Bioenno Power®

Overview of LiFePO4 Batteries for Solar/Ham Radio Applications

Presented to Orange County Amateur Radio Club (OCARC)
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About Bioenno Power

- Founded in 2010
- OEM of various products
  - Lithium Iron Phosphate (LiFePO4) Batteries
  - Solar products
  - Lithium Polymer (LiPo) Batteries
- Facilities located in Santa Ana, California for small scale manufacturing
- Company/contract manufacturers have implemented ISO 9001:2008 and ISO 14001 quality and environmental standards
- World class-technology
- Best in class, after-sales service and outstanding warranty
- Customers world-wide!

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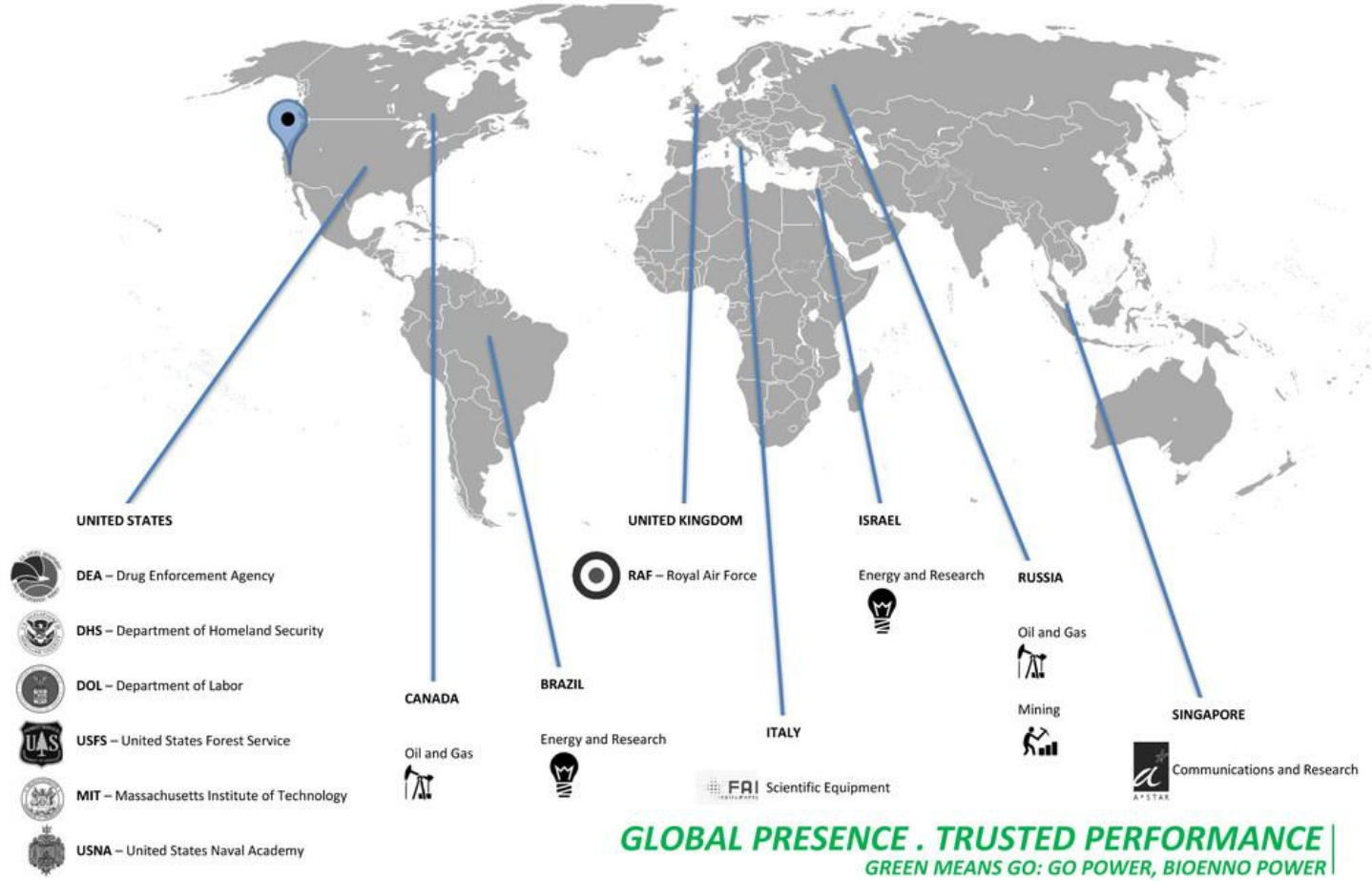
World-Wide Customers



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What is LiFePO4?

- Also known as “LFP”, “Lithium Iron Phosphate”, “Lithium Ferrous Phoshpate”, “LIFE-PO”, “LiFE”
- State-of-the-art battery chemistry
- Tremendous thermal and chemical stability
- Intrinsically safer because of the ultra-stable Fe-P-O bond
- Enhanced charge cycles; over 2000+ charge cycles! 5+ years of service life!
- Totally different than LiCoO2 and Li-Ion Polymer or LiPo! Don’t confuse them!

Advantages of LiFePO4 Batteries

	Bioenno Power LiFePO4	Sealed Lead Acid
Safety	Inherently Safe as a result of strong chemical bonds and non-toxic	Sulfating, Venting, Leaking, Lead is toxic
Weight	50% to 60% lighter compared to SLA batteries	Heavy!
Life Cycles	>2000+ Cycles	< 200 to 300
Protection Circuitry	Built-in and advanced protection circuit module (PCM) and battery management system (BMS) Prevents overcurrent, overdischarge, undervoltage/ overvoltage, thermal	No protection – Can easily overdischarge SLA batteries, or overcharge them
Capacity	Get nearly 100% of the full capacity out of the battery	Can only discharge 50% of the written capacity!

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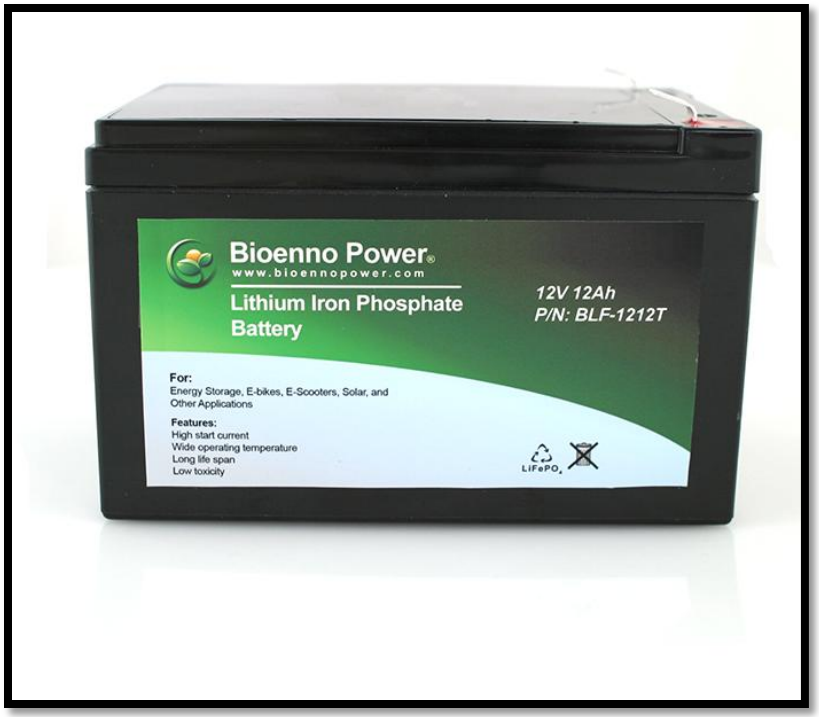
LiFePO4 Full Capacity Advantage!

12V, 12Ah Lead Acid
Only can be discharged
50%. So in reality you get
Only 6Ah out of the battery!
12V, 12Ah Lead Acid
is basically a 6Ah
battery



12V, 12Ah LiFePO4
You get nearly 100% capacity!
12Ah LiFePO4 = 12Ah of True Capacity

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Run-Time Calculations

- How to calculate run-time based on power for LiFePO4
- Simple:
  - Find out the average continuous power of your equipment
  - Power (Watts) = Voltage (Volts) x Current (Amps)
  - Example:
    - 10 Watts (continuous)
    - Voltage x Capacity of battery: 12V x 12Ah = 144 Watt-Hours (unit of energy capacity)
    - Watt-Hours / Watts = 144 Watt-hours / 10 Watts = 14 hours

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Weighted Average Calculations

- Weighted Average:
  - $(x)*(Power_1) + (1-x)(Power_2) =$ Weighted Average Power
  - Example 1:
    - 20% of the time: Transmit at 10 Watts*
    - 80% of the time: Receive at 2 Watts*
    - Weighted Average Power = 0.20*10 + 0.80*2 = 3.6 Watts
    - 12V, 12Ah LiFePO4 → ~36 hours of run-time ([12Vx12Ah]/3.6)
  - Example 2:
    - 20% of the time: Transmit at 100 Watts*
    - 80% of the time: Receive at 2 Watts*
    - Weighted Average Power = 0.20*100 + 0.80*2 = 41.6 Watts
    - 12V, 40Ah LiFePO4 → ~11 hours of run-time ([12Vx40Ah]/41.6)

    - *Note: Power consumption is the electrical consumption of the power amplifier

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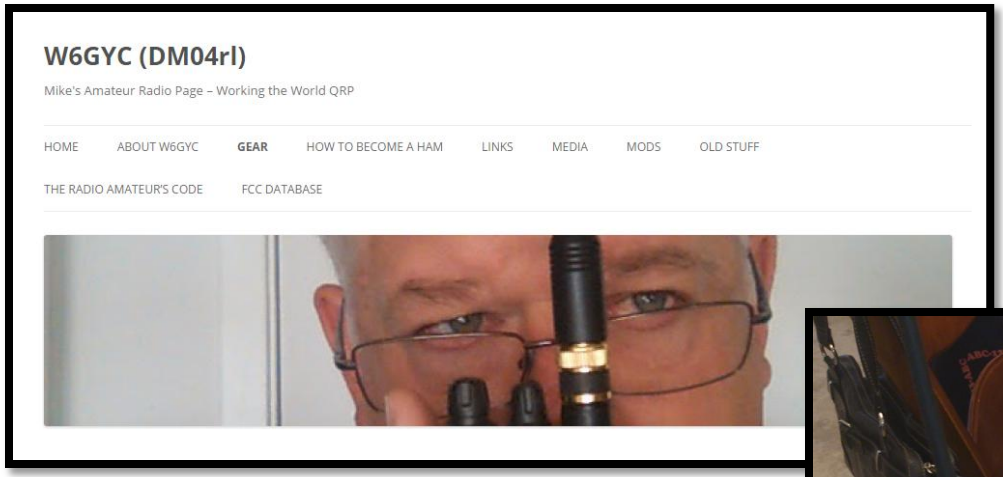
Growing Ham Radio Base…



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Growing Ham Radio Base…

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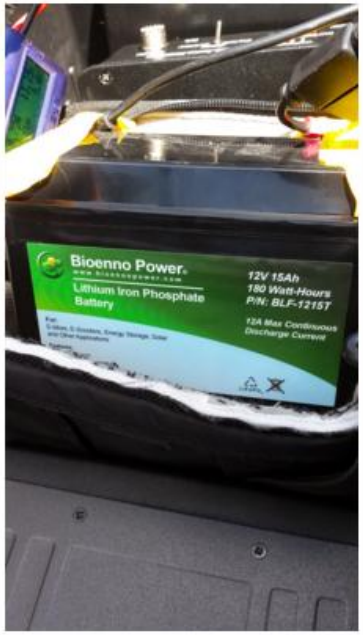
Growing Ham Radio Base…

N4KGL

Greg Lane
730 Brandeis Ave
Panama City, FL 32405
Bay County, USA
Loc: EM70de

Slim Jim Antenna.



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Growing Ham Radio Base…

Norwegian Amateur Radio Station LA9XGA

Lisenced since 1989

This SOTA hike started from my home (Eikesaas Ranch) at 06:00 UTC, and it took me around 3 hours to get to the summit. The weather today was almost unbelievable with minus 10 degrees and a clear blue sky, and the view from the summit almost indescribable. On this activation I was using my Elecraft KX3 with 5-10W output, 2 x Bioenno Power LiFePo4 12V 8Ah battery and a Buddistick multi-band vertical antenna. I made a total of 153 QSO's on this remote summit activation.

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Building a Solar System Setup

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FAQ for Solar Panels

Common Question:
How many Watts for the Solar Panel?

Answer:
Depends on Size of the Battery!
12V 12Ah LiFePO4 Battery = 144 Watt-Hours

Need a 60 Watt Panel to Charge the battery in ~2 hours
(144 Watt-Hours/ 60 Watts = 2.4 hours)

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FAQ For Solar Charge Controller

Common Question:
Do I really need a solar charge controller? I want to just hook up the panel directly to the battery

Answer:
Solar charge controller is a must to regulate the solar panel voltage (which can range anywhere from 15VDC to 22VDC for a "12V solar panel"). The solar charge controller steps down the voltage from the solar panel so that the battery can accept it for properly charging the battery.

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FAQ For LiFePO4 Battery

Common Question:
What size of battery do I need?
How do I know ?

Answer:
First, you need to know the total power consumption. Second, what's the desired run-time.

Example: 50 Watts total power
12V 12Ah -> ~3 hours run-time
12V 20Ah → ~ 5 hours run-time
12V, 40Ah -> ~10 hours run-time
12V, 100Ah -> 24 hours run-time

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Variety of Power Solutions….

- Bioenno Power provides a variety of advanced power solutions:
  - Audio/Visual/Film
  - E-Bikes / E-Scooters
  - Electric Golf Caddy
  - Energy Storage
  - Gardening Tools
  - Green Energy (Solar and Wind)
  - Photography
  - Radio Communications (including Amateur Radio)
  - Replacement for SLA (sealed lead acid) batteries
  - Robotics
  - UPS (uninterruptible power supply)
  - Wheelchairs

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Thank You!

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