How Designer Calculates Battery Backup Time for SolarEdge Energy Bank

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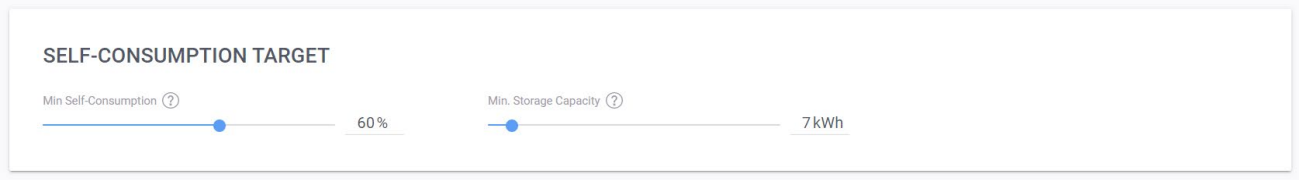
In this application note, we explain how Designer calculates how many batteries are required to support self-consumption or backup requirements instead of using electricity from the grid.

Calculating the Number of Batteries Required for Self-Consumption

By determining the minimum self-consumption and minimum storage capacity, the Designer calculates the minimum number of batteries that are needed to support these requirements, instead of using electricity from the grid. The number of required batteries is called battery capacity. Designer calculates self-consumption in two ways:



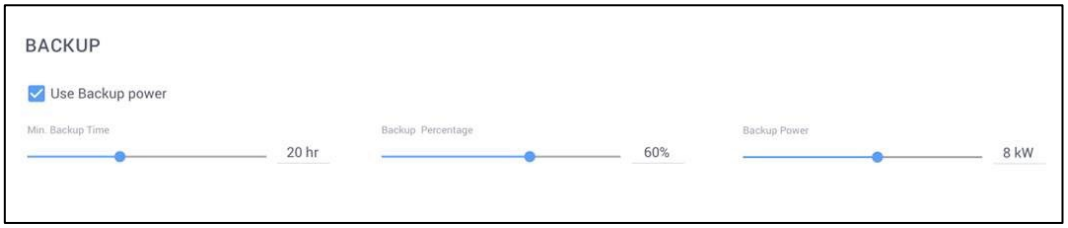
- **Minimum Self-Consumption** is the lowest amount of self-consumption from PV and battery that the site needs to maintain itself.
- **Minimum Storage Capacity** is the lowest capacity of storage needed to meet the site's requirements.

Calculating Backup Time and Battery Requirements

To determine how many batteries are required for backup, Designer first calculates the backup requirements. Then, it calculates the number of batteries required to support the backup.

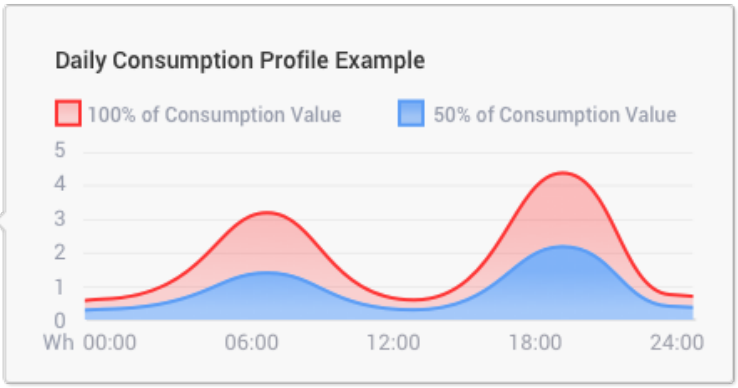
Calculating Backup Requirements

Designer determines the amount of time the SolarEdge Energy Bank battery needs to back up the house every day of the year. Battery capacity is the total capacity of all the batteries that are recommended for the site. The user can set three backup goals:



These are:

- Minimum number of hours that batteries need to support backup (**Min. Backup Time**)
- Percentage of the total consumption that will be available for backup (**Backup Percentage**)



- Power supplied during backup. (**Backup Power**)

→ How SolarEdge Designer calculates backup requirements:

We start with the first hour in the day and assume the energy in the battery is at full usable capacity, and there is no backup time.

1. For each hour afterward:
    a. Designer calculates the net load in the house. The net load is equivalent to hourly consumption, multiplied by the **Backup Percentage**, minus hourly production.
    b. Designer then calculates how much energy is removed from the battery to meet the net load. The energy used is equivalent to the battery capacity plus the energy in the battery, minus the delta energy.
    c. Designer checks to see if the battery has capacity left. If so, the battery continues charging for the next hour. The backup time is measured in one-hour increments.
    d. The battery takes a break from charging when its energy is less than the usable capacity multiplied by the minimum state of energy. We stop calculating the battery's capacity after 7 days because at this point, the backup power is infinite.

This calculation is repeated daily. The reported backup duration is the backup time on the 90th percentile day. Effectively, 90% of days it will last longer than this value.

Calculating the Number of Batteries Required for Backup

The following steps explain how Designer calculates how many batteries are necessary to achieve a specific backup time. This calculation is done every day.

→ To calculate the number of batteries required for backup:

Designer starts the calculation in the first hour in the day, when the battery is fully charged.

1. When the hours required for backup are less than the minimum number of hours set in **Min. Backup Time**, Designer calculates the net load in the house. The net load is equivalent to hourly consumption, multiplied by the **Backup Percentage**, minus hourly production. Designer checks these parameters:
    - The energy in the battery is at a minimum and there is no delta energy available for backup.
    - If the energy in the battery is empty, then the backup time is zero.
    - The minimum energy level is equivalent to the minimum energy in the battery.
2. Designer continues this process for the next hour until the minimum backup time is reached. The required battery capacity is when it reaches the minimum energy level.

This calculation is repeated daily. The reported backup duration is the backup time on the 90th percentile day. Effectively, 90% of the days, backup will last longer than this value.