

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 3 (2C)

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LUNAR INFRASTRUCTURE SYSTEM ARCHITECTURE ENABLED BY WATER BASED ISRU  
PLANT**Abstract**

In recent years, lunar exploration and development programs have accelerated worldwide. For example, JAXA's lunar exploration roadmap[1] envisions four astronauts conducting 42 day annual surface missions around 2030, followed by a semi-permanent crew of four around 2040. Looking beyond these milestones, and assuming a future lunar city with a population on the order of 1,000 residents, JGC Corporation aims to contribute to the realization of a sustainable lunar society, termed the Lunar Smart Community (Lumarnity™). Lumarnity™ is defined as a self-sustaining community that regenerates essential resources—such as electric power, hydrogen, oxygen, water, carbon dioxide, food, and treated human waste—while ensuring efficient resource circulation through integrated systems engineering. Leveraging JGC's experience as a leading global contractor in the oil, gas, and industrial plant sectors, we are promoting this concept from the perspectives of infrastructure and habitation system development. As part of this initiative, we are collaborating with JAXA and the Ministry of Agriculture, Forestry and Fisheries (MAFF) in Japan. Under JAXA projects including “Conceptual Study of a Pilot Plant toward the Realization of a Lunar ISRU Plant”[2] and “Preliminary Design and Breadboard Development for a Terrestrial Pilot Plant for a Future Lunar ISRU Plant”[3], we are investigating system concepts for ISRU (In Situ Resource Utilization) facilities to produce liquid hydrogen/oxygen propellants, potable water, and breathable oxygen from lunar water resources. In parallel, under the MAFF-led program[4] on an advanced circular food supply system for long-duration lunar habitation, we are studying sustainable habitat infrastructure. This paper will describe JGC's proposed lunar infrastructure system architecture enabled by a water based ISRU plant, highlighting our technical approach to future lunar development requirements and our long term contribution roadmap.

**References**

- [1] JAXA, Future Space Exploration Scenario 2025 (Nov 2025).  
<https://www.exploration.jaxa.jp/assets/img/news/pdf/scenario/2025/Scenario2025.pdf>

- [2] JGC News Release, “JGC Selected for the JAXA Project ‘Conceptual Study of a Pilot Plant toward the Realization of a Lunar ISRU Plant’” (Dec 2023).  
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- [3] JGC News Release, “JGC Selected for a JAXA Project on Preliminary Design and Breadboard Development, Testing, and Other Tasks for a Terrestrial Pilot Plant for a Future Lunar ISRU Plant” (Jul 2025).  
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- [4] SPACE FOODSPHERE News Release, “Consortium with SPACE FOODSPHERE as representative organization selected for government-led R&D project in space food domain.” (Dec 2021).  
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