

# 2016 LEAG Meeting Outcomes

## Findings

- Korean Pathfinder Lunar Orbiter mission and U.S. involvement
- Small Lunar Surface Payload RFI
- Resource Prospector Mission
- Polar Volatiles
- Coordinated Lunar Prospecting missions
- Sample Return
- Lunar Reconnaissance Orbiter Mission
- Space Launch System
- Moon Village

## Consensus Statements

- Visit of Congressman Jim Brindensine
- Poster Reception
- U.S. involvement in the Russian Luna (25-28) missions

## Action Item

- Mining industry contacts; SRR/PTMSS, etc.

# 2016 LEAG Meeting Findings

The attendees of the 2016 LEAG Annual Meeting (1-3 November 2016) endorse and support the following findings.

**Korean Pathfinder Lunar Orbiter mission.** The LEAG community supports and endorses the Korean Pathfinder Lunar Orbiter mission and applauds NASA (both HEOMD and SMD) for facilitating U.S. involvement in this mission. It is hoped that such involvement will extend to the proposed follow on Korean Lunar Lander mission. [[KARI](#), [KICT](#), [HEOMD-AES](#), [SMD-PSD](#)]

## **Background.**

<https://sservi.nasa.gov/articles/salmon-2-opportunity-for-korea-pathfinder-lunar-orbiter-kplo-instruments/>

# 2016 LEAG Meeting Findings

**Small Lunar Surface Payload RFI.** The LEAG community supports and endorses HEOMD-AES for the Small Lunar Surface Payload Request for Information (RFI), although the cost-sharing requirement will potentially limit the response. However, we applaud commercial industry's willingness to offset such costs. [[HEOMD-AES, SMD-PSD](#)]

## **Background:**

<http://www.nasa.gov/feature/nasa-seeks-additional-information-on-small-lunar-surface-payloads>

<http://www.prnewswire.com/news-releases/moon-express-announces-15m-in-funding-for-nasa-payloads-to-the-moon-under-lunar-scout-program-300355068.html>

# 2016 LEAG Meeting Findings

## **Continued Support for the Resource Prospector Mission.**

The LEAG community wishes to convey their continued strong support for the Resource Prospector mission as a first step to prospecting for lunar volatiles in the polar regions. We wish to reiterate that continued HEOMD support is encouraged, given the international attention now focused on this region of the Moon and the value of lunar resources for Solar System exploration. SMD-PSD involvement is urged given the potentially huge science return of this mission. [[HEOMD-AES](#), [SMD-PSD](#)]

**Context: 2015 Resource Prospector Mission Finding.** The attendees of the LEAG meeting support the HEOMD Resource Prospector Mission and are excited by the progress made since the 2014 LEAG meeting. Given the international interest in getting to the Moon, continued HEOMD support is encouraged for this vital mission.

# 2016 LEAG Meeting Findings

**Polar Volatiles.** Exploration on the lunar surface of the upper few meters of regolith in volatile-rich regions around the lunar poles is critical for science, exploration, and developing lunar commercial opportunities and public-private partnerships. Such ground-truth is necessary for truly quantifying the amount, form, composition, and accessibility of such resources. [[HEOMD](#), [SMD-PSD](#)].

**Context. 2015 Finding – Lunar Polar Volatiles and Their Long-Term Use.** A long term and integrated approach to understanding the significance and scientific implications of polar volatiles and their potential as a strategic resource is the logical next step.

**Background:** Presentations at the 2016 LEAG meeting demonstrated the important potential fuel refined from lunar volatiles could have for enabling cis-lunar and Solar System transportation capabilities. Coupled with presentations on commercial potential for getting payloads to the lunar surface, exploration of such regions is becoming with multiple payloads is becoming more feasible.

# 2016 LEAG Meeting Findings

## **Coordinated Lunar Polar Prospecting Missions.**

With international focus on exploring the lunar poles and the volatiles, multiple robotic surface prospecting missions with common measurement and robotic capabilities are necessary to visit various polar locations in order to determine the viability of polar volatiles as an enabling resource. The LEAG community recommends that the different agencies and stakeholders sending such missions to the Moon coordinate their efforts, such as through the International Space Exploration Coordination Group (ISECG), such as through the LV-SAT. The burgeoning commercial lunar transport industry could facilitate such missions. [[HEOMD](#)]

# 2016 LEAG Meeting Findings

## Coordinated Lunar Polar Prospecting Missions (continued).

Context: LEAG Roadmap Implementation Plan -

<http://www.lpi.usra.edu/leag/reports/RoboticAnalysisLetter.pdf>

LEAG Volatiles Specific Action Team Report:

[http://www.lpi.usra.edu/leag/reports/vsat\\_report\\_123114x.pdf](http://www.lpi.usra.edu/leag/reports/vsat_report_123114x.pdf)

**Background:** By working together, various space agencies with an interest in investing in exploring and using the lunar poles could coordinate their efforts and leverage their resources and investments to maximum effect and stimulate the burgeoning lunar commercial market. Such coordination could

- Generate knowledge about resource viability that is essential for future exploration planning
- Deliver high priority science on the sources and evolutionary processes of volatiles on Earth and in the inner Solar System
- Create an initial lunar market and jump start commercial space at the Moon
- Determine the viability of future commercial markets based on lunar resources
- Reduce the cost of cis-lunar and Solar System transportation systems
- Deliver inspirational missions to the public
- Optimise the cost effectiveness and benefit return from investments made by participants

# 2016 LEAG Meeting Findings

**Sample Return.** The LEAG community endorses the human-assisted robotic lunar sample return and human lunar sample return concepts (i.e., as defined in the ISECG mission scenarios), and urges SMD and HEOMD to work together to find ways of implementing such missions. It is noted that the utility of targeted solely robotic sample returns should not be overlooked. [[HEOMD-AES](#), [SMD-PSD](#)]

**Background:** Both the Planetary Science Division of SMD and the HEOMD are considering sample return as important current missions or in the future (e.g., Global Exploration Roadmap 2013; Vision and Voyages 2013-2022 – Planetary Science Decadal Survey). By working together such missions could be accomplished earlier and achieve both science and exploration goals.

# 2016 LEAG Meeting Findings

**Lunar Reconnaissance Orbiter.** LRO is an indispensable mission for both science and exploration. We thank SMD for extending LRO operations and analysis through 2018, based on the excellent Cornerstone Mission prepared by the LRO science team. We are encouraged that HEOMD will provide some funding for Mini-RF operations and look forward to exciting new results from the full complement of LRO instruments. [[SMD-PSD](#), [HEOMD](#)]

# 2016 LEAG Meeting Findings

**Development of the Space Launch System (SLS) and Potential for Enabling Payloads.** The development of the SLS has the potential to establish enabling infrastructure around the Moon (such as communication satellites) and facilitate science. The LEAG community recommends utilizing SLS capabilities when possible to launch competed or directed scientific orbital and landed assets and communication relay capabilities as co-manifested payloads to support global access to the lunar surface for science and exploration activities. HEOMD and PSD are encouraged to include such payloads in future EM calls or other launch opportunities. [[SMD-PSD](#), [HEOMD](#)]

**Background:** The presentation by David Smith on progress of the SLS was enthusiastically received by the LEAG community. The capacity of the SLS could allow a communication satellite system to be set up around the Moon, thus enabling global access for both robotic, human-assisted robotic, and human missions to the Moon.

# 2016 LEAG Meeting Findings

**Moon Village**. After a dedicated session and discussion on the Moon Village concept, the LEAG community supports this initiative because it has the potential to serve multiple stakeholders, enable future science and exploration missions, technology advances, international cooperation, infrastructure development, and foster commercial opportunities for developing cis-lunar industries. [[HEOMD](#), [ESA](#)]

# 2016 LEAG Meeting Consensus Statements

**Congressman Jim Bridenstine.** The LEAG community wishes to extend their heartfelt thanks to Congressman Jim Bridenstine for his stimulating address to the 2016 Annual LEAG Meeting on 2 November. Members of the lunar community stand ready to help the congressman with analyses and data in the discharge of his duties on the House Subcommittee on Space.

# 2016 LEAG Meeting Consensus Statements

**Moon Express.** The LEAG community wishes to thank Moon Express and Bob Richards for sponsoring the poster reception at the 2016 LEAG Meeting. We appreciate your continued support of LEAG and look forward to future science and exploration opportunities enabled by Moon Express.

# 2016 LEAG Meeting Consensus Statements

**Science Involvement in the Russian Luna Program.** The LEAG community applauds James Green (SMD-Planetary Science Division) for exploring possibilities for the US lunar science community to be involved in the Russian lunar program (Luna 25-28). We look forward to further updates as they become available. [[SMD-PSD](#)]

# 2016 LEAG Meeting Action Item

**Action Item.** The LEAG community charges the Executive Committee to develop closer ties with the mining industry in terms of facilitating better interactions between our communities on identifying, prospecting, mining, refining, and using lunar resources.

**Background.** In the discussion it was evident that there was a need to develop a community of scientists who can work on the needs of the commercial interests - identifying the extent, purity, and depth of deposits, geotechnical properties, etc. Establishing closer ties with the Space Resources Roundtable and the PTMSS communities will be explored.