

Stellio Heliostat: SolarPACES 2015 Technology Innovation Award

The Stellio Development History

schlaich bergemann und partner- sbp sonne gmbh (sbp) are consulting engineers and technology developers in the field of Concentrating Solar Power (CSP). Stellio, the latest heliostat design developed by sbp, targets long-term cost-reduction and improved performance, especially for large power plants. It focuses on generating solar energy on a commercial scale and relies on having designed and built solar power plants and collector fields for more than 25 years, having pioneered technologies and operational frameworks globally.

Stellio was elaborated for and in collaboration with the South African company SASOL Technology for the South African market and site conditions. However, SASOL withdrew from the project and sbp formed a partnership with Masermic and Ingemet Solar to advance the techno-economic concepts formulated to a prototype and a series design. The group has a combined extensive know-how based on over forty years of international experience in all existing CSP technologies and over 600 operating MW of CSP plants designed, manufactured, built and/or commissioned worldwide.



Technological Innovations and Improved Manufacturing Technology:

The engineering design study aimed to minimize the Levelised Cost of Energy (LCoE). The resulting design optimizes optical quality achieving close to the theoretical limit whilst the cost-effective structural design results in optimum cost/performance ratio. The drive and control systems revolutionize existing technologies resulting in unparalleled tracking quality at the lowest cost. Three significant innovations are realized within the Stellio design:

Reduced cost by slope drives and control systems configuration:

By changing tracking axes orientation to suit the yearly sun path using mathematical strategies, a slope drive configuration has been developed. This special axes arrangement in the drive system allows the use of cost-efficient adapted commodity linear actuators. The drive system can self-calibrate using intelligent software to compensate tolerances, self-weight deflections and/or foundation behavior. This control strategy enables reduction in size of structural components, thus significantly saving on steel and foundation costs without losing performance.

Central Symmetrical Concentrator:

The Stellio's size (47.5 m²) and its compact round-like form are a balanced design to reduce cost and improve performance. The nearly circular concentrator minimizes shading and blocking, and can be manufactured very precisely through a high-precision jig. The design features off-the-shelf glass panels and an assembling process doing away with costly pre-manufactured facets. The pentagonal shape and the appropriate size offers very low astigmatism optics, and the central-symmetric structural system provides better optics by higher stiffness with less material, greater evenness of deflection and lower wind excitation.

Unprecedented optical quality:

The advancement in heliostat technology by the introduction of the slope drive and control systems, together with the new central symmetrical concentrator design, all of which derived from detailed techno-economical studies, resulted in unprecedented optical precision for a heliostat of commercially significant size, as confirmed by independent international experts. An indication of cost savings obtained through this advanced technology is observed in the solar field cost close to 100 Euro/m² reducing LCoE by over 20 percent (15 percent heliostat cost reduction and five percent required reflective area reduction due to higher efficiency) compared to today's most competitive heliostat design.

The Stellio Group Partners:

sbp sonne gmbh: Led the development of the technology from initial studies through series production design.

Ingemet Solar: CSP steel experts supporting the design and cost control of the structural framework, responsible for the assembly and erection procedures.

Masermic: Experts in solar and automotive control development and manufacturing, responsible for developing the control and power supply strategy.