BATTERY HEALTH & 100% DOD

INTRODUCTION

Lithium Iron Phosphate (LiFePO) batteries are widely recognized for their high efficiency, long cycle life, and excellent safety profile. However, their longevity and reliability are significantly affected by how deeply they are discharged during each cycle. EG4® recommends an 80% Depth of Discharge (DoD) to maximize battery lifespan and maintain optimal performance. This white paper explores the detrimental effects of discharging batteries to 0% State of Charge (SoC) and explains why following the 80% DoD guideline is crucial for long-term reliability.

UNDERSTANDING DOD

Depth of Discharge refers to the percentage of a battery's total capacity that is used before recharging. For example:

- 80% DoD means the battery is discharged from 100% SoC to 20% SoC before being recharged.
- 80% DoD can also be achieved by discharging from 90% SoC to 10% SoC before being recharged.
- 100% DoD means the battery is fully discharged from 100% SoC to 0% SoC before recharging.

LiFePO chemistry is more resilient than lead-acid alternatives, but excessive discharge still has a measurable impact on performance and lifespan.

EFFECTS OF 100% DOD

While EG4® LiFePO batteries are designed to handle deep discharges, regularly draining them to 0% SoC introduces several risks:

REDUCED CYCLE LIFE

- Most EG4 battery models are rated for 6,000-8,000 cycles at 80% DoD.
- At 100% DoD, cycle life can drop significantly, roughly cutting the battery's useful lifespan in half.

INCREASED CAPACITY DEGRADATION

- Full depletion accelerates the chemical aging process inside the cells, causing faster capacity loss over time.
- Users may notice shortened run times and lower effective capacity much sooner than expected.

RISK OF BMS SAFETY CUTOFFS

- EG4 batteries feature a Battery Management System (BMS) that helps prevent over-discharge, among other safety features.
- If the battery reaches 0% SoC, the BMS will enter a protection mode, potentially requiring a reset before recharging can resume.
- In extreme cases, over-discharging could cause the battery to fall below the minimum voltage threshold, making it difficult to recover.

LOWER EFFICIENCY AND PERFORMANCE

- Imagine a rubber band, stretched repeatedly to its limit. Over time, this would of course cause it to lose elasticity. Similarly, fully discharging a battery may result in more heat generation and energy losses during recharging.
- Frequent 100% discharges may lead to inconsistent voltage regulation, disrupting system stability.

THE BENEFITS OF 80% DOD

By adhering to an 80% DoD guideline, EG4® battery users experience:

EXTENDED BATTERY LIFESPAN

- EG4 LiFePO batteries can exceed 6,000+ cycles when maintained within the 80% DoD range.
- This translates to 15+ years of reliable performance in most applications.

MORE STABLE CAPACITY RETENTION

- Gradual capacity loss is minimized, ensuring batteries maintain a higher usable capacity over their lifetime.

ENHANCED SYSTEM RELIABILITY

- The battery stays within safe voltage parameters, reducing the risk of unexpected shutdowns or protection triggers.

IMPROVED EFFICIENCY

- Charging and discharging cycles are more energy-efficient, reducing the overall strain on the battery system.

EG4'S RECOMMENDED BEST PRACTICES

To optimize battery health, EG4® advises the following:

- **Set Low-SoC Cutoff Appropriately:** Adjust system settings to prevent the battery from dropping below 20% SoC.
- **Monitor Battery State of Charge:** Use the EG4 monitoring platform to track DoD levels and adjust usage accordingly.
- **Use Proper Charging Profiles**: Ensure compatible chargers and inverters follow charge parameters (refer to the product's spec sheet located at www.eg4electronics.com) to avoid over-discharge conditions.
- **Regular Maintenance Checks:** Periodically verify BMS logs and battery performance to catch any potential issues early.

CONCLUSION

While LiFePO batteries can technically handle full discharges, consistently running them to 0% SoC significantly reduces their lifespan, degrades capacity faster, and increases the likelihood of BMS protection events. EG4® strongly recommends maintaining an 80% DoD to maximize battery longevity, efficiency, and overall reliability. By following best practices, users can extend the life of their investment and ensure consistent, trouble-free operation for years to come.