Objective: To determine the total daily and monthly electricity usage (in kWh) for a small house by analyzing individual appliance consumption.

Step-by-Step Solution:
1. Understand Key Concepts:

Power (Watts - W): The rate at which electrical energy is consumed by an appliance.

Energy (Watt-hours - Wh or Kilowatt-hours - kWh): The total amount of power consumed over a period of time.

1 kWh = 1000 Wh

Formula: Energy (Wh) = Power (W) x Time (Hours)

Energy (kWh) = (Power (W) x Time (Hours)) / 1000

2. Identify Typical Appliances in a Small House:

Make a list of common electrical appliances found in a small house. This should cover various categories.

Refrigeration: Refrigerator

Lighting: LED bulbs

Cooling/Heating: Ceiling fans, (maybe a small AC unit or heater if applicable, but for a "small house" let's stick to

Cooking: Microwave, Electric Kettle

Laundry/Cleaning: Washing Machine, (maybe a vacuum cleaner)

Personal Care: Laptop/Phone chargers, Hair Dryer

Miscellaneous: Phantom loads (standby power for always-on devices)

3. Estimate Power Rating (Watts) and Daily Usage (Hours):

For each identified appliance, research or estimate its typical power rating and how many hours it's used per day.

Power Rating: Can often be found on the appliance label, in the manual, or by searching online (e.g., "average wattage of a refrigerator").

Daily Usage: This is an estimate and can vary. For appliances that cycle (like a refrigerator), estimate the effective daily run time or use an average wattage over 24 hours.

4. Create a Load Analysis Table:

Organize your findings in a clear table. This makes the calculation systematic.

Appliance Category Item Power Rating (W) Avg. Hours Used/Day Daily Energy (Wh) Daily Energy (kWh) Notes
Refrigeration Refrigerator 150 24 (effective) 3600 3.60 Cycles

Lighting 5 x 10W LED Bulbs 50 6 300 0.30
Cooling 2 x Ceiling Fans 120 8 960 0.96
Entertainment 40" LED TV 80 4 320 0.32
Wi-Fi Router/Modem 15 24 360 0.36 Always on
Cooking Microwave 1000 0.25 (15 min) 250 0.25
Electric Kettle 1500 0.1 (6 min) 150 0.15
Laundry Washing Machine 500 0.5 (30 min, 3x/wk) ~71
~0.07 (500W*0.5h)/7 days
Personal Use Laptop/Charging 50 5 250 0.25
Hair Dryer 1200 0.1 (6 min) 120 0.12
Other Phantom Load (misc) 50 24 1200 1.20 Standby power
TOTALS 7581 Wh 7.58 kWh

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(Self-correction: The previous example used 1 hr for washing machine 3 times/week. Here I'm breaking it down to daily average for consistency, or one could state "Weekly Energy" then divide by 7 for "Daily Average Energy.")

5. Calculate Total Daily Consumption:

Sum the Daily Energy (kWh) column from your table.

Total Daily Consumption = 3.60 + 0.30 + 0.96 + 0.32 + 0.36 + 0.25 + 0.15 + 0.07 + 0.25 + 0.12 + 1.20 = 7.58 kWh

6. Calculate Total Monthly Consumption:

Multiply the total daily consumption by the average number of days in a month (usually 30 or 30.4).

days

Total Monthly Consumption = 7.58 kWh/day × 30 days = 227.4 kWh

7. Calculate Peak Load (Optional but Recommended for a Detailed Analysis):

Identify the maximum instantaneous power that could be drawn if several high-wattage appliances are used simultaneously. This helps in understanding circuit breaker requirements.

Consider a scenario where: Refrigerator, all Lights & Fans, TV, Microwave, and Kettle are ON.

Peak Load (W) = 150 (Ref) + 50 (Lights) + 120 (Fans) + 80 (TV) + 1000 (MW) + 1500 (Kettle) + 50 (Phantom)

Peak Load (W) = 2950 W = 2.95 kW

8. Document Your Findings:

Present your calculations clearly, including the table, formulas used, and the final daily and monthly consumption figures. Discuss the assumptions made (e.g., hours of usage, type of appliances).

Output for Submission:
(Title: Power Consumption Analysis for a Small House)

1. Introduction: This report details the estimated total power

analysis of common household electrical loads. The objective is to calculate daily and monthly energy consumption (in kWh) and identify major contributors to electricity usage.

2. Methodology: The analysis involved identifying common appliances, estimating their power ratings (Watts), and typical daily usage hours. The fundamental formula used is: Energy (kWh) = (Power (W) x Time (Hours)) / 1000

3. Load Analysis Table:

Appliance Category Item Power Rating (W) Avg. Hours Used/Day Daily Energy (Wh) Daily Energy (kWh) Notes
Refrigeration Refrigerator 150 24 (effective) 3600 3.60 Cycles on/off
Lighting 5 x 10W LED Bulbs 50 6 300 0.30
Cooling 2 x Ceiling Fans 120 8 960 0.96
Entertainment 40" LED TV 80 4 320 0.32
Wi-Fi Router/Modem 15 24 360 0.36 Always on
Cooking Microwave 1000 0.25 (15 min) 250 0.25
Electric Kettle 1500 0.1 (6 min) 150 0.15
Laundry Washing Machine 500 0.5 (30 min, 3x/wk) 71 0.07 (500W*0.5h)/7 days
Personal Use Laptop/Charging 50 5 250 0.25
Hair Dryer 1200 0.1 (6 min) 120 0.12
Other Phantom Load (misc) 50 24 1200 1.20 Standby power
TOTALS 7581 Wh 7.58 kWh

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4. Results:

Estimated Total Monthly Power Consumption: 7.58 kWh/day × 30 days = 227.4 kWh

Estimated Peak Load: 2.95 kW (considering Refrigerator, Lights, Fans, TV, Microwave, Kettle, and Phantom Load simultaneously)

5. Discussion and Assumptions: The calculations are based on average power ratings and estimated daily usage. Actual consumption can vary depending on appliance models, usage habits, seasonality (e.g., more fan usage in summer), and specific household needs. Phantom loads, though individually small, contribute significantly over time. High-power appliances like microwaves and kettles have a large impact on peak load but less on total energy due to short usage times.

6. Conclusion: A small house can expect an average daily consumption of approximately 7.58 kWh, leading to an estimated monthly consumption of 227.4 kWh. Understanding individual appliance usage is crucial for identifying opportunities for energy saving.