SURVIVING NIGHT AT THE LUNAR SOUTH POLE: EXPLORING VIABILITY OF RADIOISOTOPE POWER SYSTEMS FOR A CREWED ROVER. T. B. Slusser[1], S. J. Wilcox[2] and Z. Y. Hernandez[3], [1]Jacobs Technology Inc., 2224 Bay Area Blvd., Houston, TX 77058 [2]Jacobs Technology Inc., 2224 Bay Area Blvd., Houston, TX 77058 [2]NASA Johnson Space Center, 2101 E NASA Pkwy, Houston, TX 77058

Introduction: Spacecraft thermal environments tend to be extreme, and the lunar surface is no exception. Future lunar missions aim to explore the lunar south pole region, focusing on permanently shadowed regions (PSRs) that may act as cold traps for volatile elements such as hydrogen. By careful selection of landing sites, the longest continuous period devoid of insolation near these PSRs can be reduced significantly from the maximum of 354 hours. Future NASA missions aim to allow exploration of PSRs with a crewed lunar rover. Program architectures may impose a requirement that the vehicle be able to survive repeated lunar nights. Surface temperatures at southern latitudes can be lower than 100K during night, causing significant energy demands heating components above keep-alive temperatures. This adversely affects lunar programs which are heavily mass-constrained. A technical exploration of various radioisotope power systems and their viability, benefits, and drawbacks was completed. An analysis was also performed examining potential vehicular mass reduction and increased lunar night survivability due to the inclusion of radioisotope power sources. The results of this analysis were compared to a baseline non-nuclear vehicle utilizing only batteries and solar arrays for energy storage.