



Portable Ham Station Power

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VE6TD Bio

Licensed in 2001 - basic and advanced in one sitting

Original call VE6BSD

US ham since 2011 - KU7R - Extra class and an examiner

Interests are repeaters, HF, digital modes, digital voice, remote station

Built several off-grid power systems - my camp site, cattle watering, residential



Portable Station

- Equipment - battery killers
- Portable energy - a chemistry lesson
- Power Budget - adds and subtracts

Portable Station

- Radio - QRP / Mid-power / High power
- Tuner - auto or manual
- Meters - Power or SWR
- Keyers and other accessories
- How much equipment needs how much power?

Battery Chemistry

- ◉ Lead Acid - sealed and flooded

- *inexpensive
- *heavy
- *regular and deep cycle
- *marine
- *high capacity
- *gradual discharge profile
- *adhere to Peukert's Law

- ◉ AGM - Absorbed Glass Mat and gel cells

- *not so cheap
- *heavy
- *high capacity
- *gradual discharge profile

- ◉ Lithium ion and Lithium iron phosphate (LiFePo)

- *expensive
- *lightweight
- *high capacity & high energy density
- *exempt from Peukert's Law
- *require cautious handling and charging
- *have a flat discharge cliff



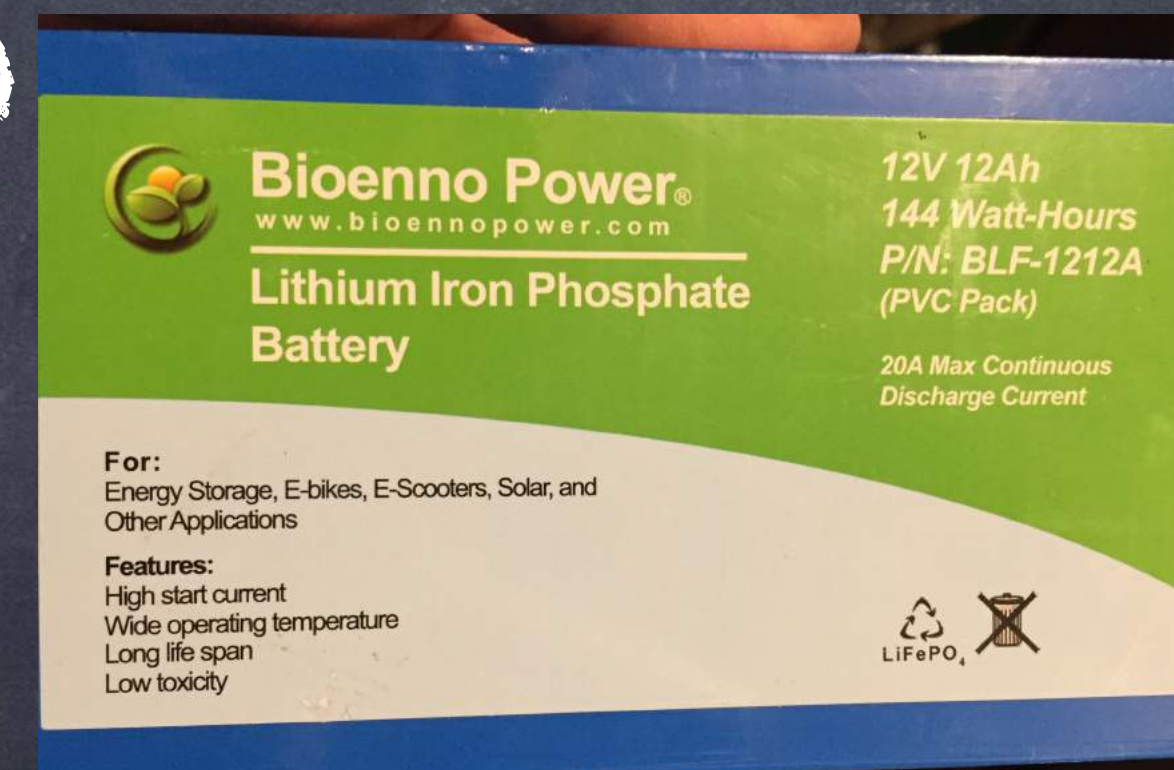
Battery Chemistry



- Lead Acid - sealed and flooded
- AGM - Absorbed Glass Mat and gel cells



Lithium ion (LiPo) and Lithium iron phosphate (LiFePO₄)



Batteries for Portable Operation

All battery chemistries have unique charge and discharge requirements

- it is crucial to adhere to this for longest life and charge/discharge cycles

Temperatures - Ambient and storage

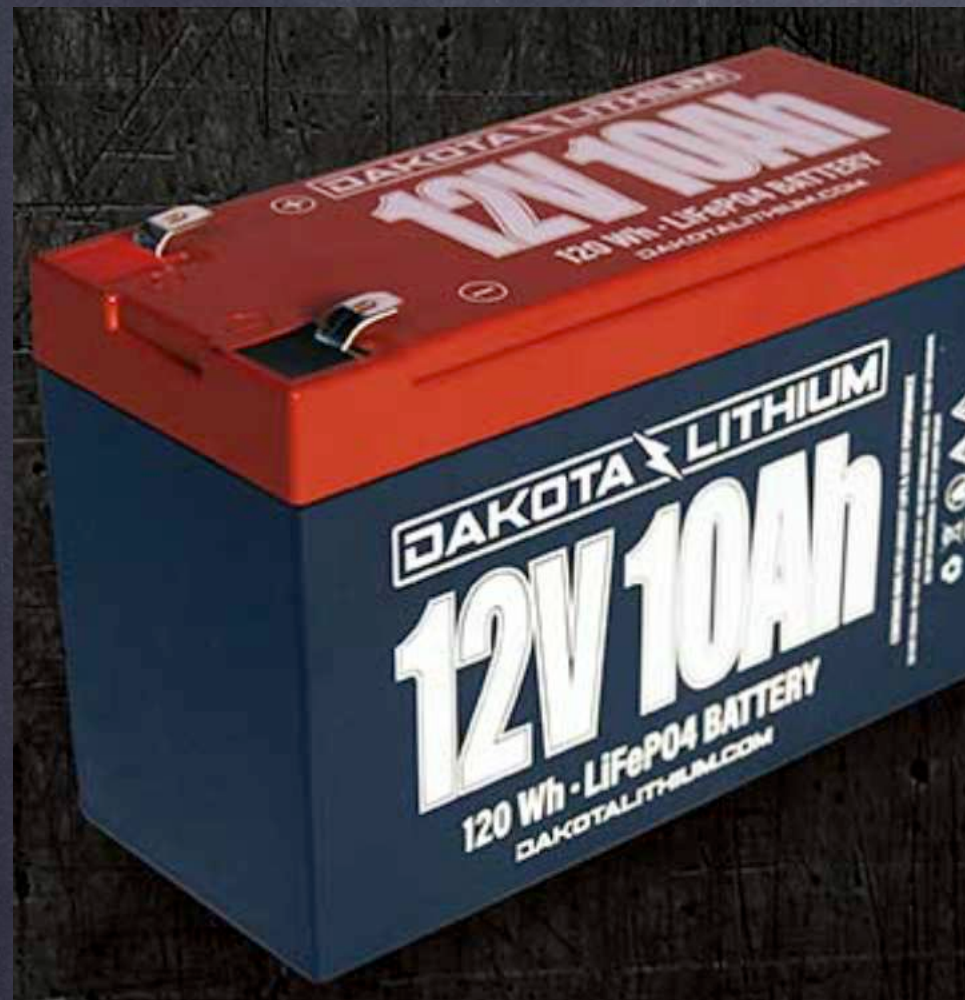
- battery capacity is reduced at low temperatures

Pick your battery pack based on your activity

- lead acid might be ok if you have a pack mule or a sherpa



Batteries for Portable Operation



Example Battery specs

- * 1.25Kg
- * 2000 cycles (@80% discharge)
- * -28 degrees C

Discharge rate

- * 20A continuous
- * 50A surge
- * 11V recommended discharge

Charge rate maximums

- * 10A
- * 14V

Some Terminology

- Watts

- Typical solar module rating and some loads

- not too useful for calculating charge/discharge

- Amp-Hours

- Typical battery capacity rating



What is a Power Budget

- An equation balancing charge and discharge
 - Calculate, measure, and validate station consumption
 - How many amps for how many hours?

Know your component duty cycles -

i.e. a transceiver receives at 1/2A, transmits at 20A

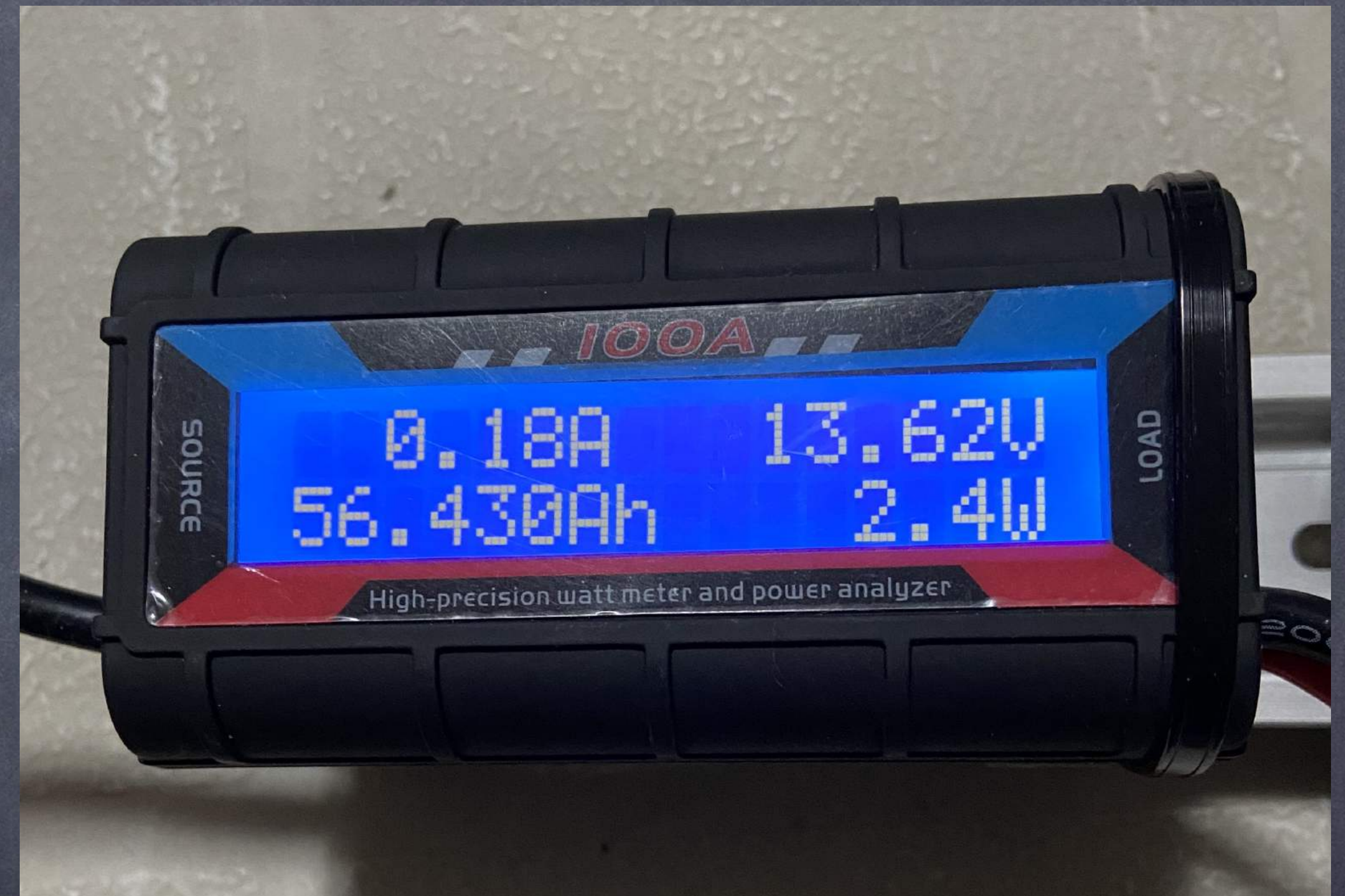


Power Budget

How many usable Amp-Hours are there in a 10Ah battery?

How do you know how much energy you've used?

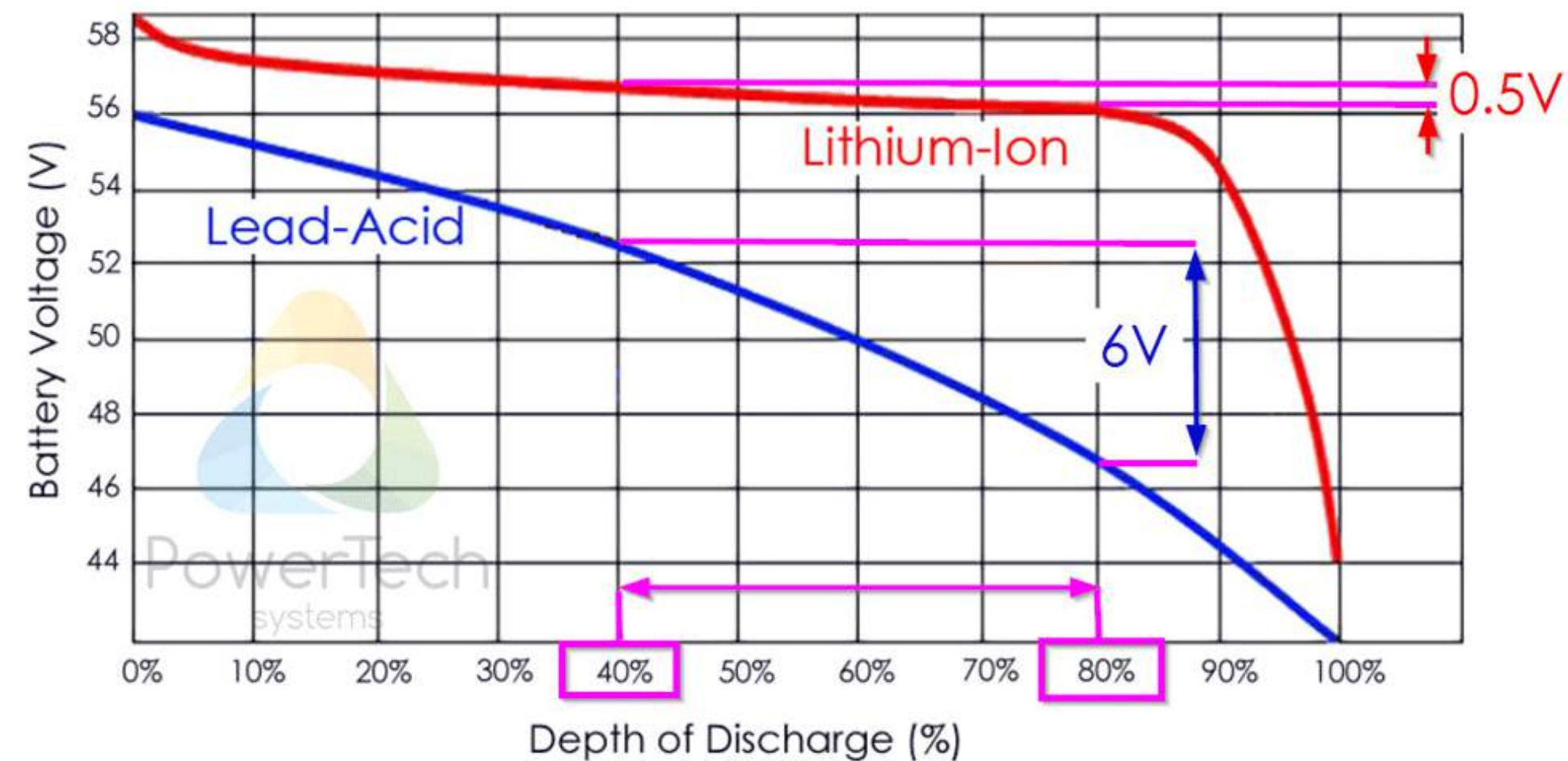
Measurements and monitoring are important



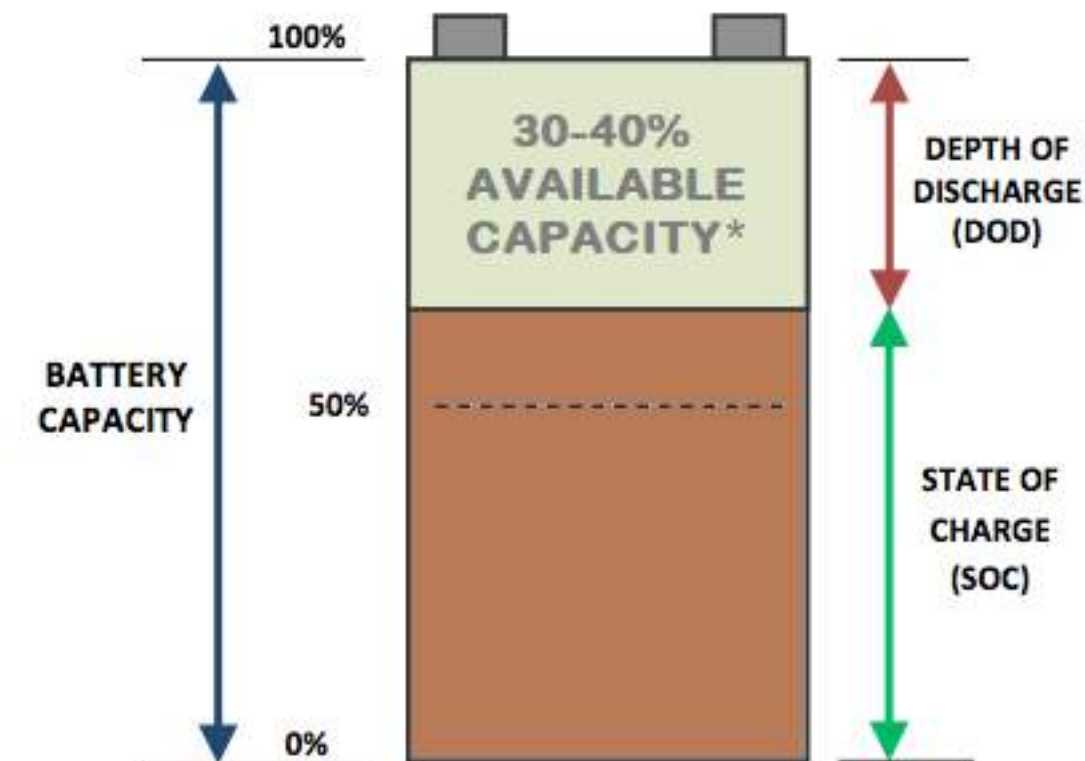
Power meter from
Powerwerx (\$50USD) and
Amazon (\$27CAD)

Power Budget - Discharge

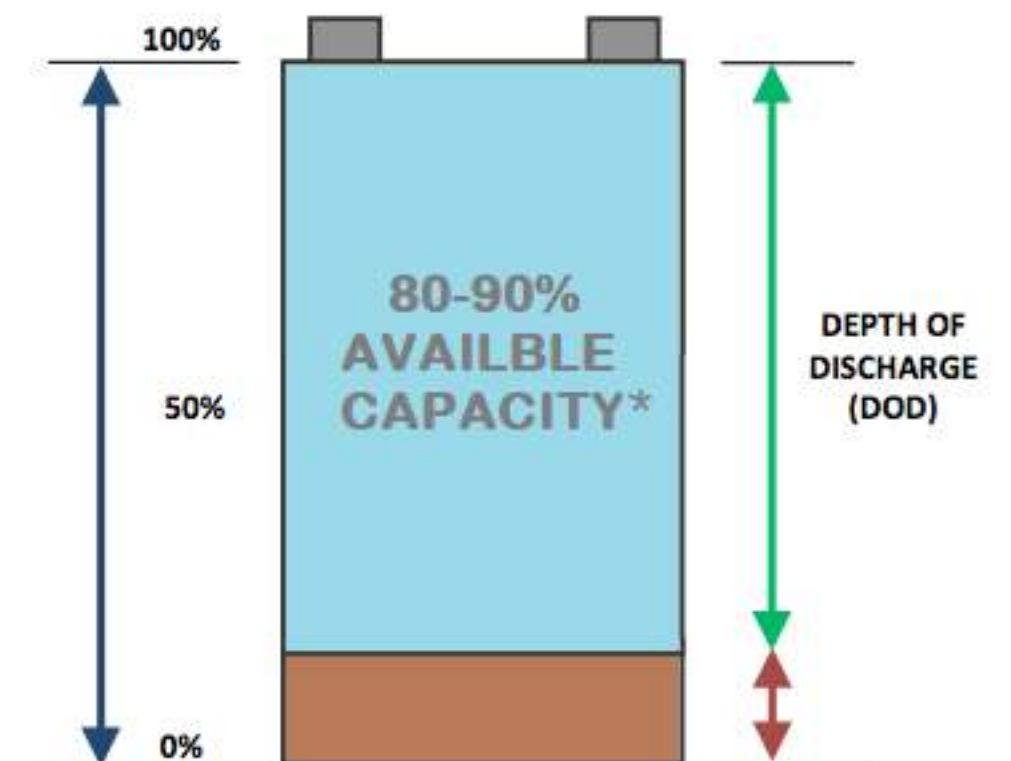
Open Circuit Voltage : Lithium-Ion vs Lead Acid



LEAD-ACID



LITHIUM-ION



* Battery capacity available in a daily cycle to prolong life - always refer to manufacturers specifications and warranty requirements

CER

Power Budget - Discharge

- Know your radio's power output to battery voltage relationship
- Keep a close eye on your battery voltage while operating

Supply Voltage	RF POWER Setting	Current Draw	RF Output Power
13.8	100%	2.3	10.1
13.5	100%	2.3	10.1
13.0	100%	2.3	10.1
12.5	100%	2.3	9.7
12.0	100%	2.2	8.4
11.5	100%	1.7	5.0

State of Charge	Voltage
100%	12.7
75%	12.4
50%	12.2
25%	12.0
Discharged	11.9



Charging your Batteries

- Use a charger designed for your battery type
 - don't overcharge your battery
 - too much voltage or too much current can be harmful or even dangerous
- Charge at the correct voltage
- Limit charge current as per battery specs

Charging your Batteries

- Portable field charging:

Foldable or roll-up solar modules - output and exposure time may not be enough to make a difference

Portable charge controller is required

How necessary is field charging?

Solar module or an additional battery?



Charging your Batteries

- Mobile charging:

Charging from the vehicle a good (easiest) option

Easier option to carry larger solar modules

Charge controller still required

Thank you

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