

Grid Peak Shaving Logic

There are five parameters that affect how and when the Sol-Ark will grid peak shave or when it will simply use batteries to cover loads. **These parameters are TOU Batt values, TOU Power Values, Battery Low Voltage/Percentage, the current SOC% or V of the batteries, and finally Grid Peak Shaving itself.**

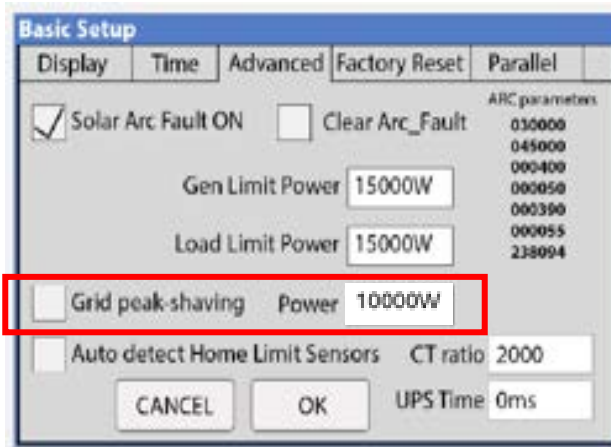


Figure 1: Advanced Tab Settings

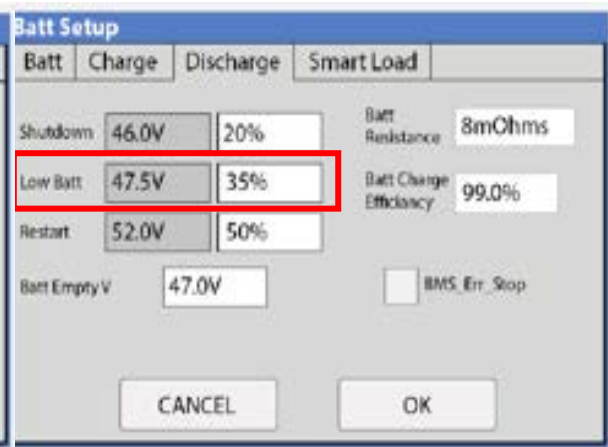


Figure 2: Battery Discharge Settings

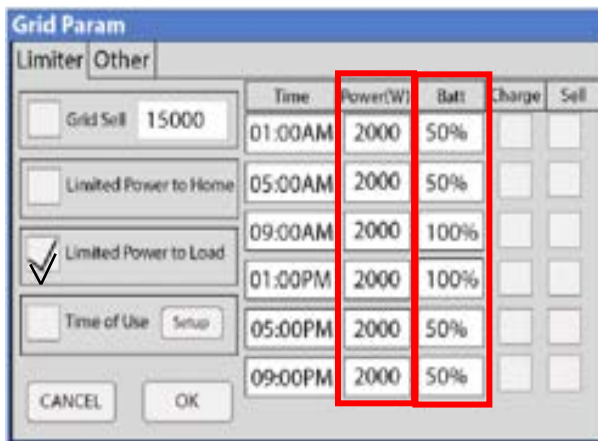


Figure 3: Time of Use Settings

Grid Peak Shaving (GPS) tells the inverter that it can discharge the batteries to make sure the utility usage does not surpass the programmed GPS Power value. The idea behind Grid Peak Shaving is to minimize battery usage, while making sure the customers also do not experience periods of high utility usage which can severely impact their energy bill. GPS also turns Time of Use (TOU) on automatically and the two features logic overlap in the TOU Table via the Power (W) and the Batt settings. This document should help break down what that overlap is and explain how they work together in different scenarios.

With Grid Peak Shaving on, at any given moment the Inverter will first determine if the current battery SOC or V is above or below the TOU **Batt** value. For example, in time slot one of the TOU table in the pictures above, Batt is listed at 50% (Figure 3). If the batteries are above the listed 50% value, the inverter would prioritize battery usage over the grid usage. The batteries will contribute power, up to the programmed TOU Power (**W**) value of 2000W, until the batteries hit 50% SOC and then it would stop using the battery. This portion is normal TOU behavior.

Once the batteries hit 50% or lower the inverter will enter the GPS portion of its programming. At a SOC of 50% or below the batteries will only discharge if the Grid Power being used reaches or surpasses the programmed GPS Power value of 10000W (Figure 1). The batteries will discharge power up to the programmed Power (**W**) value of 2000W. It will do so until the batteries reach the **Low Batt** value of 35% (Figure 2) and then the inverter will completely stop using the batteries even if the Grid usage goes above the GPS Power maximum.

I created a table that looks at time slot one and breaks down the possibilities of what can happen with Grid Peak Shaving based on the Time of Use settings and the potential load usage of the customer. The parameters in the top portion match the programming from the pictures on the front of the document.

TOU and Grid Peak Shaving Programming			
Low Batt Value: 35%	Batt Parameter In TOU: 50%	Power Parameter In TOU: 2000W	Grid Peak Shaving Power Limit: 10000W
Current Batt SOC	Home Load Usage	Battery Power Contributed	Grid Power Contributed
75%	1,500W	1,500W	0W
51%	12,000W	2,000W	10,000W
49%	1,500W	0W	1,500W
36%	12,000W	2000W	10,000W
35%	12,000W	0W	12,000W

Edge Cases

Looking at time slot 3 in Figure 3, the programmed TOU **Batt** value is 100%. This means that the batteries will only ever discharge if the Grid Usage is above the **GPS Power limit** (Figure 1). It will continue to do so until the **Low Batt** (Figure 2) value is reached.

What Happens if you program the TOU **Batt** value to match the **Low Batt** value? (35% in the examples case 35%) This would essentially mitigate Grid Peak Shaving and for the effected time slot you would get normal Time of Use behavior until 35% is reached and then the batteries will rest.