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# SSPS DEVELOPMENT ROAD MAP

**Abstract**

Two types of wireless power transmission experiment, using microwave and laser, are now under preparation in Japan for SSPS (Space Solar Power Systems) research. In the microwave transmission experiment, a microwave beam around 3 kW from array antenna will be transmitted to a rectenna located typically at 100 m from the transmitter. The microwave beam will be precisely guided using the retro-directive beaming technology with a pilot signal from the rectenna site. In the laser transmission experiment, a laser beam around 1 kW directly generated by the concentrated solar light will be transmitted to a photovoltaic receiver located at 500 m apart from the transmitter. After completion of the ground wireless power transmission experiments, we will be ready for a small-scale demonstration experiment in orbit. For the microwave demonstration experiment, power transmission at 3 kW from the low earth orbit to the ground will be conducted. The space experiment will demonstrate the beam control technology for several hundred km and verify the power beam transmission through the ionosphere without serious loss of power. It is highly desirable to perform another demonstration experiment in orbit for the technologies associated with the laser and large space structure. Based on the results from the small-scale demonstration experiments in space and laboratory experiments, we will make a decision on the technology selection, microwave or laser, for the next phase development. In the next step, we will make a 100 kW-class SSPS demonstration experiment in orbit, and then scale up to a 10 MW-class pilot plant before 2030. This scenario will lead to realization of the first commercial model in the 2030's. Currently, we have three types of commercial model, basic microwave model, advanced microwave model, and laser model. The basic model is the Tethered-SPS in which the power generation/transmission panel is suspended by tether wires and stabilized by gravity gradient force, which has been studied by USEF. The advanced model is a combination of reflective mirrors with power generation solar array and microwave transmitter. It utilizes the formation flight of reflective mirrors and power generation/transmission complex, which has been studied by JAXA. For the laser technology, another application to the planetary exploration is also considered in the road map. The laser technologies are expected to play an important role in the energy system for the lunar rover and lunar base.