



RV SALES SOLAR WORKSHEET

COLD Months

DC Loads	Amps	Volts	X qty appliances	X run hours/day	Total Watt hours per day	Total AH Daily (=WH/12v)	Notes	V*A=P(watts)			
								Volts	Amps	Solved Watts	(V*A)
LED Lights	0.1	12	8	8	77	6.4					
Water pump	10	12	10	0.25	300	25.0	2 showers, dishwashing	38.5	8	308	
12v TV	2.75	12	1	0	0	0.0	Movie/TV; amps per manufacturer				
Bathroom Fan	2	12	1	0.25	6	0.5	2 showers; max fan uses 2 amps on high, 0.7 on low. (2 Amps on High, 0.7 on Low)	Watts	Amps	Solved Volts	(W/A)
Furnace Fan					0	0.0	(Cold months, 50% cycle time, while in camper)	250	8.8	28.40909091	
Refrigerator (propane mode)	1.9	12	1		0	0.0	(33% duty cycle... estimated; when running on propane)				
Propane CO Alarm	0.2	12	1	24	58	4.8		Volts	Watts	Solved Amps	(W/V)
CPAP	3.5	12	1	1	42	3.5	330 WH actual based on actual home use measure (using heated hose and humidifier); actual usage is 70 W	38.5	275	7.142857143	
Phone charger	2	5	2	8	160	13.3	2 phones charged daily.				
Liquid tank heating pad	5.0	12	3	8	1440	120.0	On at 45°, off at 65°; very rough estimate of duty cycle				
Charge eBike battery	2.5	12	1	8	240	20.0	Full charge from empty				
Total					2322	193.5	Note: Bluetti AC200 capacity 1700 WH; solar production capacity 2100 WH in 5h day				

WARM Months

12v DC Appliances	Amps	Volts	qty appliance	run hours/d	Total Watt hours per day	Total AH Daily	Notes
LED Lights	0	12	0	0	0	0.0	Probably less light usage in summer
Water pump	0	12	0	0	0	0.0	2 showers, dishwashing
12v TV	0	12	0	0	0	0.0	Per manufacturer
Bathroom Fan	0	12	0	0	0	0.0	Summer cooling venting (on high, 0.7 on low)
Furnace Fan	0	12	0	0	0	0.0	(Cold months, 50% cycle time)
Refrigerator (propane mode)	0	12	0	0	0	0.0	(50% duty cycle... estimated)
Propane Alarm	0	12	0	0	0	0.0	
CPAP		0	0		0	0.0	Per manufacturer, when using climate line and humidifier
Phone charger	0	5	0	0	0	0.0	
Total					0	0.0	

Using Cold Season Numbers... Higher Power Needs

Watt Hour Needs (total, and Lithium, Carried from Daily Needs Tab)	2322	Notes
Watt Hours Battery Bank (lead acid)	4645	(x 2x the WH needs, given lead acid and only drawing to 50% charge)
Divided by voltage	12	
Amp hour bank need (AKA-Number of batteries needed)	194	Lithium, at 100 discharge
2 hr 235 AH batteries (lead acid) Cost	\$260.00	5-7 year life
200 AH lithium iron phosphate Cost	\$800	>20 year life
Minimum solar array size = needed watt hours / 5 hours of charge time per day on average	775	Watts solar

			Panel Input V	Panel Input A	Panel W	To Battery V	To Battery A		
Factor in efficiency/de-rated values from green table at right			31	9	279	14.5	18.24137931	Suniva Used Panels	
550 W 0.77 panel and charger derating (common from forum)	424	Reasonable expectation	18	11.1	200	14.5	13.79310345	New 200 W panels, each	
and 15h per day	2118	Expected generated Watt hours per day							
Charge controller sizing									
Panel specs approximately 9 Amps									
	Panel Watts	Available Amps at 12 V							
	550	61.1							
	450	50.0							
	400	44.4							
Number of 200 Watt solar panels needed based off of solar watts above	#REF!	Number of panels							

Solar - Flooded Lead Acid										
2000 Amp Hour batteries give about 100 Amp hours if using max 50%										
Number	Cost Each	Total Cost	Notes	Pros	Cons	Expected years of life	Cost per year			
Batteries	2	\$150.00	\$300.00	for 20 20 amp hours batteries in series	responsive, basic	Need to replace electrolyte	6	\$176.47		
Charge Controller	1	\$300	\$300.00	MPPT Charge Controller 20-200 Amp and 200 W input		Big electrolyte to replace every				
Solar panels	2	\$100	\$200.00	200 W panel, expect approximately 200 W						
Add inverter	1	\$200	\$200.00	For 110 needed to run computer etc. Pure sine wave inverter with remote control.						
			\$1,000.00							

Solar - Lithium batteries - BLUETTI AC200 475 200H WITH BUILT IN MPPT CHARGE CONTROLLER, PURE SINE INVERTER										
Number	Cost Each	Total Cost	Notes	Pros	Cons	Expected years of life	Cost per year			
Batteries	1	\$1,200	\$1,200.00	Highly responsive. Normally ~ \$1000.00	Long life, lot use of capacity	Good to about 40° F. Doesn't really like cold. If you expect winter, needs to be heated for the entire duration of cold weather charging. Substantial power loss, up to 70% per hour, and the system is either on or off, no power for sleep. DC power is superior to AC power with the built-in controller.	20	\$16.00		
Charge Controller	0	\$150	0	Built-in	Capacity close to equal to 2 lead acid.					
Solar panels	2	\$100	\$200.00	175 W panel, expect approximately 200 W						
Add inverter	0	\$200	0	Not in AC200	Extremely low maintenance					
			\$1,500.00							

Generator										
Number	Cost Each	Total Cost	Notes	Pros	Cons	Expected years of life	Cost per year			
Generator (Small Fuel)	1	\$500.00	\$500.00	Sealed deep-cycle lead acid	Extremely easy to use, reliable	Fuel consumption, noise in camp	15	\$105.33	PLUS FUEL and maintenance	
Secure lockable bracket to hold	1	\$100.00	\$100.00		Allows AC and microwave use	Minor maintenance				
Propane tanks 20 gal	2	\$100.00	\$200.00		Maximum flexibility					
	4	\$138.00	\$552.00							
			\$1,082.00							

Solar - Lithium batteries - Ampere Time 2400 WH / 200 Amp Hour Battery with pure sine inverter, Victron MPPT CHARGE CONTROLLER										
Number	Cost Each	Total Cost	Notes	Pros	Cons	Expected years of life	Cost per year			
Batteries	1	\$1,000	\$1,000.00	Amperage Time ~ 200 Amp Hours	Long life, 5 year warranty minimal maintenance. No electrolyte to change or pour. Fully power ready, will start car but requires a new key to start.	Good to about 40° F	20	\$19.00		
Charge Controller	1	\$300	\$300.00	Victron 100 AMP MPPT needs to be able to handle either 20-30 Amp, and 500 W input.						
Solar panels	2	\$100	\$200.00	200 W panel, expect about 200 W						
Add inverter	1	\$150	\$150.00	200 W rated, expect about 200 W						
DC to temperature cutoff	1	\$30	\$30.00	Prevents battery from being connected to store charge controller, can send out temp charge protection on battery 200C						
			\$1,580.00							

2 panels				
If parallel (like to like) - add amps, volts stay same				
If series (+ to -), add volts, amps stay same				
2x 275w panels @ Open Circuit 38.5v 9.3a; Max Power 31.1v and 8.85 a				
	Amps	Volts	Watts	De-rated W at 75%
Parallel output open circuit	18.6 nominal	34.4	200	150
Series output open circuit	9.3 nominal	77 nominal	550	412.5
Wire in Parallel from roof to connector - 10 ga wire is fine for up to 30 amps more than 10 feet.				
Pv to controller				
Controller specs up to 100V input, 60A, and 700W, so can handle either series or parallel.				
Series will yield lower amps that will be fine for 10 AWG wire from panels to controller				
Add isolator switch to cut pv input to charge controller				

2 panels	Single panel for temp config
Wire from Victron to batteries	Wire from Victron to batteries
Amps out at 14v 10.7 3% voltage drop	Amps out at 14v 5.357142857
30 amps at 20ft 6 AWG for full trailer run	Existing 10 AWG should be fine to current lead acid.
30 amps at 6 feet 10 AWG if batteries at charge controller	Could have a 10% voltage drop at that distance.

LENGTH	CIRCUIT TYPE				CURRENT F							
	10% VOLTAGE DROP Non Critical		3% VOLTAGE DROP Critical		5A	10A	15A	20A	25A	30A	40A	50A
	0 to 20 ft.	0 to 6.1 M	0 to 6 ft.	0 to 1.8 M	16 AWG	14 AWG	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG	2 AWG
30 ft.	9.1 M	10 ft.	3.0 M	16 AWG	14 AWG	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG	2 AWG	
50 ft.	15.2 M	15 ft.	4.6 M	14 AWG	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG	2 AWG		
65 ft.	19.8 M	20 ft.	6.1 M	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG	2 AWG			
80 ft.	24.4 M	25 ft.	7.8 M	10 AWG	8 AWG	6 AWG	4 AWG	2 AWG				
100 ft.	30.5 M	30 ft.	9.1 M	8 AWG	6 AWG	4 AWG	2 AWG					
130 ft.	39.6 M	40 ft.	12.2 M	6 AWG	4 AWG	2 AWG						

