

LSIC Surface Power Focus Group

December 3, 2020

Begins at 11:03



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Overview



- **LSIC community updates**

- Reminder: Join Confluence, invite others who are not yet LSIC members!
- Next portion of the LSIC cycle
- Happy Holidays! Next Telecon January 28 @ 11:00 EST

- **Fall Meeting**

- **Live notes captured on Confluence:**
 - [Isic-wiki.jhuapl.edu/display/LSIC/Fall+Meeting+Debrief+Live+Notes](https://isic-wiki.jhuapl.edu/display/LSIC/Fall+Meeting+Debrief+Live+Notes)
- Summary details/Feedback
- Breakout sessions preliminary overview
- LSIC next actions/activities
- Open Discussion

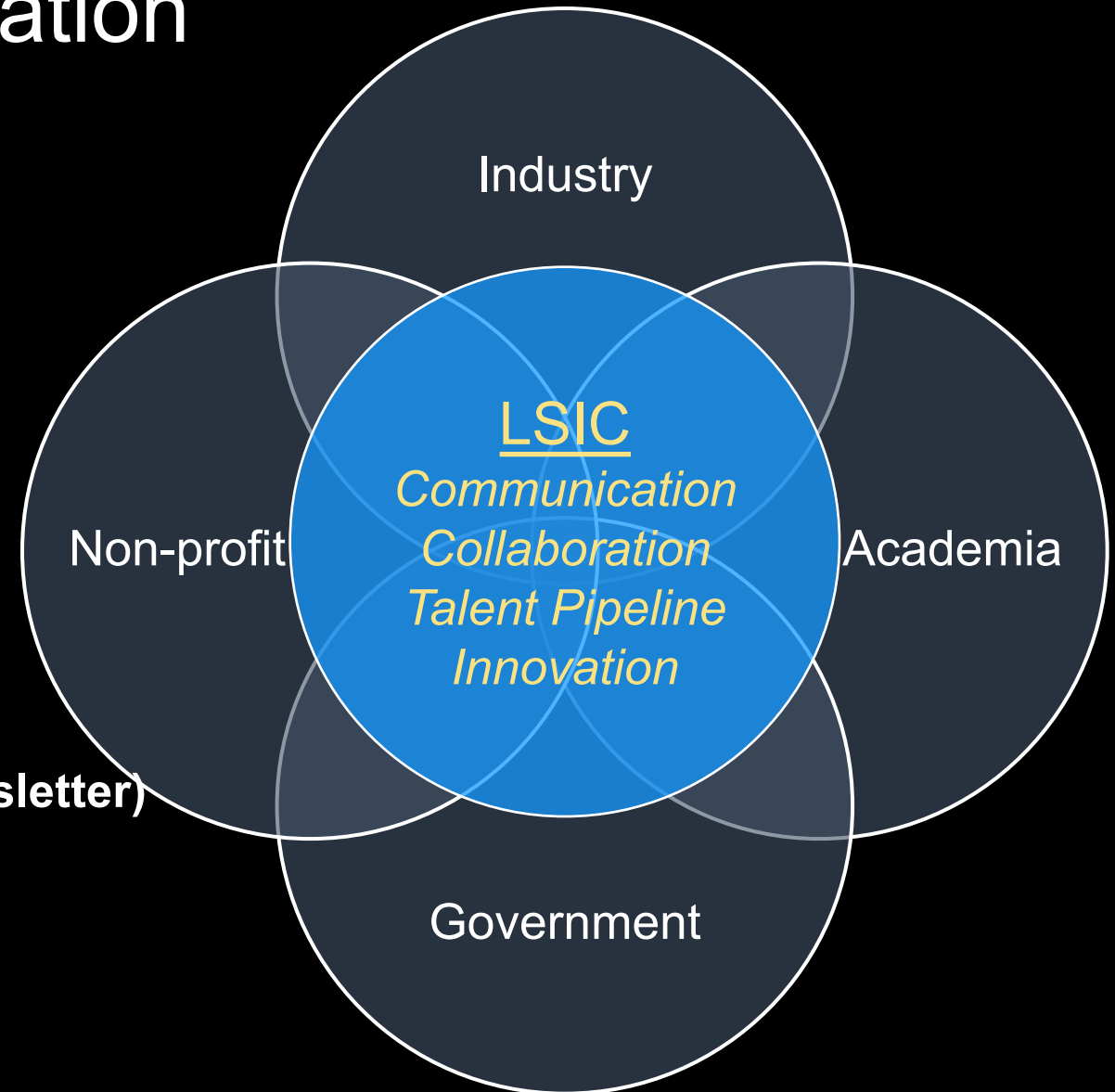
LSII | Lunar Surface Innovation Consortium (LSIC)

- **Want to continue to grow our community**

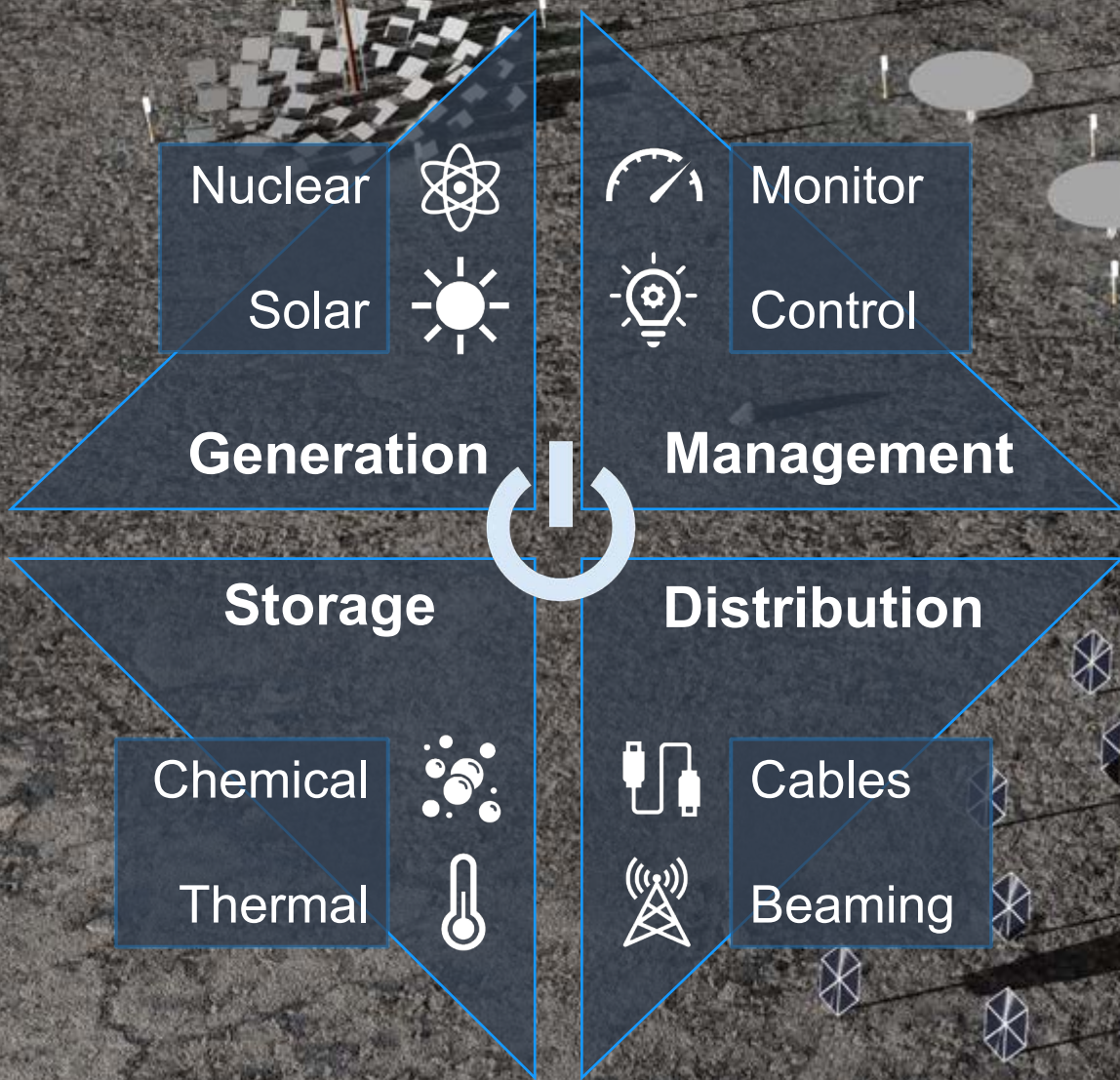
- Membership
 - LSIC.jhuapl.edu
 - Institutions will be asked for primary POC
- Participation
 - Telecons, meetings, workshops
 - Confluence conversations
 - Email: ams573@ALUMNI.PSU.EDU

- **Executive Committee: 15 Members (see newsletter)**

- organizational charter
- mentorship portal for members
- outreach strategy



LSII | Surface Power: Next Telecon January 28th



- **Lightning talks**
- **Subgroups**
- **Finalize year-one goal**

LSIC | Space Tech: Current Funding Opportunities

Lunar Vertical Array Solar Technology

Proposal Deadline: 14 December 2020, up to \$700K Base (4 max), \$7.5 M Option (2 max)

Design and prototype fabrication of autonomously deployable and relocatable lunar surface solar arrays

Watts on the Moon

Phase 1 Registration and Submission Deadline: 25 March 2021, up to \$5M

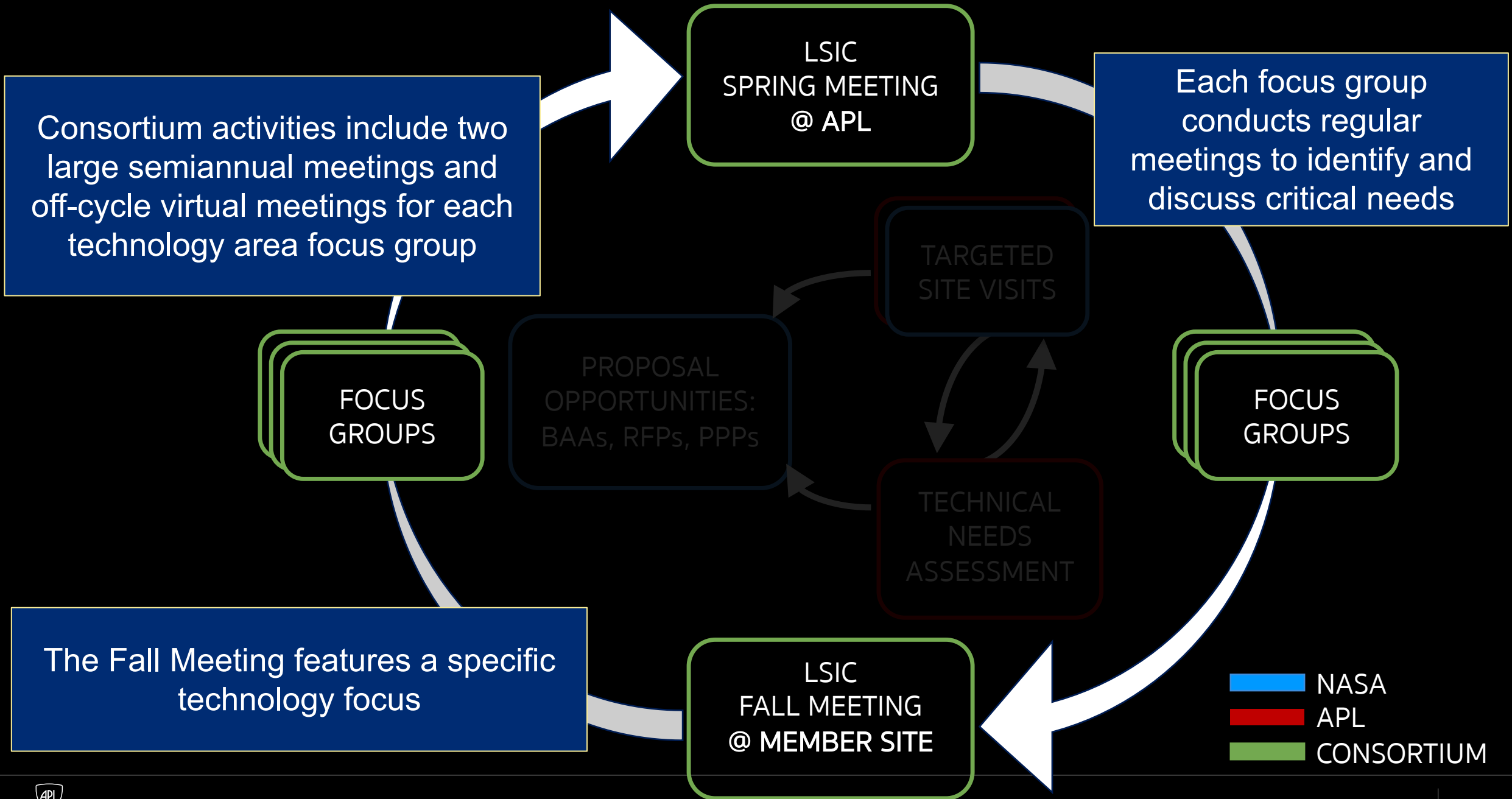
Energy distribution, management, and/or storage that address NASA technology gaps and can progress toward flight readiness and future operation on the lunar surface.

Other opportunities include:

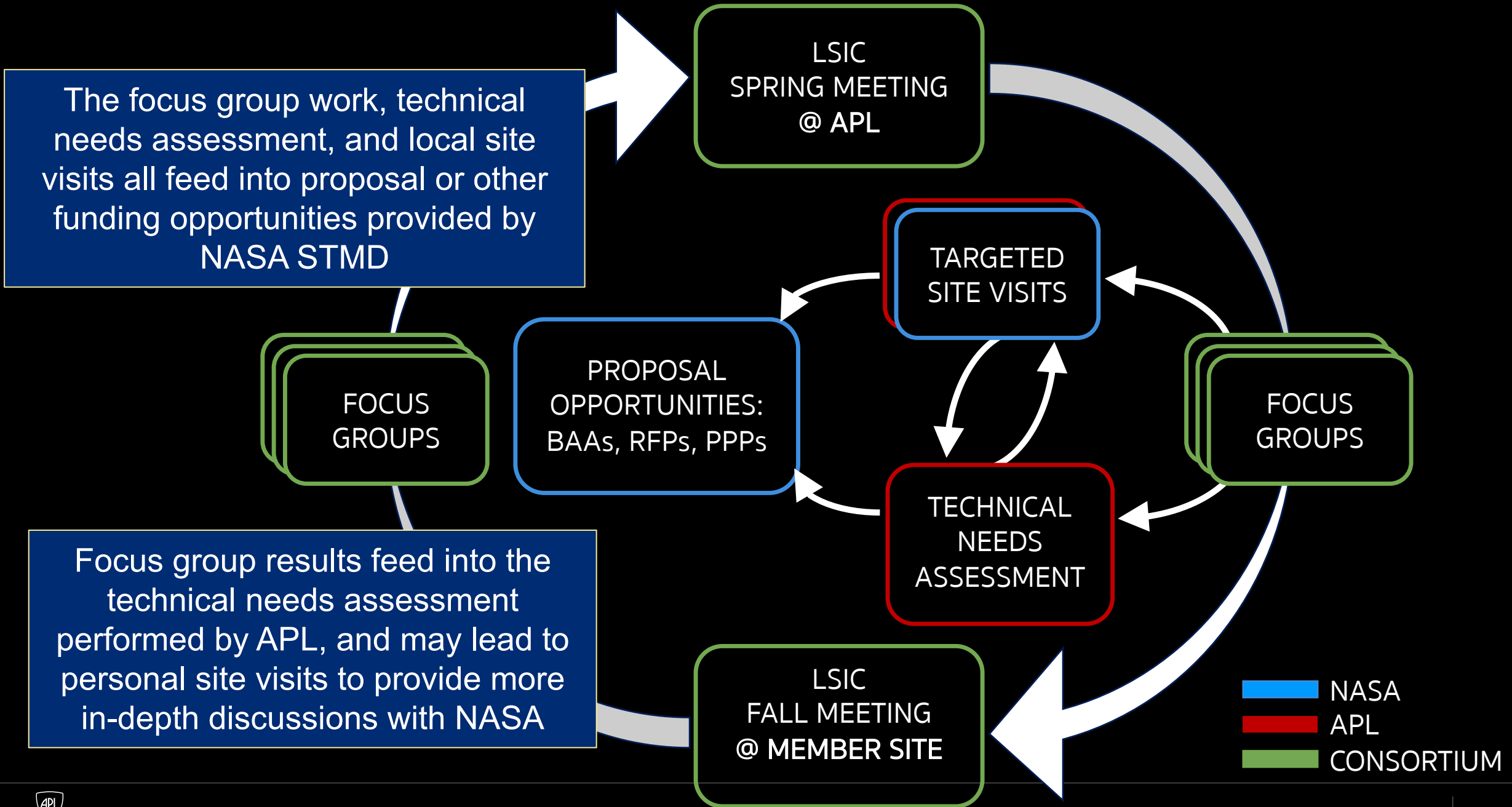
Break the Ice Lunar Challenge: Excavate icy regolith and deliver acquired resources in extreme lunar conditions

Lunar Dust Challenge: innovative ideas from the academic community for lunar dust mitigation solutions

Contextual Role of the Focus Groups



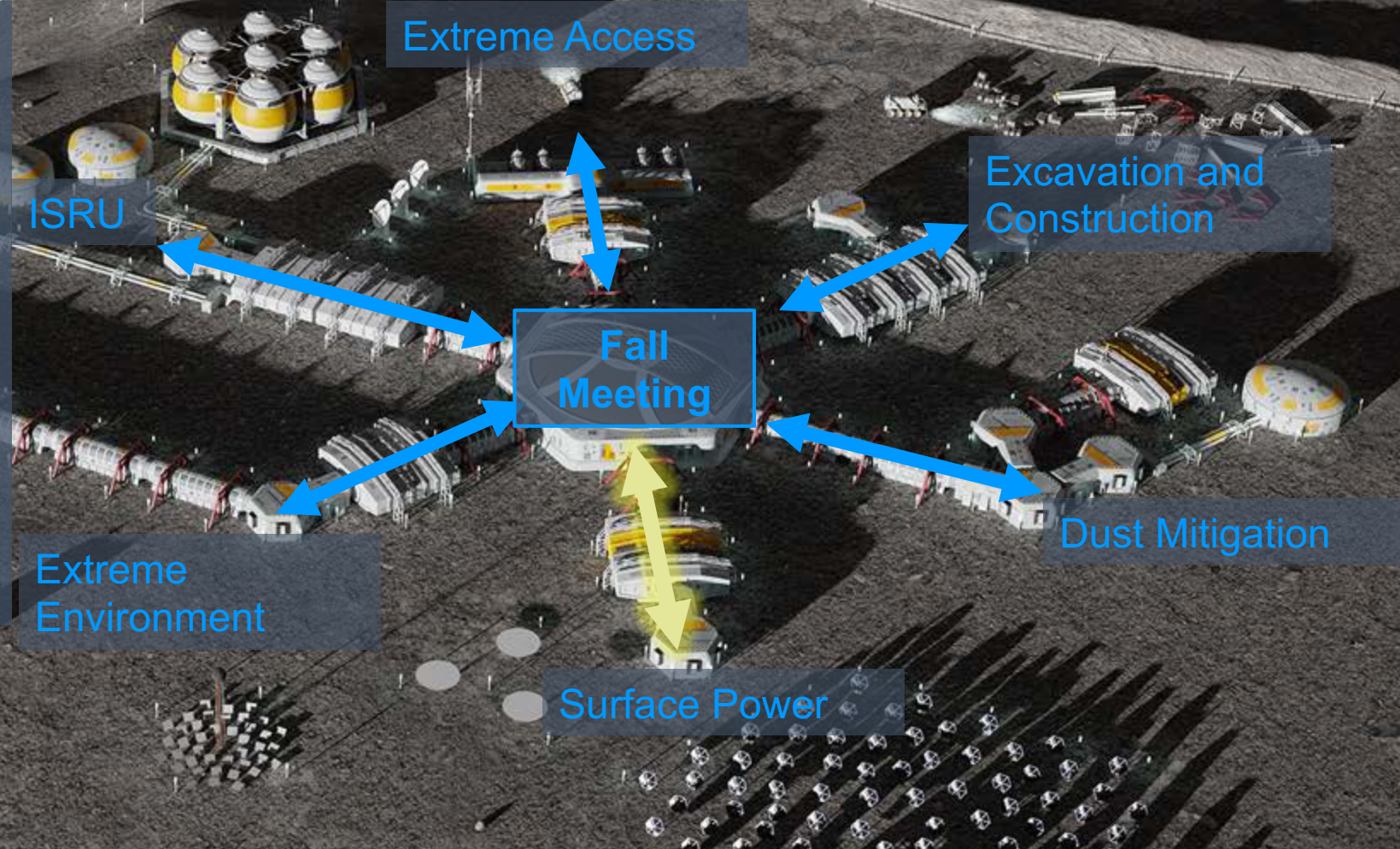
Contextual Role of the Focus Groups



LSIC | Fall Meeting Summary

Interrelationships between focus areas, especially in the context of surface power

- 500+ attendees
- 100+ break-out participants
- Virtually hosted by ASU
- Themes included
 - Space Tech funding opportunities
 - Systems-level concerns
 - Public/private partnerships
- Keynote by NASA Administrator Jim Bridenstine



LSIC | Fall Meeting Feedback

Digital Tools:

1. Need to better prepare community for use of new tools (Miro, Gathertown)
 - Wide range of opinions on Miro especially
2. Virtual tools did facilitate more input, but did not provide universal access

Plans to address:

1. Offer calendar invites for training sessions
2. Make participation details available further in advance
3. Work to better accommodate all users

Additional Comments?

LSIC | Fall Meeting Plenary Talk Summary

- **Administrator Bridenstine**
 - Co-creation
 - Commercial Partnerships
 - International community
- **Jim Reuter (AA for Space Tech)**
 - Opportunities across TRL levels
 - Key technologies roadmap
- **LSII/LSIC Updates (Ben Bussey, Rachel Klima)**
 - Systems Integration
 - Simulant Portal
 - LSIC context and updates
- **ASU (Lindy Elkins-Tanton, Michael Goryll)**
 - Overview of Space Missions and related research
 - NewSpace, Interplanetary Initiative and Commercial partnering
- **Niki Werkheiser (Space Tech Lead for LSII)**
 - LSII and the return to the Moon
- **Marc MacDonald (Space Tech Chief Architect)**
 - Strategic framework and Gap analysis (Spring release)

Talks available online
lsic.jhuapl.edu/Events/102.php

LSIC | Fall Meeting Panel Discussion Summary



- **Space Tech Opportunities**

- **Jenn Gustetic**, Program Executive, NASA Small Business Innovation Research & Small Business Technology Transfer Programs
- **Chris Baker**, Program Executive, NASA Small Spacecraft and Flight Opportunities
- **Jason Derleth**, Program Executive, NASA Innovative Advance Concepts
- **Jan Rogers**, Technical Integration Lead, STMD Space Technology Research Grants Program
- **Amy Kaminski**, Program Executive, NASA Prizes and Challenges

- **Power Panel**

- **Anthony Calomino**, NASA Space Tech, Nuclear Systems Portfolio Manager
- **Chuck Taylor**, NASA Space Tech, Lunar Vertical Solar Array Technology Project Manager
- **Marija Ilic**, Senior Research Scientist, MIT Institute for Data, Systems, and Society
- **Isik Kizilyalli**, Associate Director for Technology, (ARPA-E)

- **Tech Transfer**

- **Dan Lockney**, Program Executive, NASA Technology Transfer Program

LSIC | Fall Meeting Lightning Talks and Posters

An aerial view of a lunar base on the moon's surface. The base consists of several interconnected modules, including a central hub, various living quarters, and storage tanks. A large, circular airlock or hatch is visible in the upper right. The surrounding lunar terrain is dark and cratered. A semi-transparent dark blue box is overlaid on the left side of the image, containing text about the LSIC Fall Meeting.

- **Ten Lightning Talks**

- Very short summaries of technical work
- NASA, Academia, Industry
- lsic.jhuapl.edu/Events/102.php

- **Poster Session**

- Held in Gathertown
- 40+ technical posters, covering LSIC focus areas
- lsic.jhuapl.edu/Events/posters.php

LSIC | Breakout Sessions



Structure by the hour:

1. Envisioned future of a sustainable presence
2. Key Challenges / Risks / Gaps
3. Actions for the LSIC

3 power scenarios:

- 10 kW continuous
- 100 kW, 70% duty cycle
- >1 MW continuous

100+ participants worked through the entire 3 hour session

LSIC | Breakouts: preliminary summary of discussion topics

Low Power (~10 kW regime)

In this paradigm, the group envisioned that the weak business case for participation with restricted power would limit commercial and sustained operations. Many activities would be sortie driven and focus on science (e.g., prospecting), with available power primarily enabling survival rather than operations.

Some top rated stickies from the Miro boards included:

- **Anchor tenants for commercial power utility**
- **Model development of a scalable power grid (modular increments)**
- **Storage and margins**
- **Lunar-rated components, especially via partnerships**

LSIC | Breakouts: preliminary summary of discussion topics

Medium Power (~100 kW, limited duty cycle)

The medium power group expressed a need for understanding economics / supply and demand of potential lunar activities, and a desire to leverage anchor customers as well as international cooperation to enhance long-term stability.

Some top rated stickies from the Miro boards included:

- **Maintain and grow stakeholders, especially international partnerships**
- **Build and solidify supply and demand case for economic development**
- **Determine interaction with crew**
- **ISRU Tech demos**

LSIC | Breakouts: preliminary summary of discussion topics

High Power (~1 MW+)

Knowledge of NASA's plans and technology gaps was deemed critical to the success of rapid, largescale development made possible the availability of high power. Involvement of terrestrial partners and frequent flight demonstrations were further cited as critical to success in this scenario.

Some top rated stickies from the Miro boards included:

- Understand NASA's plans and known gaps ASAP
- Involve more terrestrial companies with relevant experience
- Power Transmission
- Heat: using & removing

LSIC | Breakouts: collective importance

An aerial view of a lunar base construction site. The terrain is dark and rocky. In the foreground, there are several large, rectangular modules with yellow and white sections, arranged in a line. To the right, there are rows of smaller, circular modules. In the background, there are more large modules and a circular structure with a yellow triangle in the center. The overall scene depicts a complex and organized lunar base.

Some topics that generated the most discussion included:

- 1. Lunar longevity (esp. dust)**
- 2. Qualification and testing (CLPS tech demos)**
- 3. AI/autonomous operations**
- 4. Public/private partnerships (port infrastructure, market access)**
- 5. Confidence/stability/economics of the lunar effort**
- 6. Questions on what “sustainable presence” means**
- 7. International collaboration**

LSIC | Possible Next Steps

- **Move from “what we did” to “what we learned,” and what that tells us about “what we do next”**
 - **Open to hearing your take-aways!**
- **Spring Meeting details will come soon**
 - **Expecting a showcase format for NASA and LSIC members**
- **Workshops – narrowly focused, may follow the ISRU S&D model**
 - **Dust mitigation: End of January (tentatively)**
 - **Extreme Access: TRN (Spring)**
 - **Your ideas?**
- **White Papers:**
 - **Critical components for modular power grid model development**
 - **Your ideas?**

LSIC | Open Discussion

- **Captured on Confluence**





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