

# AI-01075 Solar Off-Grid Calculation

👤 Owner	Ⓜ Rigel Arcayan
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🕒 Created time	@July 25, 2024 12:15 AM

my monthly electric usage is 300 kWh, I would like to off-grid my electric, design a hypothetical ah battery and solar panels for me

## Designing a Hypothetical Off-Grid System for 300 kWh Monthly Usage

**Disclaimer:** This is a simplified estimate based on average conditions. Actual requirements will vary based on specific location, appliance usage, and weather conditions. It's strongly recommended to consult with a solar professional for a tailored design.

### Understanding the Basics

Before we dive into specifics, let's clarify some terms:

- **kWh (Kilowatt-hour):** This is a unit of energy. Your monthly consumption is 300 kWh.
- **Ah (Ampere-hour):** This is a unit of electric charge stored in a battery.
- **Solar Panels:** Convert sunlight into electricity.
- **Battery:** Stores electricity for use when the sun isn't shining.
- **Inverter:** Converts DC power from the battery to AC power for household appliances.
- **Charge Controller:** Regulates the charging of the battery from the solar panels.

## Estimating Solar Panel Capacity

To determine the solar panel capacity, we need to consider:

- **Average daily sunlight hours:** This varies by location. Let's assume 5 peak sunlight hours per day.
- **Solar panel efficiency:** Typically around 15-20%. Let's assume 18%.

Calculation:

- Daily energy consumption = 300 kWh / 30 days = 10 kWh/day
- Solar panel output required = 10 kWh/day / 5 hours/day = 2 kW
- Considering 18% efficiency, actual panel capacity needed = 2 kW / 0.18 = 11.11 kWp (kW peak)

**So, you would need approximately 11.11 kWp of solar panels.** This can be achieved with multiple panels combined.

## Estimating Battery Capacity

Battery capacity depends on:

- **Days of autonomy:** How many days you want the battery to power your home without sunlight. Let's assume 3 days.
- **Battery depth of discharge (DoD):** This is the percentage of battery capacity you can safely use. Let's assume 80%.

Calculation:

- Total energy storage needed = 10 kWh/day \* 3 days = 30 kWh
- Battery capacity required = 30 kWh / 0.8 = 37.5 kWh

**Considering battery voltage (usually 12V, 24V, or 48V), you can calculate the Ah capacity.** For example, for a 48V system:

- Ah capacity = 37.5 kWh / 48V = 781.25 Ah

**So, you would need a battery bank with a total capacity of around 781.25 Ah at 48V.** This can be achieved by combining multiple batteries in series and parallel.

## Additional Considerations

- **Inverter size:** Should be able to handle your peak load.
- **Charge controller size:** Should handle the solar panel output and battery charging rate.
- **Battery type:** Consider factors like lifespan, charging efficiency, and cost (e.g., Lithium-ion, Lead-acid).
- **Backup generator:** For extended cloudy periods or emergencies.
- **System monitoring:** To track performance and optimize energy usage.

**Again, this is a simplified estimate.** Actual requirements can vary significantly based on your specific location, consumption patterns, and desired level of independence. Consulting with a solar professional is essential for a comprehensive and optimized system design.

**Would you like to explore specific solar panel and battery options based on your location or budget?**