Lunar Microgrid

An artistic rendering of what a resilient microgrid for a lunar base camp might look like. Sandia National Laboratories engineers are working with NASA to design the system controller for the ...

islanded microgrids, one for the habitat and one for ISRU production. In these two islanded grids, the solar arrays and batteries operate in the same voltage range that the loads require, so no power conversion is needed. Excess power from one of the "islanded" microgrids can be shared to the rest of the lunar microgrid. ed to a Compar

An artistic rendering of what a resilient microgrid for a lunar base camp might look like. Sandia National Laboratories engineers are working with NASA to design the system controller for the microgrid. This is not the first time Sandia has partnered with NASA to power equipment on the moon.

Lunar surface power distribution is one of the essential technologies for supporting future space exploration missions. Developing and implementing lunar surface microgrids could address the challenges for lunar applications, such as intermittent power sources and harsh environments. This paper introduces the Flexible Dc Energy Router (FeDER), a modular and scalable power ...

In this paper, a Lunar DC microgrid (LDCMG) structure is the backbone of the energy distribution, storage, and utilization infrastructure. The method to analyze the LDCMG power distribution network and ESS design is the Hamiltonian surface shaping and power flow control (HSSPFC). This ISRU system will include a networked three-microgrid system ...

The testbed can be used to build a scaled-down representation of the lunar microgrid, and used to study the power system controllers, energy storage, power electronics, and distributed energy sources.

technological solutions that could be applied upon a lunar microgrid. INDEX TERMS Space microgrids, lunar power system state-of-the-art, solar power in space, lunar manned.

power electronics on a DC microgrid that is a scaled and simplified representation of the eventual lunar microgrid, Raskin said. Most terrestrial microgrids, and terrestrial electrical grids in general, run on alternating-current power. 5/9

Power and Energy Management System of a Lunar Microgrid - Part I: Modeling Power Demand of ISRU. / Saha, Diptish; Bazmohammadi, Najmeh; Lashab, Abderezak et al. In: I E E E Transactions on Aerospace and Electronic Systems, Vol. 60, No. 2, 01.04.2024, p. 1364-1375.

Baseline Artemis with a Lunar Microgrid o Create a regional lunar grid with: - Primary distribution system to

enable power sharing between local microgrids - Additional power source (FSP) that can be utilized by local microgrids o NASA has conducted grid trade studies to inform grid and interface converter design. 6

Energy management systems (EMSs) and autonomous power control (APC) for space microgrids (MGs) on the Moon need properly designed operating points and references to ensure the mission"s safety. The oxygen and water requirements of the lunar base are supplied by the in situ resource utilization (ISRU) from the lunar regolith. ISRU is one of the most power-demanding ...

Reliable power system network is necessary to meet the needs of the ongoing research establishments on the lunar surface. Interconnected microgrids on the lunar surface will help in load sharing during extreme failure events. However, detailed system-level planning including network resiliency is crucial to make the system survive during high-impact low probability ...

Lunar microgrids are simply remote microgrids, in this case, operating on the moon. They mostly follow the same applications and parameters that a remote microgrid on Earth would follow (Figure 1 ...

They will also use the testbed to study questions about power system controllers and the interactions between distributed energy resources, energy storage and power electronics on a DC microgrid that is a scaled and ...

Designing a Lunar microgrid to provide electrical power allows o Addition of dissimilar source and storage methodologies to enhance reliability and availability o Systematic integration of new ...

The National Aeronautics and Space Administration (NASA) is interested in developing an incremental lunar power grid to support continuous human/robotic operations under the Artemis missions and can scale to global power utilization and industrial power levels. The initial lunar surface power system will be composed primarily of assets that contain their own ...

Autonomous power control (APC) and energy management system (EMS) for space microgrids (MGs) on the Moon require well-designed operating references to ensure their safe operation considering the long-term goals of the mission. Oxygen and water, as two vital elements for human survival on the Moon, can be produced from the lunar regolith using the in-situ ...

within a wide range of lunar microgrids. TECHNICAL APPROACH Architecture study of lunar microgrids Three layers of planning and control of microgrids I. Routing, fault diagnostics, reconfiguration strategies II. Energy management system III. Modular T-Breaker based energy router with smart resistor function

Abstract: Energy management systems (EMSs) and autonomous power control (APC) for space microgrids (MGs) on the Moon need properly designed operating points and references to ...

LUNAR MICROGRID SIZING A. Installation site Solar irradiance conditions is the main criteria for the selection of the installation site, since the lunar base is powered by photovoltaic (PV) arrays. In 2007,

"Kaguya" mission collected data and estimated the total solar irradiance at various locations on the Moon for the year 2020. Point D ...

Microgrid for Lunar Surface Power Sustained lunar surface operations will require access to continuous and highly reliable power to support mission needs and an ability to evolve and grow over time (years). The first initial loads that arrive on the lunar surface will contain their own dedicated power sources. Over time, as the lunar surface operations and power demands ...

(a)Illumination time-series profile at the candidate lunar site with longitude 222.6627 and latitude -89.4511 near the Shackleton crater from July 6, 2023, to August 5, 2023.

Lunar microgrid to provide electrical power - Flexibility, evolvability, and reconfiguration - Optimal dispatch of power sources and energy storage to service loads & ...

Future lunar missions will utilize a Lunar DC microgrid (LDCMG) to construct the infrastructure for distributing, storing, and utilizing electrical energy. The LDCMG"s energy management, of which energy storage systems (ESS) are crucial components, will be essential to the success of the missions. Standard system design currently employs a rule-of-thumb ...

"All of [the standards] being developed for the lunar station include emulation capability," Rashkin explains. The test-bed may be used to create a scaled-down model of the lunar micro-grid, as well as to research power distribution controllers, energy storage, electronics, and decentralized energy sources.