**Documentation for the Solar Battery Savings Model**

**Purpose of the Model**

The aim of this model is to assess the financial benefits of installing a battery system alongside existing solar panels for a residential electricity consumer over a 20-year period. This analysis is conducted under two scenarios of electricity price increases, providing insights into potential cost savings and investment viability.

**Data**

The model relies on hourly data from 2020 for solar electricity generation and household electricity usage. Before analysis, comprehensive data checks are performed:

* Validation for missing values and data consistency – This step is accomplished by initial profiling and confirming the completeness and consistency, in terms of data types, of the data set.
* Identification and handling of outliers to ensure data integrity – Abnormal values i.e. absurdly high values and inaccurate readings are handled.
* Corrections for negative values in excess solar electricity generated over electricity used, ensuring logical coherence in calculations.

**Assumptions**

* Constant electricity prices are assumed within each month.
* The battery system has a fixed maximum capacity of 12.5 kWh and will not suffer degradation with use over time.
* Unutilized excess solar electricity due to battery capacity constraints is disregarded.
* Prioritization in electricity supply follows solar generation, battery discharge (if available), and finally, electricity purchases from the provider.

**Methodology**

Data Preparation: Hourly data for solar generation and electricity usage in 2020 are processed and checked for consistency.

Hourly Calculations: Excess solar electricity over usage is computed for each hour.

Hourly electricity purchases from the provider are determined, considering both with and without a battery.

Cumulative battery charge levels are modelled, accounting for operational constraints and capacity limits.

Projection for 20 Years: Future annual savings from battery installation are projected for 20 years under two scenarios of electricity price increases.

Net Present Value (NPV) and Internal Rate of Return (IRR) are calculated for each scenario. NPV is taken as (savings/1+discount) y and then taken as a sum for 20 years. IRR is the cash flows of 20 years taking our initial costs and annual savings.

**Conclusion**

This documentation provides a comprehensive overview of the Solar Battery Savings Model, ensuring transparency in assumptions, methodology, and validation processes. By adhering to best practices in model documentation, stakeholders can confidently interpret and utilize the model's outcomes for informed decision-making.