PROJECT NEWSLETTER

Development of an innovative low-cost and highly efficient Energy Storage system
Grant Agreement n° ENTERPRISES/ENERGY/1123/0027

Contents

The Technology

The DIAS project is developing an innovative Thermal Energy Storage (TES) system using geopolymer materials derived from Construction and Demolition Waste (CDW) such as clay bricks. These geopolymer-based materials are optimized for high thermal stability, withstanding temperatures up to 700 °C. The TES units are modular in design and can be produced via casting or 3D printing, enabling scalable and cost-effective manufacturing. This system stores excess thermal energy and releases it

Challenge

Despite Cyprus having one of the highest solar energy potentials in Europe, more than 20% of renewable energy production is currently wasted due to the lack of effective energy storage infrastructure. Additionally, large quantities of construction and demolition waste remain underutilized. The challenge lies in developing a solution that not only balances renewable energy production and demand but also upcycles waste materials into high-value applications, contributing to sustainability goals.

Solution

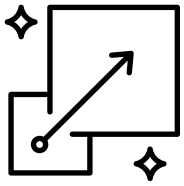
DIAS proposes a dual-impact solution: the development of a low-cost, high-efficiency TES system made from recycled CDW materials. By transforming waste into advanced thermal storage components, the project addresses both energy and waste management challenges. The system stores heat from renewable or industrial sources and releases it when needed, making it ideal for applications in industry, power plants, and buildings. The use of geopolymer technology ensures safety, durability, and environmental compatibility.

Technical Objectives

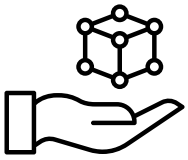
Testing the performance of CDW-based inorganic polymers in heating and cooling cycles between 600 and 25 °C

Develop robust three-dimensional engineered TES structures (3D TES) based on CDW; assessment of properties

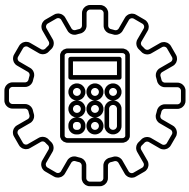
Design and develop a modular TES system for both, large- and small-scale applications, ensuring scalability, modularity and adaptability



Up scaling of the developed TES module to a system-model and operation in charging - discharging cycles, simulating the needs of concentrated solar plants



Preparation of prototype; demonstration in pilot-scale with an estimated total energy capacity of 10 kWh m^{-3}



Techno-economic evaluation of the innovative TES solution

Scientific Objectives

Formulation of the CDW-based inorganic polymers for TES applications, using thermodynamics to achieve the proper refractory mineral-phases.

Identification of the critical properties and set up of specifications and requirements for the inorganic polymers-based innovative TES system.

Proof of sustainability for the novel CDW-based TES inorganic polymers.

Impact

The DIAS project delivers impact across multiple domains. It supports renewable energy integration, reduces energy waste, and promotes circular economy by repurposing CDW. It also offers a cost-effective alternative to conventional TES systems, helping industries and energy providers improve efficiency and reduce emissions. Scientifically, it expands the use of geopolymers in energy applications. Economically, it lays the foundation for commercial adoption and job creation in clean technology sectors.

Consortium

DIAS consortium consists of two partners from Cyprus - the development organisation of RTD Talos and FREDERICK RESEARCH CENTER (FRC).

About RTD Talos

TALOS is an SME offering high quality services in the field of project management both in European and national level. It is being considered among the biggest consultancy firms in Cyprus. TALOS has years of demonstrated experience in project management being involved since its foundation in more than 60 European research projects and having taken the responsibility for managing administrative and financial tasks, reporting, maintenance of agreements between the consortium members and handling overall legal, ethical, financial and administrative issues. Moreover, TALOS is an expert in exploiting and disseminating project results and has prepared numerous successful Exploitation Agreements with special emphasis on proper IPR management among the partners.

Since 2021 RTD Talos created the Technology Development Department. This Department aims to help and support their customers in turning an idea into a fully functional product or service, following all the necessary steps to develop the product or service when needed, enhancing energy efficiency and supporting grid flexibility.

Interview with the Project Coordinator

Dr Alexandros Michaelides

Dr Alexandros Michaelides is the CEO of RTD Talos LTD. He has a diploma in Mining Engineering and Metallurgy from the National Technical University of Athens (NTUA). In 1995 he completed his Ph.D. degree in the sector of Metallurgy and Materials Technology at NTUA.

Why is energy storage important for balancing the electricity grid?

Energy storage is essential for stabilizing the grid, especially when using renewable sources like solar and wind, which are not always available when demand is high. The DIAS system stores excess energy as heat during low-demand periods and releases it when it's most needed, helping to smooth out supply and demand and avoid energy waste.

How does using construction waste support sustainability?

DIAS uses waste materials like bricks and roof tiles from construction and demolition sites to create geopolymer-based storage blocks. This reduces the need for virgin raw materials, cuts down landfill waste, and transforms a problem into a resource, contributing directly to the principles of the circular economy.

What makes the DIAS technology innovative?

Unlike batteries or molten salt systems, DIAS uses geopolymers made from recycled materials that are safe, durable, and thermally stable up to 700 °C. It offers a low-cost, scalable, and environmentally friendly solution, especially suited for industrial heat applications and renewable energy storage.

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Where can the DIAS TES system be applied?

This system can be applied across a wide range of sectors, including Concentrated Solar Power (CSP) plants, electricity grid balancing, industrial waste heat recovery (such as in cement or plastic production), district heating networks, and even in buildings like hotels and residential complexes. Its modular and scalable design makes it adaptable to both large- and small-scale applications. With strong commercial potential, the DIAS project is actively laying the groundwork for future deployment and market adoption.

What is the future of energy storage in clean energy transition?

Energy storage is the backbone of a renewable future. Without it, clean energy can't be fully utilized. Technologies like DIAS help countries like Cyprus with high solar potential to store and use this energy more efficiently, reducing fossil fuel dependence and supporting a greener, more resilient energy system.

News & Activities

Kick-off meeting

The project partners came together to officially launch the DIAS project and discuss its goals, future activities, and collaboration strategy. This meeting marked the beginning of a joint effort toward developing an innovative energy storage solution.

Find Out More

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DIAS Project

www.talos-rtd.com/dias-project/#

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Designed by RTD Talos

Funded by the European Union NextGenerationEU

Republic of Cyprus

Cyprus tomorrow RECOVERY AND RESILIENCE PLAN

RESEARCH & INNOVATION FOUNDATION

This Project is funded by the Recovery and Resilience Facility of the NextGenerationEU instrument