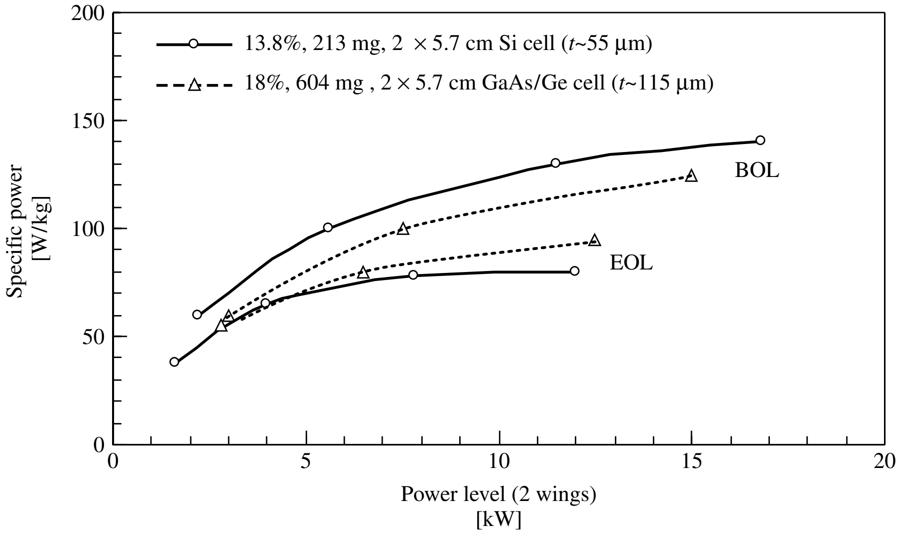

Figure 10.14 Projected specific power of the APSA array with various cell technologies [13]

The Hubble Space Telescope used such a roll-out array (see Figure 10.15). It contained a polyimide blanket in a roll-up stowed configuration. The array was deployed by a tubular, extendable boom (Bi-STEM) deployment system. The flexible role-out array design was developed for the US Air Force.

After eight years in orbit, the solar arrays on Hubble were replaced on orbit owing to degradation [51]. During the repair mission, delamination of the solar array bus bars was observed and it was also noticed that two of the hinge pins had started to creep out. One of the arrays was returned to Earth to be studied, while the other array was jettisoned into space. The returned solar array was shipped to ESA for further study. These roll-out arrays were replaced with rigid panels that were thought to be more reliable.

AFRL has begun a $6 M, three-year program with two prime contractors (Boeing and Lockheed Martin) to investigate and design complete arrays uniquely tailored to thin-film solar cells. The SquareRigger™ solar array being developed by AEC-ABLE is a flexible blanket system composed of modular "bays." This array is attempting to combine an ultra-high-power capability (>30 kW) with a high stowed packaging efficiency. The SquareRigger™ solar array system is projected to achieve a specific power between 180 to 260 W/kg BOL, depending on the type of cells used. A SquareRigger™ system using thin-film cells is projected to offer an order-of-magnitude reduction in cost over conventional rigid panel systems.

10.5.5 Concentrating Arrays

Photovoltaic concentrating arrays have been proposed for missions to outer planetary missions, solar electric propulsion missions, and missions that operate in high-radiation environments. These arrays are attractive for these missions because they have the potential to provide a high specific power, higher radiation tolerance, and improved performance in