Paper ID: 28828
oral

66th International Astronautical Congress 2015

SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

Author: Dr. Stefan Belz
University of Stuttgart, Germany, belz@irs.uni-stuttgart.de

RFCS CONCEPT FOR ORBIT PHASES AND PLANETARY HABITATS AT HIGH SYNERGETIC INTEGRATION LEVEL

Abstract

Regenerative fuel cell systems (RFCS) are an option to secondary batteries for energy storage tasks on manned or unmanned space systems. One major advantage of RFCS is the separation of power and energy density. Energy density of the RFCS is driven by the electrical energy demand during eclipse phases when the fuel cell of the RFCS is running. The eclipse phases depend on the mission scenario, particularly on the orbit or the position on a planetary surface. The longer an eclipse phase is and the higher the power demand is, the higher is the equivalent system mass benefit compared to secondary batteries. A second advantage of the RFCS is the ability of synergetic integration. This means that the mass flows of oxygen, hydrogen and water are not only provided for the electrical power system, but also for other subsystems (S/S) such as the life support and propulsion system. The paper represents a technical concept (setup) for an RFCS related to exemplary mission scenarios including valves, pressure regulators, filters, gas and water conditioning, and thermal control components. The power demand of a scenario requires an adapted operation mode of the RFCS in terms of voltage and current. The synergetic link to a life support system is calculated by need of hydrogen, oxygen and water. Especially an earlier study showed that the RFCS can provide human commodities in emergency cases (e.g. failure of a life support component).