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PROGRESS REVIEW OF NASA IN SITU RESOURCE UTILIZATION (ISRU) DEVELOPMENT IN ARTEMIS

Abstract

In 2017, the United States National Aeronautics and Space Administration (NASA) initiated the Artemis program to send astronauts back to the lunar surface, create a sustainable human lunar exploration program, and lead the first human exploration mission to the Mars surface. In 2018, NASA began transitioning the focus of In Situ Resource Utilization (ISRU) development from Mars to the Moon. In 2019 NASA started to outline the main goals and objectives for lunar ISRU development, refocus Mars ISRU work where possible, and began to implement the Leader/Follower strategy for lunar polar water mining and oxygen from regolith ground development and flight demonstrations leading to a Pilot plant system demonstration. These development and flight strategic plans have been presented in various forums starting in 2019 with a presentation at the Space Resources Roundtable titled "Current NASA In Situ Resource Utilization (ISRU) Strategic Vision" and at the 2nd Mining Space Summit in Luxembourg titled "What's Next for Space Resource Utilization?". Since 2019, NASA has been funding a significant amount of technology development work to advance lunar ISRU within NASA and with industry and academia though numerous solicitations and challenges. NASA also initiated technology demonstration and flight missions associated with ISRU as well as missions to advance capabilities needed to support ISRU resource assessment, extraction, and processing through Artemis, the Space Technology Mission Directorate (STMD) Flight Opportunities (FO) and Technology Demonstration Mission (TDM) programs, and the Science Mission Directorate (SMD) Commercial Lunar Payload Services (CLPS) program. This paper will provide an overview of the progress that has been made since 2019 on NASA's ISRU technology development and flight implementation plans and objectives, as well as information on future ISRU development and implementation plans.