23rd IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

Author: Dr. Koichi Ijichi
Japan Space Systems, Japan

Mr. Noriaki Oka
Japan Space Systems, Japan
Mr. Osamu Kashimura
Japan Space Systems, Japan
Dr. Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency, Japan
Mr. Atsushi Uchida
Mitsubishi Research Institute Inc., Japan
Dr. Tomohiko Mitani
Research Institute for Sustainable Humanosphere, Kyoto University, Japan
Dr. Kazuhiko Honjo
The University of Electro-Communications, Japan, Japan
Dr. Ryo Ishikawa
The University of Electro-Communications, Japan, Japan
Dr. Kosei Ishimura
Waseda University, Japan
Prof. Yoshiyuki Fujino
Toyo University, Japan
Dr. Kazuhisa Fujita
The Graduate school for the Creation of New Photonics Industries, Japan
Prof. Kenji Itoh
Kanazawa Institute of Technology, Japan
Mr. Yoshihiro Kawakami
Obayashi Corporation, Japan
Dr. Yoji Ishikawa
Obayashi Corporation, Japan
Mr. Akihiko Ogawa
IHI Aerospace Co, Ltd., Japan
Mr. Takunori Ishikawa
IHI Aerospace Co, Ltd., Japan
Mr. Hiroshi Yamaguchi
Japan
Ms. Emi Habuta
Japan
Mr. Yoshiyuki Chiba
Japan
Mr. Takeshi Kai

Mitsubishi Heavy Industries Ltd. Japan, Japan
Mr. Hiroki Yanagawa
Japan Space Systems, Japan

THE CONCEPT STUDY OF THE MOON ELECTRIC POWER SYSTEM

Abstract

Since Japan signed ARTEMIS accord in the year of 2019, the Ministry of Economy, Trade and Industries (METI) started the FS regarding the energy issues on the Moon in the year 2021, and organized the groups to study the water mining to produce Hydrogen and Oxygen at the PSR of Moon south pole region. For those purposes, the electricity is essential and need to be prepared. Although ISS is the precursor large scale electrical power system for the space application but the study was started considering the ground electrical power system because the Moon electrical system may include the various power generation system, power transmission system and also the consumer may spread around including the Hydrogen plant system and human habitant.

Considering the positioning of the electrical power system on the Moon human society, the power system on the moon should be regarded as "the Electrical Power Grid" as same as that of the ground power systems prepared as the infrastructure of the society. And more, considering the unique features of the Moon, following are the issues to be considered. 1.The power generation system on the Moon orbiting satellite and be sent to the moon is required considering the shadows of the landscape, PSR and the long night 2.Long distant power transmission should be via the Wireless Power Transmission not by the high voltage power transmission due to the plasma discharge problem 3.The power supply should be secured for the life of the hundreds of human habitation society. So that three independent and different power generation means in principle should be equipped to the power grid. The NASA safety requirements indicated that the Two Fault Tolerant(2FT) should be equipped not to injure or loss of human life.

Issues are also located as the electrical power is essential for the any activities on Moon, so that the power system should have to supply power by already established technologies and also perform new technology development activities in parallel.

The concept of the electrical power system on the Moon with step-by-step phased development concept from initial design and research on the earth to the small launcher on the Moon to investigate and demonstration of the various system for the Moon, and then to the final fully operational electrical power infrastructure on the Moon are going to be introduced and discussed.