

Article title: A novel approach to determine the non-dimensional heliostat field boundary for solar tower plants

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Abstract

Solar tower technology has gained considerable momentum over the past decade. In a solar tower plant, the power collected by the heliostat field is strongly coupled to the height of the tower and its location with respect to the field. This paper provides a methodology to fix the boundary of the field (non-dimensionalised with respect to the tower height). While developing this methodology, it was realised that one needs to have an estimation of the nominal variation of packing density with non-dimensional distance of the heliostat from the tower base. Packing density is fixed during the design of the field. A nominal variation of packing density was obtained by studying three existing plants which use radial staggered field patterns. This packing density data was used to arrive at contours of equal annual energy per unit land area (e_l). This approach was then evaluated qualitatively and verified quantitatively with non-dimensional solar fields of existing plants. Based on these comparisons, it is suggested that for preliminary analysis, a seed value of $e_l = 0.16$ MWh/m² may be used as a nominal value to set the field boundary. The significance of coupling of the solar field boundary with tower height is also discussed.