AMADEUS Project (Next generation Materials and Solid State Devices for Ultra High Temperature Energy Storage and Conversion) pursues the development of a new generation of ultra-compact latent heat energy storage devices operating at temperatures in the range of 1000-2000 ºC. The state-of-the-art energy storage devices can hardly break the operating temperature limit of 600°C. Thus, with the proposed technology we can potentially achieve energy storage densities of an order of magnitude greater than the current ones. The operation of the proposed technology is based on Phase Change Materials (PCMs). In the frame of this project new PCMs will be synthesized, which are Silicon-Boron (SiB) alloys with latent heat in the range of 2-4 MJ/kg (an order of magnitude greater than that of typical salt-based PCMs). Such materials will be stored in a proper casing, which will be thermally insulated in order to minimize thermal losses. This vessel in its one side is connected with a new kind of hybrid thermionic-photovoltaic (TIPV cell) device that has been recently formulated theoretically. The TIPV cell takes advantage of the **thermionic phenomenon** and can convert the thermal energy into electric energy, in conjunction with the conversion of the emitted radiation in the solar cell into electricity. With the thermionic phenomenon the thermal efficiency of the cell **can theoretically surpass the maximum thermal efficiency specified by Carnot theorem.**

The developed system can be used in concentrated solar power (CSP) units, for the exploitation of solar radiation in space applications, for storing energy in dwelling or district level and to assist the electrical grid in terms of stability and flexibility.

The consortium consists of seven (7) organisations from six (6) different countries. Among these partners, 3 universities (UPM, USTUTT and NTNU), 3 R&D centres (CERTH, CNR and FRI) and 1 SME (IONVAC) are included. The Coordinator of the Project, which started in January 2017, is the Technical University of Madrid (UPM-Universidad Politécnica de Madrid, Spain). The research team on behalf of **CERTH/CPERI**, under the supervision of the Senior Researcher Dr. Nikolaos Nikolopoulos, is constituted by Dr. Aristeidis Nikolopoulos, Dr. Dimitrios Rakopoulos, PhD candidate Myrto Zeneli, PhD candidate Ilias Malgarinos and PhD candidate

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Panagiotis Drosatos, and will focus on the three-dimensional (3D) simulation of the whole system. At first Computational Fluid Dynamics Tools (CFD) on the basis of ANSYS Fluent commercial program will be implemented. As a further step, a stress-strain analysis of the vessel will be carried out by means on the Finite Element Analysis (FEA) tools, **in order to identify the optimum geometrical configuration that minimizes the mechanical stress in the container** due to continuous expansions-contraction of PCMs (Phase Change Material) during solidification-melting.

AMADEUS project is a FET-Open (Future and Emerging Technologies) Project funded by the European Commission. It should be underlined that the success rate in such a highly competitive call is approximately 4.5%.

For further information, you may contact the Project scientific responsible on behalf of CERTH/CPERI, Dr. Nikolaos Nikolopoulos: n.nikolopoulos@certh.gr
Or visit the project at: http://www.amadeus-project.eu/