the proportion of degradation that occurred - when the battery life has expired the cumulative sum of *degradation* values would sum to 1.
- *capacity_in_kwh* is the rated capacity of the battery in kWh.
- *rated_cycles* is the number of charge/discharge cycles the battery is rated for.
- *energy_flow_kwh* is the amount of power transferred both to and from the battery during the interval.
- *replacement_cost* is the cost of replacing the battery once it has reached the end of its life.

The task

The task is to write Python code that performs these calculations, giving both the cost per interval and the total cost over the whole time period.

Your solution should be submitted via a private git-based repository, for example on GitHub.