IN-POWER: Development of an effective and highly durable antisoiling coating for CSP mirrors

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1. Introduction

IN-POWER European project (GA 720749) aims at developing and integrating new innovative material solutions into concentrated solar technology to increase the efficiency while simultaneously decreasing the energy production cost. These advanced material solutions consist of (1) High reflectance, tailored shapes, self-healing and anti-soiling coated, light glass-free smart mirrors, (2) Optimized and lighter mirror support structure, (3) High-operational-temperature absorber coating in new vacuum-free-designed receiver. (4) Novel modular solar field architecture and design achievable by these new components. Having the identical low associated environmental impact, this promising technology is expected to decrease the land use by four-time. (5) high-operating-temperature thermal storage materials (TES) that will guarantee up to three-time increase in thermal capacity respect to standard TES, depending on Heat Transfer Fluid (HTF), also leading to the reduction of thermal storage system size. IN-POWER will validate these novel functional materials and new manufacturing processes will guarantee decrease in Levelised Cost of Electricity below 0.10 €/KWh beyond 2020 by validating these technologies in Lineal Fresnel Collector and Parabolic through Collector pilot plants under 2100-2700 kWh/(m²a). IN-POWER consortium is composed by 10 partners from different EU countries and type of organizations guarantying the covering of all the developments, from lab scale to validation in demosites.

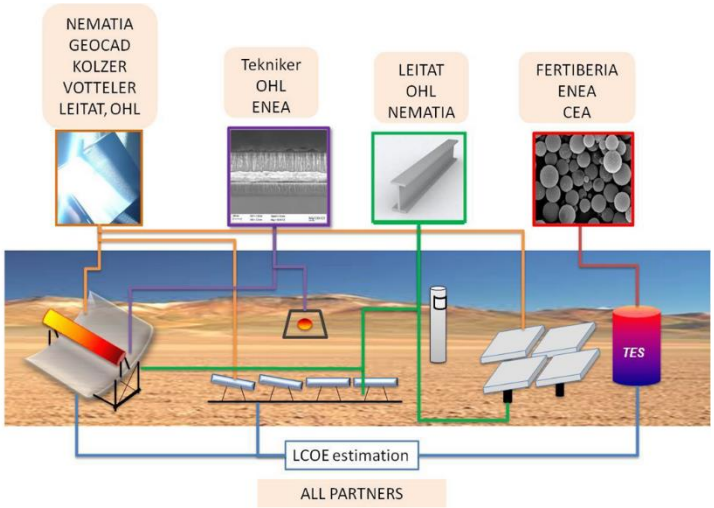

Fig. 1: Distribution of partners in IN-POWER activities

2. Anti-soiling coating development for IN-POWER mirrors

Particulate contamination of optical surfaces has been found to have a significant detrimental effect on energy yield due to the adsorption and losses of the incident light. Therefore, antisoiling coatings are being

developed in IN-POWER European Project as a solution to this issue. These coatings are based mainly on the incorporation of fluorocarbon compounds with the aim of conferring oleophobic and superhydrophobic surfaces (oil/water-repellent properties) and antistatic compounds for avoiding particle sand deposition. The strategy followed is a combination based on nanotexturing surfaces assisted by atmospheric plasma technology and application of the antisoiling formulations (and/or surface grafting technologies) for the achievement of increased superhydrophobic properties. In order to study the antisoiling behavior, a test station is being used and soiling collected from different locations is being deposited over the surfaces to assess the efficiency and the durability of these coatings (for being customized to the location where it will be destined to be placed).