the European Space Agency (ESA) was created in 1975 by the merger of the European Organization for the Development and Construction of Space Vehicle Launchers (ELDO) and the European Space Research Organization (ESRO), which had begun in the early sixties. There are notable achievements in photovoltaics from these multiple agencies.

As the first PV devices were being created, there were corresponding theoretical predictions emerging that cited ∼20% as the potential efficiency of Si and 26% for an optimum band gap material (∼1.5 eV) under terrestrial illumination [4]. In addition, it was not long before the concept of a tandem cell was proposed to enhance the overall efficiency. An optimized three-cell stack was soon to follow with a theoretical optimum efficiency of 37% [5]. Early solar cell research was focused on understanding and mitigating the factors that limited cell efficiency (e.g. minority carrier lifetime, surface recombination velocity, series resistance, reflection of incident light, and nonideal diode behavior).

The first satellites needed only a few watts to several hundred watts. They required power sources to be reliable and ideally to have a high specific power (W/kg), since early launch costs were ∼$10 000/kg or more. The cost of the power system for these satellites was not of paramount importance since it was a small fraction of the satellite and the launch cost. The size of the array, and therefore the power, was limited for many early satellites owing to the body-mounted array design. Thus, there were multiple reasons to focus on higher-efficiency solar cells. Explorer I launched in 1958 discovered the van Allen radiation belts, adding a new concern for space solar cells (i.e. electron and proton irradiation damage). The launch of Telstar in 1962 also ushered in a new era for space photovoltaics (i.e. terrestrial communications) [6]. Telstar's beginning of life (BOL) power was 14 W but high radiation caused by the "Starfish" high-altitude nuclear weapon test reduced the power output [7]. This test caused a number of spacecraft to cease transmission. The lessons learnt from Explorer I and Telstar prompted a surge of activity in radiation protection of space solar cells and prompted the use of n-on-p silicon semiconductor type (rather than p-on-n) for superior radiation resistance. Radiation damage studies at the Naval Research Laboratories in the 1960s provided much in the way of guidance to spacecraft designers in accounting for cell degradation [8].

As communication satellites evolved throughout the 1960s, so did their power requirements and thus the size and mass of the solar arrays. There were some early attempts to address the issue of mass by developing thin-film cells such as CdS on CuS_2 heterojunction devices [9]. Unfortunately, their use was prohibited by severe degradation over time. CdTe cells were developed reaching efficiencies of ∼7% [10]. However, the higher efficiency and stability of the silicon solar cells assured their preeminence in satellite power for the next three decades. Research on thin-film cells for space applications, because of their higher specific power and projected lower costs, is still an area of intense research today.

In 1973, the largest solar array ever deployed up to that time was placed in low-Earth orbit (LEO) of Skylab 1 [11]. Skylab was powered by the Orbital Workshop array and the Apollo Telescope Mount array. The orbital Workshop array had 2 deployable wings, each with 73 920 (2 cm × 4 cm) n-on-p Si cells that provided over 6 kW of power. Unfortunately, one of these wings was lost during launch. The Apollo Telescope Mount array had 4 wings with 123 120 (2 cm × 4 cm) cells and 41 040 (2 cm × 6 cm)