NASA'S Battery Needs

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NASA Science Area

- Earth
- Heliophysics
  - What causes the sun to vary?
  - How do the Earth and Heliosphere respond?
  - What are the impacts on humanity?
- Planets
  - How did the sun's family of planets and minor bodies originate?
  - How did the solar system evolve to its current diverse state?
  - How did life begin and evolve on Earth, and has it evolved elsewhere in the Solar System?
  - What are the characteristics of the Solar System that lead to the origins of life?
- Astrophysics
  - How Does the Universe Work?
  - How did we get here?
  - Are we alone?

Earth

Advancing Earth System Science to meet the challenges of climate and environmental change

- **Atmospheric Composition**
- **Weather**
- **Carbon Cycle & Ecosystems**
- **Water & Energy Cycles**
- **Climate Variability & Change**
- **Earth Surface & Interior**

Platforms

- **Low Earth Orbit (LEO)**
- **Geosynchronous Earth Orbit (GEO)**

Battery Needs for LEO/GEO spacecraft

- **Higher Energy/Volumetric Density - > 200 Whr/kg**
- **LEO - > 30,000 cycles**
- **GEO - > 10 years**
- **Thermal - . -5 to 35• C or better range**
- **Cell-to-Cell voltage variance - < 0.08 MmV**
- **Multiple cell/battery vendors**