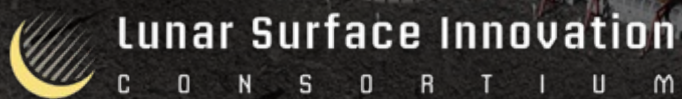


LSIC Surface Power Telecon

May 25, 2022

Begins at 11:03



Wesley T. Fuhrman, PhD
Johns Hopkins Applied Physics Laboratory
Space Exploration Sector

Wesley.Fuhrman@jhuapl.edu

- Community Updates
 - Upcoming/recent events
 - Solicitations
 - LSSW Workshop – Prospecting / Resource Evaluation
 - LSIC SP Summer Workshop
 - Scenarios for “mock-PDR” discussions
- NASA “LIVE” RFI
 - Quick overview
 - Breakouts for discussion
 - Plan/refine your response
 - Discuss/debate as a community

LSIC | Upcoming Meetings and Workshops



- **LSIC Spring Meeting: Keynote NASA Associate Administrator Robert D. Cabana**
 - Abstracts due March 4, 2022, Event May 4-5 (hybrid) <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=200>
- **Nuclear and Emerging Technologies for Space (NETS)**
 - May 8-12, Registration open <https://www.ans.org/meetings/nets2022/>
- **Advanced Power Systems for Deep Space Exploration**
 - Aug 30-Sept 1 <https://www.usasymposium.com/deepspace/default.php>
- **Lunar Surface Science Workshop.**
 - June: Lunar Resource Evaluation Campaign Design
 - Abstract Submissions Due May 27th
- **LSIC Surface Power Workshop**
 - July 28th 11:00 – 4:00 ET (notional timeline)
 - Registration opening ASAP!
- **AIAA ASCEND.**
 - 24- 26 Oct. Las Vegas.
- **More complete calendar on LSIC website: email with additional events!**

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

Announcement for Partnership Proposals (AFPP) to Advance Tipping Point Technologies

Space Technology Announcement of Collaboration Opportunity (ACO)

Final proposals due: July 28, 2022

Watts on the Moon Challenge, Phase 2

Registration due: June 15, 2022 at 5 p.m. EDT

Early Stage Innovations (ESI 2022)

Proposals Due: June 23, 2022

Technology Advancement Utilizing Suborbital and Orbital Flight Opportunities "TechFlights"

Response due: June 2, 2022

Request for Information: NASA's Strategic Technology Framework "GO Thrust"

Comments due: May 27, 2022

Request for Information: NASA's Strategic Technology Framework "LIVE Thrust"

Comments due: June 23, 2022

Upcoming:

NASA Innovative Advanced Concepts (NIAC) 2023 Phase I

Space Technology Research Institutes (STRI) Solicitation

LSIC | Solicitations: Watts on the Moon Phase 2



June 15, 2022, 2 p.m. PDT

Registration deadline, Competition Level 1 submissions due

NASA has identified two critical gaps for lunar surface power systems:

- 1. Power Transmission** that can deliver power from a remote generation source to critical mission operation loads where a) power loads are frequently or permanently immersed in extreme cold; and b) there are large variations in average power loads versus peak power loads. NASA has significant interest in both wired and wireless transmission, and the challenge seeks to incentivize and demonstrate both types of solutions.
- 2. Energy Storage** that can a) power mission operation loads when power generation is not available; and b) survive and operate in extreme cold environments.

<https://www.herox.com/WattsOnTheMoon>

Phase 2 of the competition will last approximately 30 months and award up to \$4.5 million.

Process is complex and involves multiple steps to be carried out by all participants in the proposal.

- Two step process. (for an initial vetting)
- **Topic 1. Cislunar/Lunar Surface Infrastructure & Capabilities**
 - Technologies that support global lunar utilization leading to commercial commodities and services for a robust lunar economy. Such infrastructure could include examples such as **long-distance lunar power distribution; survive and operate during lunar night;** in-situ Resource Utilization; lunar communications; autonomous construction...
- Funded Space Act Agreement
 - Cost sharing, more agency to industry

A space technology is at a Tipping Point if:

- TRL \sim >4 at time of submission of the Mini Proposal.
- Ground demonstration or flight demonstration will result in:
 - Maturation to TRL 6+
 - More able to bring technology to market
- There is a robust plan for commercialization

Schedule	
Mini Proposal Q	3/15
Mini Proposal due	3/31
Notifications	5/31
Final Proposal Q	7/14
Final Proposal due	7/28
Selections Notified	11/30
Funding	Jan 2023

The background of the slide is a high-resolution image of the lunar surface, showing a large, dark crater in the foreground and a field of smaller craters extending into the distance. The lighting creates strong shadows, highlighting the rugged terrain.

LUNAR SURFACE Science Workshop

Virtual Session 17: Defining a Coordinated Lunar Resource Evaluation Campaign

June 27, 2022

Abstract Deadline — May 27, 2022, 5:00 p.m. U.S. Central Daylight Time (GMT -5)

<https://www.hou.usra.edu/meetings/lunarsurface2020/abstracts/>

- **Context:** lunar thermal environment
 - Overview of thermal environment
 - Higher-fidelity estimates of power needs during eclipse
- **Near-term system solutions**
 - Panel discussion on targeted topics
- **Technology survey**
 - lightning talks – abstract submission
- **Collaborative System Solutions** Participants network and address a given scenario (“mock PDR”)
 - “Tiny” asset (science station/cube rover style)
 - “mobile-scale” (landers and rovers)
 - “grid-scale” (ISRU, crew support)

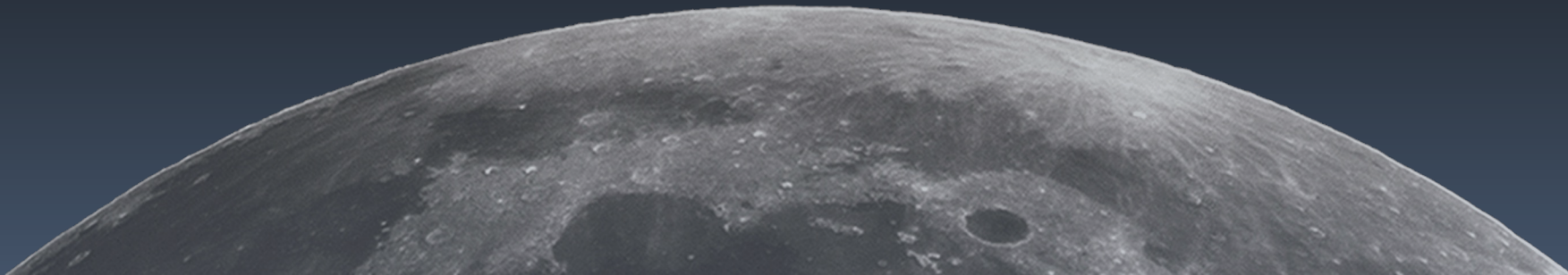
Virtual, July 28th

~4-5 hours

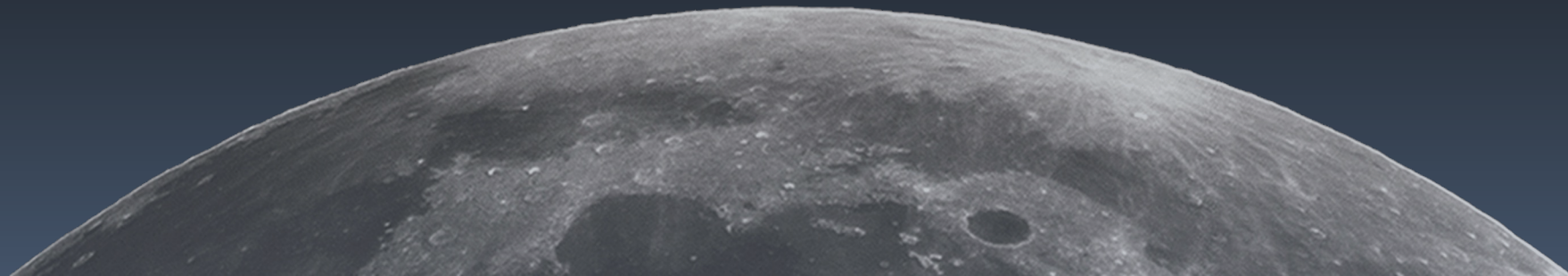
Zoom Webinar Registration



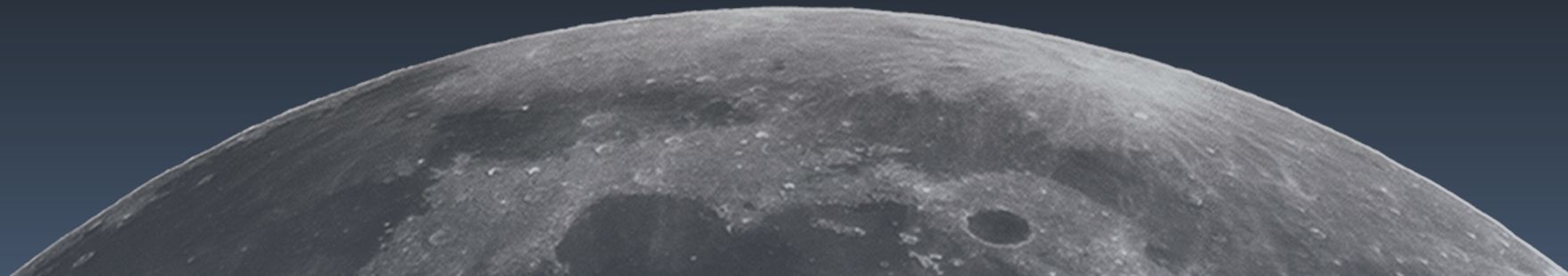
- **Near-term system solutions** Panelists to cover targeted topic themes.
 1. Hibernation
 2. Low-T battery chemistry
 3. Radioisotope thermal support/power
 4. Thermal management/design
 5. Fuel cells/chemical heat/power



- **Technology Survey: Lightning Talks**
 - Lightning talks, targeted at near-term solutions.
 - Short, easy abstract submission
 - Length of lightning talks TBD based on number of abstracts received



- **Collaborative System Solutions (“Mock PDR”)**
 - Participants address a given scenario
 - APL to compile scenarios suggested by registrants. Open to having planning sessions off-cycle from telecons. Current scenarios under consideration:
 - “Tiny-scale” (e.g., weather station/cube rover style)
 - “mobile-scale” (e.g., landers and rovers)
 - “grid-scale” (e.g. ISRU in hibernation, crew support)



- <https://techport.nasa.gov/framework>

Strategic Framework

Charting the horizon of NASA technology development

Space Technology Mission Directorate (STMD)

STMD rapidly develops, demonstrates, and transfers revolutionary, high pay-off space technologies, driven by diverse ideas.

NASA's Space Technology Mission Directorate (STMD) organizes the agency's technology investments into the Strategic Framework, with the goal of addressing its desired outcomes through technology development. The framework is comprised of 18 Capability Areas, grouped into four categories of investment called Thrusts: *Go, Land, Live, and Explore*.

Each strategic outcome includes an Envisioned Future that further describes possible futures enabled by achieving the outcome. NASA is engaging the community to validate and improve the end state described in these Envisioned Futures, and update the framework as appropriate. STMD will use these updates to collect technology gaps, prioritize, and plan future content and investments.

- <https://techport.nasa.gov/framework>

Live

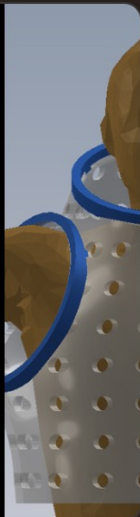
Sustainable Living and Working
Farther from Earth

Advanced Habitation Systems (AHS)

Keep astronauts healthy and productive while living in space and planetary vehicles.



2.4 MB PDF

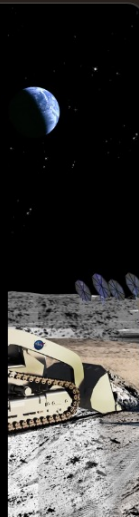


In-Situ Resource Utilization

Develop scalable ISRU production/utilization capabilities including sustainable commodities on the lunar and Mars surface.



2.8 MB PDF



Power and Energy Storage Systems

Develop sustainable power sources and other surface utilities to enable continuous lunar and Mars surface operations.



2.6 MB PDF



Thermal Management Systems

Develop thermal management technologies that enable surviving the extreme lunar and Mars environments.



1.9 MB PDF



Excavation, Construction, and Outfitting (ECO)

Develop methodologies for moving regolith for in-situ purposes such as commodities extraction and constructing infrastructure like landing pads and other structures using in-situ resources.



3.6 MB PDF



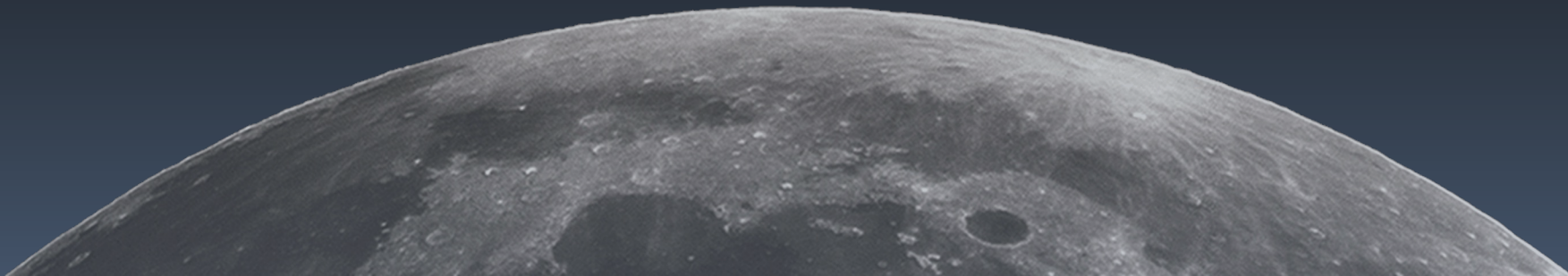
- **The RFI solicits feedback on the envisioned futures that comprise STMD’s Strategic Framework**
- Due Jun 23, 2022 5:00:00 PM ET
- Virtual Industry Day on Wednesday June 01 2022 at 3:30pm ET
- **Critical opportunity to weigh-in on the recently released RFI:**
NASA is engaging the community to validate and improve the end state described in these Envisioned Futures, and update the framework as appropriate. STMD will use these updates to collect technology gaps, prioritize, and plan future content and investments.



- Breakouts organized by areas:

Breakouts organized by areas represented within the POWER Envisioned Future. The boards and topics are (PW is LSICLSIC):

1. Power Generation (Fission Surface Power, Photovoltaic Arrays, RPS)
 - https://miro.com/app/board/uXjVOz_56y0=/
2. Power and Energy Storage (Grid-Scale Energy Storage, Low Temperature Batteries, Fuel Cells)
 - https://miro.com/app/board/uXjVOz_56_E=/
3. PMAD (Rad-Hard Power Electronics, Transmission Cable Systems, Wireless Power Transmission)
 - https://miro.com/app/board/uXjVOz_566g=/





JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

