



COMPETITION SUMMARY

Background

The Night Rover Challenge is the latest in a successful series of Centennial Challenge competitions from NASA's Office of the Chief Technologist. Learn more about the Centennial Challenges program at www.nasa.gov/challenges and the Night Rover Challenge at: www.nightrover.org

Overview

Create an energy storage system that can allow a simulated rover to remain operational throughout the 14-day-long lunar night.

Restrictions

- 100kg maximum
- 2m x 1m x 1m maximum dimensions
- Must not use any materials or systems that won't be available or function in a space.

Requirements

- Store and deliver enough energy to provide an average of 85W continuously throughout two lunar cycles (starting from the first lunar noon).
- Provide a minimum of 30.09 kWh over each lunar night cycle.
- Maximize Watt-Hours / Kilogram, Watt-Hours / Liter, and total energy storage capacity.

Trials

Systems will be tested through 2 lunar cycles (~2 months) at ambient temperature and pressure conditions. NASA's Plumbrook Station in Sandusky, Ohio will host the trials.

Judging

To be eligible systems MUST meet the power load requirements averaging 85W throughout the lunar night (354 hours). Systems will be scored on a combination of three weighted criteria: mass (60%), volume (20%), total capacity (20%). Mass is scored on how many kg less than the 100kg restriction, volume is scored on how many liters less than the 2 cubic meter restriction, and capacity is scored on how the total number of Watt-hours provided before the system is exhausted.

Awards

Three levels of awards will be available. Only the highest level of awards reached will be available to all competitors.

Level 1: greater than 300 Watt-hr/kg - (1st place \$500K; 2nd place \$100K; 3rd place \$50K)

Level 2: greater than 400 Watt-hr/kg - (1st place \$750K; 2nd place \$200K; 3rd place \$100K)

Level 3: greater than 500 Watt-hr/kg - (1st place \$1,000K; 2nd place \$300K; 3rd place \$200K)

Deadlines

- Registration Deadline: October 25, 2013
- Trials Begin: January 24, 2014
- Announcement of Results: April 4, 2014

PRIZES BY



CENTENNIAL
CHALLENGES

Night Rover Challenge
88 King Street #406
San Francisco, CA 94107

Web: www.nightrover.org
www.cleantechopen.org
www.nasa.gov/challenges

Contact: josh@nightrover.org

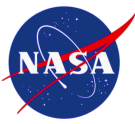




SPEC SHEET

Energy Storage System Specifications	
Max Weight	100.0kg
Max Volume	1.0 cubic meter
Maximum Length	2.0m
Cycle Life	2 cycles (708hrs each), 25 ⁰ C
Calendar Life	Not restricted
Cell Chemistry	Not restricted
Number of Cells/Modules	Flexible
Data Interfaces	Cat 5 ethernet connector,
BMS	- CAN Bus (connect to facility by Cat 5 ethernet connector) - BMS will detect problems and isolate the test article as outlined in the accepted registration packet from the team.
Electrical Interface	6 foot pigtail input & output connectors
Thermal Interface	thermocouple pigtails (type T),
Venting	1/4 inch Swagelock VCR and connectors
Voltage range	15 +/- 0.1 VDC
Usable Energy	30.09 kWh at 25 ⁰ C, BOL to EOL
Energy Density (Pack Level)	Level 1 > 300wh/kg Level 2 > 400wh/kg Level 3 > 500wh/kg
Temperature of operation	15 to 25 ⁰ C
Heating / Cooling	Must be provided by the team and are considered part of the system mass. No external heating/cooling is allowed.

PRIZES BY



CENTENNIAL CHALLENGES

Night Rover Challenge
88 King Street #406
San Francisco, CA 94107

Web: www.nightrover.org
www.cleantechopen.org
www.nasa.gov/challenges
Contact: josh@nightrover.org





SPEC SHEET CONT.

Max peak discharge power	120W for 3 hour
Max peak charge power	564 W
Power duration	14 days/cycle
Safety	<ul style="list-style-type: none"> - “A Sample” prototype qualified for 2 lunar cycles. - Facility includes isolation contactors/disconnects. - Team must provide monitoring data service disconnects - no fire/no explosions during trials or storage
Liability	\$1,000,000 insurance policy
Environmental Restrictions	<ul style="list-style-type: none"> - Sensors that rely on the earth’s magnetic field - Ultrasonic or other sound-based sensors - Earth-based or earth orbit-based radio aids - Open circuit pneumatics - Air-breathing systems - Class 1, 3, 4, 5, 6, or 7 hazardous materials - Outgasing at > 0.2 standard liters per minute (SLPM). - Nuclear energy storage systems
Total Power Measurements	- Facility will record voltages, currents, and power delivered of power supply and load.

PRIZES BY



Night Rover Challenge
88 King Street #406
San Francisco, CA 94107

Web: www.nightrover.org
www.cleantechopen.org
www.nasa.gov/challenges
Contact: josh@nightrover.org

