

The background of the slide is a space-themed image. It shows a large, detailed view of the Moon on the left, with the reddish planet Mars visible in the upper left. A small spacecraft is shown in the center, emitting a bright blue beam of light. The sky is dark blue with many stars. In the bottom right, there is a silhouette of a person's head and shoulders, looking towards the left.

**EXPLORESpace TECH**  
TECHNOLOGY DRIVES EXPLORATION

# **Lunar Surface Innovation Initiative (LSII) Status**

*NAC Technology, Innovation, and Engineering (TI&E) Committee,  
January 27, 2021*

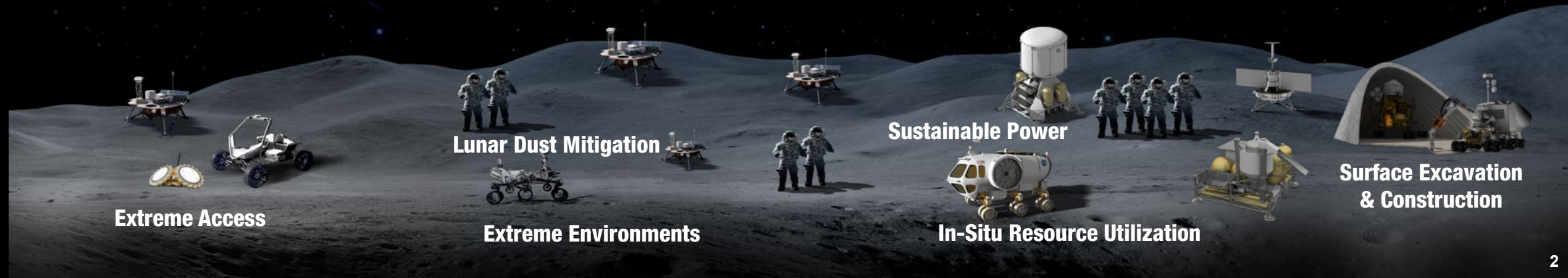
Niki Werkheiser | Director, Technology Maturation | NASA Space Technology Mission Directorate

# Lunar Surface Innovation Initiative (LSII) Status



LSII works across industry, academia and government through in-house efforts and public-private partnerships to develop transformative capabilities for lunar surface exploration.

- Growing the Lunar Surface Innovation Consortium (LSIC) comprised of academia, industry, non-profits and other government agencies
- Formulating and integrating technology maturation activities across the TRL pipeline and Space Tech Pprograms
- Leveraging innovative procurement mechanisms to expedite technology development
- Utilizing early uncrewed lunar surface flight opportunities to inform key technology development



# Lunar Surface Innovation Consortium (LSIC) Status

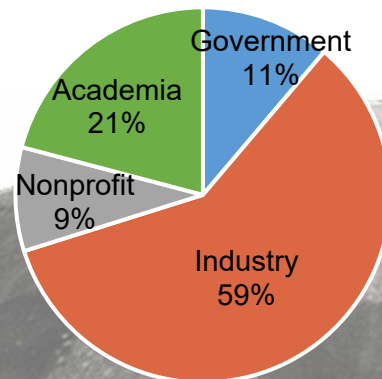


*The LSIC, facilitated through the Johns Hopkins University Applied Physics Lab (APL), is a nationwide alliance of universities, industry, non-profit research institutions, NASA, and Other Government Agencies with a vested interest in our nation's campaign to establish a sustained presence on the Moon.*

- The LSIC Kick-off was held at APL on February 28, 2020 with >250 participants across industry, government, and academia. The Consortium continues to see growth with >500 participants at the virtual Fall Meeting held from October 14-15, 2020.
- In June 2020, APL initiated monthly LSIC Focus Groups across each of the six LSII capability areas to enable regular interaction across the community. APL Focus Group facilitators coordinate with NASA Subject Capability Leads to identify key priorities and topics. These groups currently include representation from over 160 organizations across industry, academia, non-profits, and government organizations.

## ISRU LSIC Focus Group

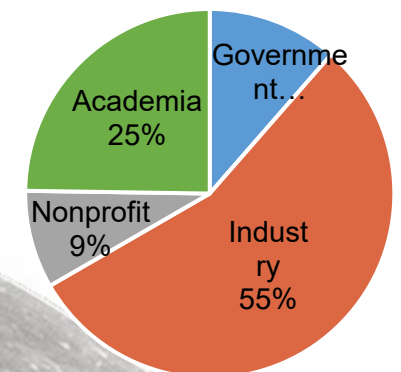
**135 Organizations**



- June 17, 2020 Kickoff: 128 participants
- **Website:**  
<http://lsic.jhuapl.edu/Focus-Areas/In-Situ-Resource-Utilization.php>

## Excavation & Construction LSIC Focus Group

**105 Organizations**



- June 26, 2020 Kickoff: 88 participants
- **Website:**  
<http://lsic.jhuapl.edu/Focus-Areas/Excavation-and-Construction.php>



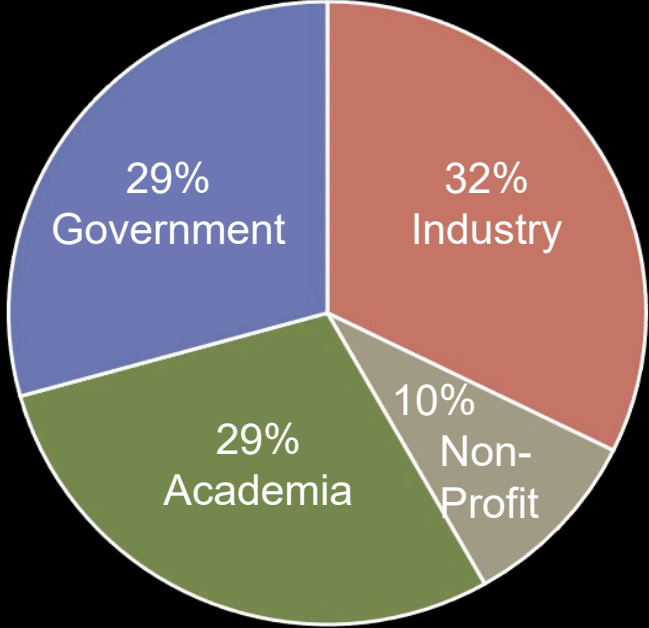
# LSIC Fall Meeting Highlights



The meeting program and presentations can be accessed online at: <http://lsic.jhuapl.edu/Events/102.php>

**The Lunar Surface Innovation Consortium (LSIC) Fall Meeting was held virtually on October 14-15, 2020 with >500 attendees from academia, industry, government and non-profit institutions.**

- The Fall LSIC Forum was led by APL and hosted by LSIC partner Arizona State University
- Keynote address by NASA Administrator Jim Bridenstine included announcement of 15 new Tipping Point Selections
- Space Tech Associate Administrator Jim Reuter provided Space Tech highlights and discussed Flight Opportunities announcements
- NASA Space Tech Opportunities panel featuring SBIR, Flight Opportunities, NIAC, Research Grants, and Prizes and Challenges
- Presentation on Technology Transfer
- Community-contributed technical lightning talks and poster presentations
- Space Technology Strategic Framework and Gap Assessments Presentation
- Panel discussion on sustainable power technology and infrastructure
- Breakout sessions to discuss critical gaps and concerns for establishing a sustained presence on the Moon



**LSIC Fall Meeting Attendance Breakout**

# LSIC ISRU Supply & Demand Workshop



- APL conducted an ISRU Supply and Demand workshop on 9/17/20 to gain a clearer understanding of the potential top-level requirements for lunar In-situ Resource Utilization (ISRU).
- The workshop had >220 participants from >110 unique institutions
- There were 12 talks provided by industry partners (six demand, six supply) outlining their near-term goals for utilization of lunar resources.
- APL published the key outcomes on the LSIC website (to be discussed in the following presentation).

<b>Demand Industry Speakers</b>	<b>Supply Industry Speakers</b>
<b>SpaceX</b>	Lunar Resources
<b>Dynetics</b>	Honeybee Robotics
<b>United Launch Alliance</b>	Masten Space Systems
<b>Lockheed Martin</b>	Aqua Factorem
<b>Firehawk Aerospace</b>	Transastra Corporation
<b>Orbit Lab</b>	Pioneer Astronautic

Recording available at:  
<http://lsic.jhuapl.edu/Events/103.php?id=103>

*LSII leverages the broad range of STMD Programs in order to establish targeted collaborations across industry and academia*



## ISRU Broad Agency Announcement Awards

- Blue Origin
- Univ of Illinois
- Collins Aerospace
- BlazeTech
- Paragon Space
- Skyhaven Systems
- Teledyne Energy Syst
- Honeybee Robotics
- OxEon Energy



## Multiple Small Business Innovative Research (SBIR) awards including:

- Surface Power
- Dust Mitigation
- Extreme Access
- ISRU



- “Watts on the Moon Challenge” – Opened Sept 2020
- “Break the Ice Challenge” – Opened Nov 2020



## Challenges Completed

- Regolith Advanced Surface Systems Operations Robot (RASSOR) Bucket Drum Design Challenge
- Honey I Shrunk the Payload Challenge



## Conducted 4 Searches of promising technologies in the following areas:

- Lunar Dust Mitigation
- Lunar Dust Filtration
- Materials for the Lunar Environment
- Lunar Surface Manufacturing (infrastructure and ISRU)



## Exploration of Lunar Pits Phase III NIAC

- Carnegie Melon/ Astrobotic

## Early Career Initiative (ECI)

- Selected seven LSII-focused ECIs in FY20 across the LSII capability areas

## STRG Early Career Faculty (ECF)

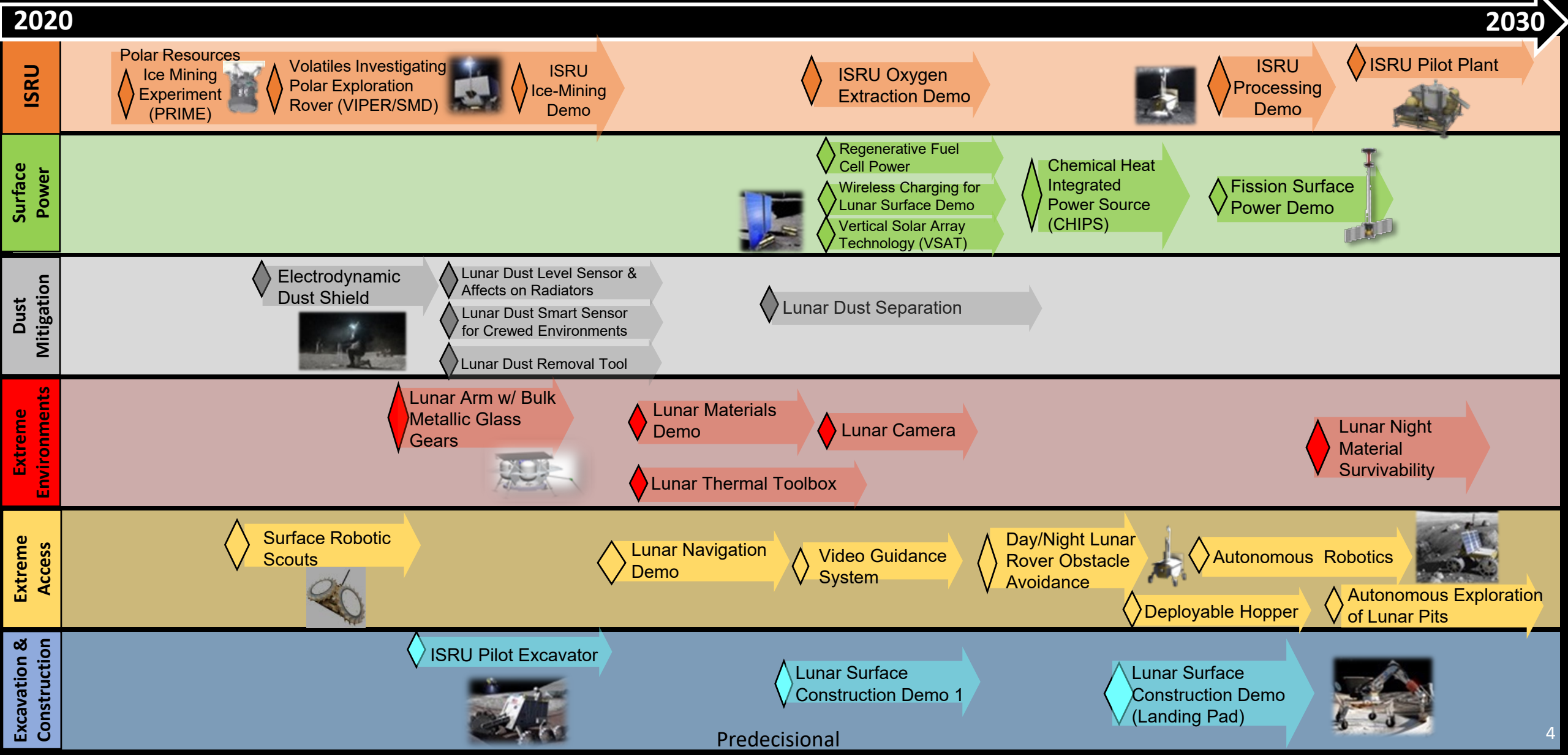
- 2020 Topic for dust behavior modeling and mitigation techniques

## Open LSII Opportunities & Anticipated Selections

- Announcement of Collaborative and Tipping Point Opportunities – October 2020
- Breakthrough Innovative Game-Changing Idea (BIG) Idea Dust Mitigation Challenge – January 2021
- Lunar Surface Technology Research (LuSTR) Opportunities (ISRU & Surface Power) – Feb. 2021

# LSII Technology Demonstration Planning

*LSII leverages early lunar missions to accelerate development of core surface technologies*



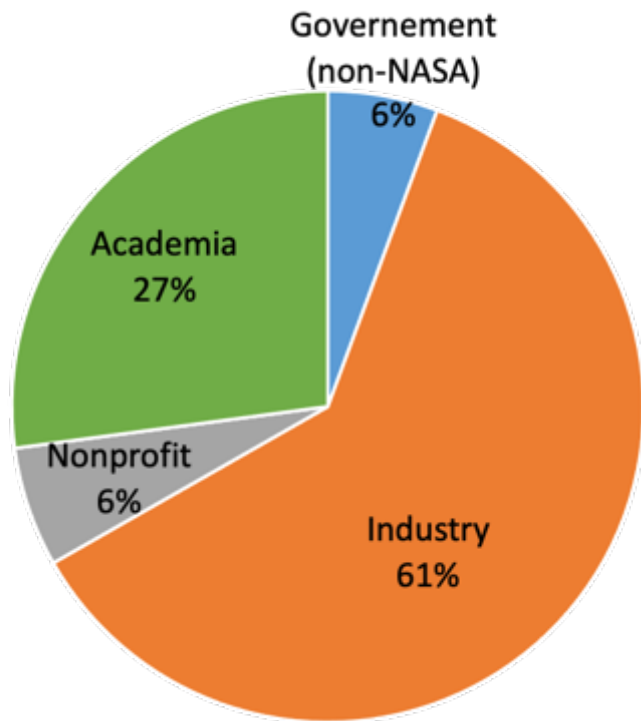
# Within one year of being established....



*LSII has engaged 390 organizations across 44 states to advance the technologies needed to explore the lunar surface in new ways and stimulate a lunar surface economy.*



## LSII Representation







Technology Drives Exploration