JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

LSIC Surface Power Telecon

August 24th, 2023

Begins at 11:03

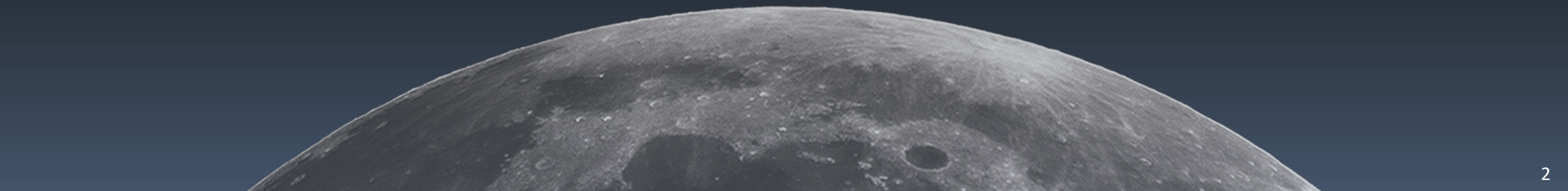
Lunar Surface Innovation
CONSORTIUM

Dr. Sean Young, Dr. Matt Clement
Sam Andrade, Julie Peck, Dr. Joseph Kozak, Abigail Wagner
Johns Hopkins Applied Physics Laboratory
Space Exploration Sector

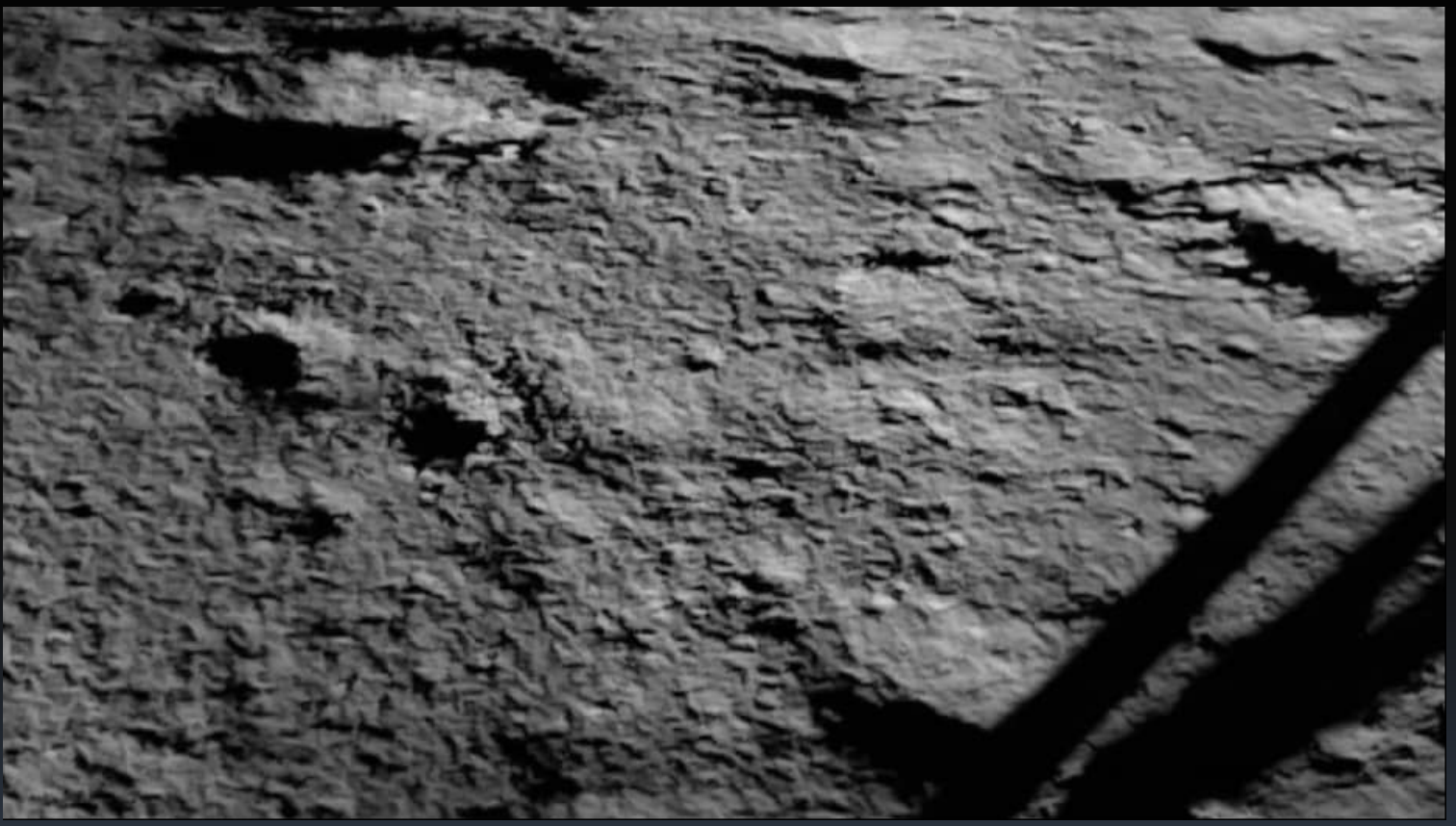
LSIC Surface Power Facilitator POC: matt.clement@jhuapl.edu

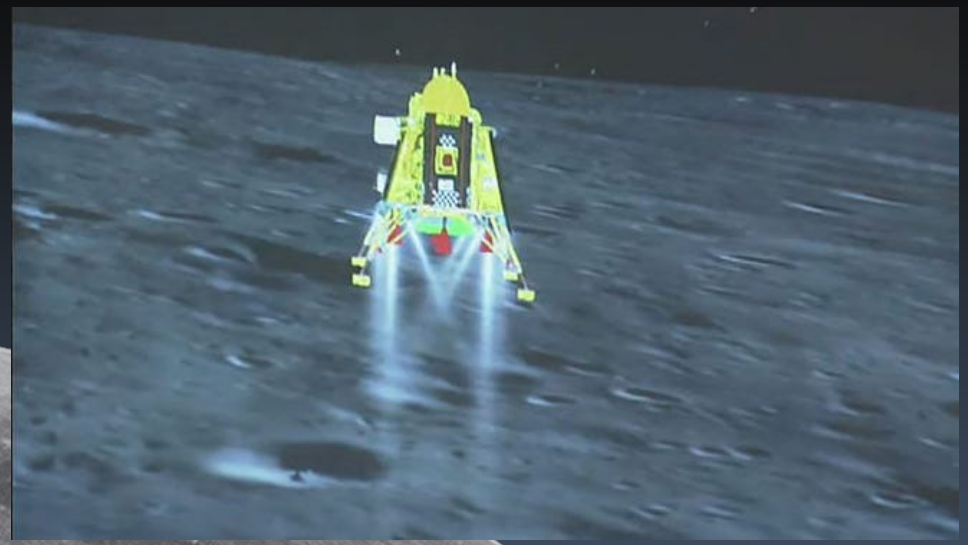
LSIC | Agenda

- Community Updates
  - Solicitations and Awards
  - Conferences/Workshops/Telecons
    - October 10-11: 2023 LSIC Fall Meeting
    - October 12: LSIC Transition to Commercial Lunar Operations Workshop
    - November 7: LSIC **Path to** Sustainable Technologies in the Lunar Surface Environment Workshop (Joint DM/EE)
- Reliability Workshop Summary (Sam Andrade, APL)
- Alex Miller (ThermAvant Technologies)
  - Talk: A High Temperature Heat Rejection System for Fission Power Generation
- Q&A



LSIC | Chandrayaan-3 on the south pole!





LSIC | Solicitations and Awards

Space Tech Solicitations (https://www.nasa.gov/directorates/spacetech/solicitations)

NASA Suborbital/Hosted Orbiral Flight and Payload Integration Services 4
Proposals Due: August 28, 2023

NASA Innovation Corps Pilot
Proposals Due: September 8, 2023

NASA 2023 SBIR Ignite
Proposals Due: September 21, 2023

TechFlights: Technology Advancement Utilizing Suborbital and Orbbital Flight Opprotunities
Invited Final Proposals Due: October 4, 2023

2024 Breakthrough, Innovative and Game-changing (BIG) Idea Challenge
Solicitation expected within the month

NASA Space Technology Graduate Research Opprotunities (NSTGRO)
Solicitation expected within the month

LSIC | Upcoming Meetings and Workshops

2023 International Astronautical Congress
October 2-6, Baku, Azerbaijan

2023 LSIC Fall Meeting
October 10-11, Pittsburg, PA and Virtual

2023 LSIC Transition to Commercial Lunar Operations Workshop
October 12, Pittsburg PA and Virtual

AIAA ASCEND
October 23-25, Las Vegas, NV

LSIC Path to Sustainable Technologies in the Lunar Surface Environment Workshop
November 7, Virtual

More complete calendar on LSIC website, email with additional events!


Lunar Surface Innovation Consortium
FALL MEETING 2023 | OCTOBER 10-11
COMMUNITY COLLEGE OF ALLEGHENY COUNTY & ONLINE VIA ZOOMGOV
SUBMIT AN ABSTRACT
DEADLINE: AUGUST 25
BASE 1
APL JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

Lunar Surface Innovation Consortium

TRANSITION TO COMMERCIAL LUNAR OPERATIONS WORKSHOP

COMMUNITY COLLEGE OF ALLEGHENY COUNTY & ONLINE VIA ZOOMGOV

SAVE THE DATE

OCTOBER 12

More information coming soon!

APL JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

Announcing DM & EE Joint Workshop!

- **Path to Sustainable Technologies in the Lunar Surface Environment**
  - We will focus on the qualification path to fielding long-lived technologies on the lunar surface. Stakeholders across industry, academia, and NASA will come together in a collaborative format to discuss the current state of the art, as well as essential knowledge and technology gaps related to the combined lunar and dust environment.
- **November 7, 2023**
- **Interactive, Virtual Workshop**
- **Topics**
  - Existing Standards and Facilities
  - Stakeholder Needs
    - NASA panel
    - Industry & Academia Panel
  - Town Hall on Next Steps
  - Q&As for all presentations

- **Registration is now open!**
  - https://lsic.jhuapl.edu/Events/Agenda/index.php?id=481

LSIC | September Telecon: Joint Power-Interoperability

We hope to see you all at our next telecon, which will take place on **Thursday September 28th, 2023 at 11:00AM ET.**

Topic: DoD/US Army Tactical Microgrid Standard

Speakers: **Jeff Csank** (NASA GRC)
Tom Bozada (US Army Engineer Research and Development Center
Dan Herring (MIT Lincoln Laboratory)
Camryn Anderson (US Army Engineer Research and Development Center

Description: The Army Tactical Microgrid Standard is a protocol that allows a mobile grid to optimally distribute power from a variety of sources (e.g. batteries, vehicles, diesel generators). Terrestrially, the capability is designed to better enable multi-domain operations, however the principles of interoperability in the system are extremely applicable to lunar operations as well.

LSIC | Reliability Workshop Summary

- Held virtually July 26th - July 27th from 11:00 AM – 3:30 PM
- As diverse stakeholders and technologies contribute to the lunar power grid, characterizing and quantifying reliability at both the system and component level is of utmost importance. This workshop was planned to address these challenges and prompt discussion.

Key Takeaways:

- NASA and industry partners should plan for reliability, maintainability, and scalability from the start to avoid reactive planning.
- Reliable power distribution has many open tech and knowledge gaps and will benefit from technology-forward missions.
- Incentivize sharing information.
- Power load profiles are not well-considered; disconnect between power providers and users needs to be bridged.
- No existing entity is coordinating standards; need to be developed in consensus and commensurate with the state of technology.

LSIC | Reliability Workshop Day 1 Agenda

Title	Presenter
Welcome/Establish Goals	Matt Clement (APL; LSIC Surface Power Lead)
Reliability 101	Clay Smith (APL)
Blueprint Objectives	John Scott (NASA; Power and Energy Storage Principal Technologist)
EHP Perspective	Blanca Lara (NASA; JSC EHP Lunar Power Lead)
Safety and Mission Assurance Perspective	Roger Boyer (NASA; Artemis Probabilistic Risk Assessment Lead)
NASA Heritage and ISS Panel (Moderator: Jamie Porter, APL; LSIC Director)	Jim Soeder (NASA retired) Tim Lawrence (Lockheed Martin, NASA retired) Clay Smith (APL, ISS PRA program creator) Ron Galvez (NASA, Systems Manager for ISS Electrical Power System)
Coffee Break	
Tangential Approaches Panel (Moderator: Matt Clement, APL; LSIC Surface Power Lead)	CDR David McGlone, USN (Submarine Safety Program (SUBSAFE, NAVSEA07Q) Director) Bill Anderson (Naval Expeditionary Warfare Center Director, Utilities Engineering & Management for remote island bases) Joe Miller (NSF Facilities & Utilities Program Manager for Antarctica Power and Operations) Brian Lee (Centerpoint Energy)
Breakout Sessions	Facilitators: Matt Clement, Sean Young, Sam Andrade, Joe Kozak, Julie Peck, Wes Furhman (APL) and John Scott (NASA)

LSIC | Reliability Workshop Day 2 Agenda

Title	Presenter
Summarize results from Breakout Session	Julie Peck(APL; LSIC Surface Power Team)
Industry Panel **(Moderator: Wes Fuhrman, APL; LSII Lead)**	Luis Carrio (Lockheed Martin, Chief Architect of the Lunar Exploration Campaign) Dean Bergman (Honeybee Robotics, Director of Strategy and Development for Exploration Systems) Joe Halackna (Westinghouse, Deputy Director for Advanced Reactor Engineering and FSP Chief Technologist) Dan Hendrickson (Astrobotic, Vice President of Business Development)
Lightning Talks (Moderator: Julie Peck, APL; LSIC Surface Power Team)	Yifan Li (Lockheed Martin): Knowledge Gaps in Lunar Electrochemistry for ISRU-Derived Energy Storage Hasnain Nisar (University of Connecticut): Advancing Space Exploration: A Cyber-Physical Testbed for Space Microgrid Leila Chebbo (University of Connecticut): Power System Modeling and Operation for Extraterrestrial Habitats Under Environmental Disturbances Yash Mirchandani (Symatec Inc.): Gallium Oxide (Ga2O3)-based lunar surface power management system Ayan Mallik (Arizona State University): Neural Network-enabled Control of Triple Active Bridge Converters for Space Applications Ibrahim Bardak (Bastion Technologies): Lunar Power Reliability EMI Concepts & Implementation Gary Barnhard (XISP-Inc.): SPACE Squared Jaclyn Wiley (Zeno Power Systems, Inc.): Applications of Commercial Radioisotope Power Systems for Space and Lunar Missions

LSIC | Reliability Workshop Day 2 Agenda Cont.

Title	Presenter
Short-Format Talks **(Moderator: Joseph Kozak, APL; LSIC Surface Power Team)**	Mark Moennens (Westinghouse): eVinci Microreactor Reliability Evaluation Program Nicholas Rolston (Arizona State University): Robust Perovskite Solar Cell with High Specific Power and Stable Output in Space Guillaume Pelletier (DotVision): Enhancing Reliability and Efficiency of Lunar Power Grid: The Crucial Role of Smart Sub-Metering Technology with Distributed AI and Command Control Capabilities Nadeem Mahadik (US Naval Research Laboratory): Reliability studies of SiC power materials and devices for extreme and harsh environments Olivia Formoso (NASA Ames Research Center): Modular Power Generation and Delivery Systems for Programmable Metamaterial Lunar Surface Systems Patrick Snouffer (Zeno Power Systems, Inc.): Scaling Radioisotope Supply to Meet Lunar Infrastructure Demand
Long-Format Talks **(Moderator: Sean Young, APL; LSII Surface Power Lead)**	Nicholas Uguccini (NASA GRC): Reliable Power Hibernation and Recovery for Solar Powered Lunar Missions Jin Wang (Ohio State University): Lunar DC Microgrid
Panel Discussion on meeting takeaways and Q&A **(Moderator: Matt Clement, APL, LSIC Surface Power Lead)**	John Scott (NASA, Power and Energy Storage Principal Technologist) Wes Fuhrman (APL, LSII Lead)

LSIC | Presentation

- Speaker: Alex Miller
- Lead Engineer, ThermAvant Technologies


APL
JOHNS HOPKINS
APPLIED PHYSICS LABORATORY