

SPACE POWER SYMPOSIUM (C3)  
Architectures, concepts and systems for space power (3)

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KSLV-I ELECTRICAL POWER SYSTEM ARCHITECTURE

**Abstract**

The electrical power system of KSLV-I(Korea Space Launch Vehicle) 2nd stage is aimed to provide and distribute electrical power stably for various electrical loads in 2nd stage. It is divided into four separate batteries and its associated power distribution unit (PDU). Among the electrical loads, fairing separation driving unit (FSDU) is included in the electrical power system because the intrinsic operation principle is to distribute and convert power, as a electrical power system does. Rechargeable batteries are used as power sources because they must be charged and discharged several times during pre-launch testing. Functional battery is the power source for electronic equipments which consume constant power over entire mission period. Activation battery is the power source for activation of pyrotechnic devices and actuation of thruster valves. TVC battery and FTS battery are the power sources for driving of TVC EMDP actuators and flight termination system, respectively. Each battery consists of a number of series/parallel-connected Li-Ion cells ranging from nominal 28Vdc to 300Vdc. The cells usually have capacities of 1.5 ampere-hours for their application. The power changeover switch (PCOS) in PDU functions selecting power sources, and transferring from the selected power source to loads. Two separate buses in PDU, these are functional bus and activation bus, are also available for connection with each battery except for TVC battery and FTS battery and offering appropriate voltages to the loads. TVC battery is connected directly to its load instead of PDU connectivity since the power level is very high. FTS battery is also connected only to flight termination system since it has to be configured exclusively without any connectivity to other systems. The functional bus provides the voltage to the functional equipment loads through solid state power controller (SSPC) used for switching for the loads and for protection of the battery. The activation bus voltage is applied to the pyros and solenoids through relays operated by external commands. For launch preparation, PDU accomplishes the functions of health monitoring and command uploading by RS-422 communication prior to lift-off. Regarding critical commands such as PCOS operation, they are uploaded only by hard-wired lines. FSDU generates above 2.2kV high-voltage power required to initiate exploding bridgewire (EBW) charge properly by jettison fairing command from 2nd stage navigation unit. As two modules are equipped within 2ndstage and each module has two output channels, in which fully redundant scheme with EBW charge can be achieved. In this paper, the electrical power system architecture of KSLV-I 2nd stage is presented and discussed in detail. The specification and the performance of components related to electrical power system are described as well.