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Lunar Surface Sustainability: A Permanent Human Settlement on the Moon

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ABSTRACT

With the Artemis program, The United States plans to return to the Moon and create a permanent human presence in the lunar south pole before the next decade. Lunar poles and cislunar space offer a great option to expand human settlement beyond the planet earth. Scientific and economic opportunities of such human settlement are enormous. However, a paradigm of new technologies: *In-Situ Resource Utilization, Sustainable Power, Dust Mitigations, Precision Landing, Surface Excavation and Construction, Cryogenic Fluid Management, Extreme Access/Extreme Environment, and Communication and Navigation Systems* need to be deployed to support a long-term lunar habitat. The development and testing of large-scale industrial systems that can autonomously operate in extreme thermal and dust environment to extract and utilize lunar resources for human habitation are critically needed. This presentation provides an overview of the key technical challenges of human settlement on the Moon.

International partnerships will be critical in ensuring a sustainable and robust human settlement on the Moon. The United States has established the Artemis Accords to develop a global coalition for peaceful exploration of the Moon. Lunar exploration can create global harmony and prosperous relationships among nations. Artemis Accords focuses on, among others, Peaceful Exploration, Transparency, Interoperability, Space Resources, and Release of Scientific Data. To date, Australia, Canada, Italy, Japan, Luxembourg, United Arab Emirates, the United Kingdom, and the United States of America have joined the effort. Bangladesh should aspire and actively engage in getting an opportunity to join this global coalition.

The name Artemis is derived from the Greek goddess of the Moon and twin sister to Apollo. The world will need an Artemis generation of young engineers, scientists, and explorers from every corner of the globe to meet humanity's ambition to become a multi-planet species. A global engagement and investment for talent development and innovation will be essential for sustainable human presence beyond the lower earth orbit.

Keywords: Lunar Exploration, Artemis, Human Settlement, and In-Situ Resource Utilizations.