Solar Integration & Home Power Consumption

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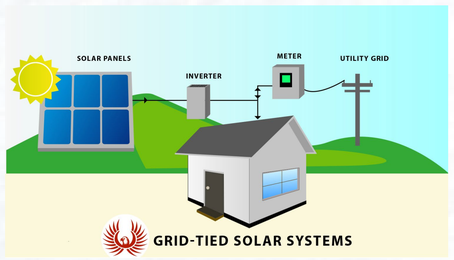
Introduction

Integration of a Solar System and the usage of batteries to provide power to a residential home so that it can be self-sustainable.

- rising energy costs
- help reduce load on grid

Solar-System

- Average solar panel can output 250-400 watts per hour
- Constant 300+ watts during peak hours of sunlight
- Peak hours usually 10 am - 3 pm.



Types of PV Panels

Monocrystalline
- Lifespan — 25 - 50 years
- Efficiency — 15 - 20%
- Average of 350 Watts

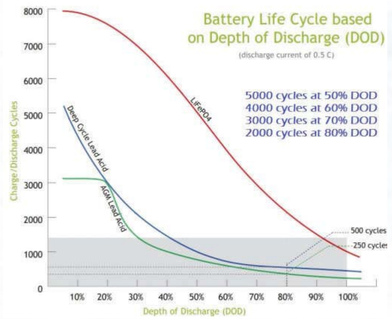
Polycrystalline
- Lifespan — 20 - 35 years
- Efficiency — 15 - 17%
- Average of 300 Watts

Thin Film
- Lifespan — 10 - 20 years
- Efficiency — 7 - 18%
- Average 250 - 350 Watts

Energy Storage

Lithium-ion vs. Lead Acid Batteries

- High Depth of Discharge
- High Energy Density
- Longer Lifespan
- Less Maintenance
- Efficient
- Cost Effective



Home Power Consumption

- In order to calculate how much energy a house is consuming daily, we can use the following formula: (Wattage of Item x Hours Used per Day))/1000
- According to the U.S. Energy Information Administration, the average monthly consumption of a residential utility customer was 893 kWh

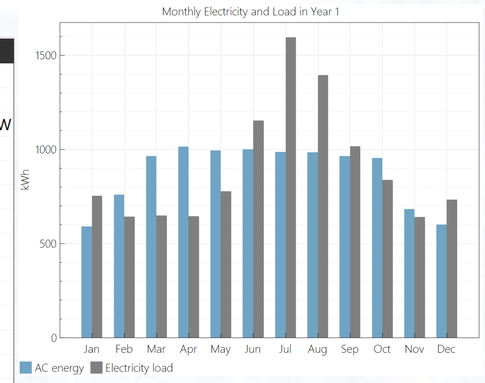
ITEM	QUANTITY	WATTAGE	HOURS USED	TOTAL DAILY CONSUMPTION
OVEN w/ STOVE	1	OVEN:: 2400W 6'/9' STOVETOP:3000W	OVEN: 0.5 STOVE: 0.5	2.7 kWh
REFRIGERATOR	1	625 kWh/year 625/365	24	1.71 kWh
DISHWASHER	1	1285 W	1	1.285 kWh
DRYER	1	5300 W	1	5.3 kWh
AC UNIT	1	500 W	8	4 kWh
COFFEE MACHINE	1	1550 W	0.15	0.2325 kWh
			TOTAL AVERAGE HOUSEHOLD	**~30 kWh**

System Advisor Model (SAM) Software

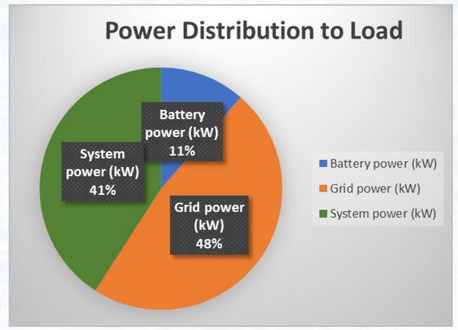
Sizing Summary

Nameplate DC capacity	6.411 kWdc	Number of modules	20
Total AC capacity	6.561 kWac	Number of strings	4
Total inverter DC capacity	6.739 kWdc	Total module area	32.600 m²
Battery maximum power	5.765 kWdc		

Metric	Value
Annual energy (year 1)	10,491 kWh
DC capacity factor (year 1)	18.7%
Energy yield (year 1)	1,637 kWh/kW
Performance ratio (year 1)	0.75
Battery roundtrip efficiency	89.03%
Battery charge energy from system	100.0%
Levelized COE (nominal)	13.25 ¢/kWh
Levelized COE (real)	10.58 ¢/kWh
Electricity bill without system (year 1)	$1,777
Electricity bill with system (year 1)	$507
Net savings with system (year 1)	$1,270
Net present value	$1,753
Simple payback period	18.5 years
Discounted payback period	NaN
Net capital cost	$29,746
Equity	$0
Debt	$29,746



- Simulate a residential home with a 6kW solar system
- Saves you 70% in power costs
- Helps improve system and battery sizing



Subsequent Abstract

through other avenues of study such as but not limited to developing technologies, GIS, Anticipated Generation Algorithms in order to optimize energy consumption for the residential consumer while providing optimization for battery usage in relation to the grid.