Chapter 1: Summary

A NSPRI Solar Academy study examined several important requirements for the establishment of space-based solar-powered satellite systems (SSPS). These primarily focused upon human development issues.

The SPSS mission is to provide bountiful amounts of environmentally safe, economically competitive energy to the Earth.

Humans have survived in space for over one year in microgravity and have overcome several health problems produced by microgravity. Humans probably can survive in microgravity for much longer times, perhaps even for indefinitely long stays. Since there is no data on stays much over one year, this assertion cannot yet be proven. Dangers in space that may not be directly associated with microgravity, such as inadequate radiation shielding, excessive psychological stress and physical confinement may be the primary factors that limit human endurance in space (this report focuses chiefly upon those factors due to microgravity).

It should not be assumed that humans can survive indefinitely in microgravity. Further, no evidence exists to conclusively demonstrate that children can be raised or conceived in microgravity. Nevertheless, this uncertainty should not prevent attempts at incrementally longer stays for adult humans. For the present, either artificial gravity provided by large centrifuges must be supplied or crews will have to be replaced at least every six months and care will have to be taken to prevent pregnancies.

Assuming psychological factors can be successfully managed, the cost of human presence in space for space-based solar power facilities could probably be minimized by the use of a habitat composed of one or two ISS node structures as well as regenerative life support systems possibly based upon algae aquaculture.
Can humans be replaced by robots to construct and maintain an SPSS? Not completely with present technology. While mechanical devices exist that can probably replicate human motion, artificial intelligence has not yet developed sufficiently to control the mechanics to perform all of the tasks required in real time. (This project did not consider whether full human sensing can be replicated). Telepresence (in which a human remotely controls a mechanical device) could supplement human presence (it appears that it cannot yet totally replace human presence, but this issue was not investigated).

In conclusion, given present technology, on-site human crews are required to build and maintain SPSS facilities. Given present medical science, regular crew rotation is also necessary.