SMALL MODULAR FISSION REACTORS THAT ENABLE AFFORDABLE AND SUSTAINABLE LUNAR ENTERPRISE. J. S. Herring[1], S. Mackwell[1] and C. Pestak[1], [1]Universities Space Research Association, 7178 Columbia Gateway Drive, Columbia, MD 21046 (jherring@usra.edu)

Common to all the robotic and human activities planned for the lunar surface is the need for abundant and reliable electrical power. Effective robotic exploration and sustained human presence will require electrical power in the 40kW to 100kW range that is continuously available throughout the entire lunar day/night cycles. A power plant capable of meeting this need would form the basis for establishing commercial electrical utility services on the lunar surface. Such services will jump start the exploration, resource mapping, commercial exploitation, and colonization of the Moon by a broad mix of public and private users that include space agencies, industries, adventurers, and entrepreneurs.

To address the challenges and opportunities of establishing in-space commercial electrical utilities, Universities Space Research Association (USRA) recently began an Internal Research and Development (IRAD) project to perform a concept study of a new Small Modular Fission Reactor (SMFR) that uses Low Enriched Uranium (LEU) for use on the Moon. SMFRs have significant advantages over other potential power sources being considered for the Moon.

By selecting LEU as the fuel, USRA is addressing design issues for a SMFR for use on the lunar surface that can be developed commercially, thus enabling greater industry participation in current and future initiatives for the exploration, habitation, and exploitation of the Moon. Our study will build upon the progress made by NASA's HEU-based KiloPower project and make use of DOE's experience in the development of compact reactor systems.

Using a variety of possible energy conversion techniques, SMFRs powered by LEU can enable a commercial enterprise to provide both the heat and electricity needed for human and robotic activities, including outposts, habitats, fleets of exploration rovers, ISRU systems, and excavation/mining operations.

This presentation describes our concept for a commercially viable SMFR for use on the Moon by 2028, if properly resourced.