

## THE EUROPEAN COMMISSION AWARDS THE AMBITIOUS DECARBONIZATION PROJECT HERCCULES - HEROES IN SOUTHERN EUROPE TO DECARBONIZE INDUSTRY WITH CCUS

Piacenza, 15/02/2023 - Today **HERCCULES** kicks off, an international research project coordinated by **LEAP** (Piacenza Energy and Environment Laboratory). The consortium made up of 23 partners will work for 5 years with the aim of demonstrating the feasibility of the entire **CO<sub>2</sub> Capture, Utilisation and Storage chain (CCUS, Carbon Capture, Utilization and Storage)** in the regions of southern Europe with a high industrial density, in this case in the Po Valley and Greece. The project stems from an ambitious idea by researchers at **LEAP** and **Politecnico di Milano**. The resulting proposal, forwarded to the European Commission with the support of **Eucore**, was funded by *Horizon Europe*, the framework program set up to valorize promising European research initiatives. The funding, awarded in the context of an *Innovation Action* tender, amounts to approximately €30 million. An additional funding of approximately 10 million euros will be made available by industrial partners, including Italian companies - **A2A, Buzzi Unicem, Eni, Eucore and Tecno Project Industriale (TPI, SIAD Group)** - and Italian divisions of multinational groups - **Air Liquide, Energean, Boston Consulting Group**. The project intends to trigger concrete actions to contain CO<sub>2</sub> emissions with an innovative, integrated and replicable approach. The primary focus is the decarbonisation of cement production and waste-to-energy, two strategic sectors for the circular economy.

The application of CO<sub>2</sub> capture technologies is an essential element for the achievement of carbon neutrality by 2050 based on the scenarios outlined by the European directives and the recommendations of the Commission itself. In Europe there are today about 70 CCUS projects at various stages of development, concentrated almost exclusively in the Northern countries. **HERCCULES** will aim to accelerate the application of the CCUS in Mediterranean Europe, leveraging on the transport and storage initiatives already under construction in Italy and Greece and developing innovative capture technologies that are not only efficient, but also particularly flexible and replicable, in order to be adaptable to the technological evolutions of the reference industrial sectors.

Specialized teams of scientists and engineers will dedicate over 9,000 hours of tests to demonstrate innovative CO<sub>2</sub> *capture* processes installed in two cement plants (one managed by Buzzi Unicem, the other by TITAN Cement Group) and a waste-to-energy plant managed by A2A. The experimental plants will be based on advanced *oxy-combustion* and *post-combustion* capture technologies such as *Calcium Looping* (designed and provided by Sumitomo SHI FW) combined with *cryogenic* purification processes (designed and provided by TPI), capable of separating CO<sub>2</sub> with efficiencies and purities close to 100%. A part of the pure CO<sub>2</sub> flow will be **used** in production processes: mineralization for the production of new cementitious materials that could replace conventional concrete (characterized by a high carbon footprint), and use in the technical gas sector.

The activities will also include the **transport of CO<sub>2</sub>** (which will be respectively handled by Air Liquide Italy and TITAN Cement Group), from the industrial capture sites to the two geological **storage** sites of **Ravenna** (managed by a Joint Venture participated from Eni) in Italy and **Prinos** (managed by ENERGEAN) in Greece, with the aim of completing the demonstration of the entire CCUS supply chain. Owing to the capture of biogenic CO<sub>2</sub> and its reuse and/or storage, **HERCCULES** aims at demonstrating the possibility of achieving **negative** CO<sub>2</sub> emissions, transforming industrial clusters from CO<sub>2</sub> emitters to CO<sub>2</sub> absorbers.

The technological, infrastructural, safety, regulatory and financial aspects will be addressed with a multidisciplinary approach, which will allow the creation of industrial communities capable of exploiting the synergy between the processes of the CCUS supply chain. Universities, research centers and consulting companies will develop business models of **HERCCULES** technologies sized for future full-scale applications. As part of the project, Air Liquide will compare these scaled-up technologies with the CO<sub>2</sub> capture solutions already available at industrial scale. In the final step of the experimental project, the entire CO<sub>2</sub> transport, utilization and storage network will be designed and optimized for different industrial cluster evolution scenarios.

Finally, one of the objectives of HERCCULES will be to raise the awareness on the CCUS theme: communication experts will organize educational and training events to communicate methodologies and technological solutions with schools, stakeholders and policy makers. Thanks to the support of Fraunhofer ISI, SHOGenenergy, Eucore and the Clust-ER Energy and Sustainable Development association, local communities will be an integral part of the project and will be constantly informed, with the aim of accompanying the transition of our industrial sectors towards a sustainable future for the European environment and economy.

**HERCCULES project in numbers:** start date: 1 January 2023; Total project duration: 60 months; Total budget: € 39.627.208,00; EU contribution: € 29.632.076,48; 23 partners: LEAP (coordinator), EU CORE Consulting (Italy), Energan Oil&Gas (Greece), Buzzi Unicem (Italy), Titan cement (Greece), Sumitomo SHI FW (Finland), Air Liquide (Italy), Fraunhofer ISI (Germany), Politecnico di Milano (Italy), BCG (Italy), CSIC (Spain), Celitement (Germany), Utrecht University (Netherlands), Wietersdorfer Alpacem (Austria), Artidek (Ukraine), Shogenergy (Estonia), LUT University (Finland), TPI (Italy), ClustER Greentech (Italy), CRES (Greece), A2A Ambiente and A2A Spa (Italy), ENI (Italy).

**LEAP:** – Laboratorio Energia e Ambiente Piacenza - is a non-profit private entity participated by the Politecnico di Milano, the Università Cattolica del Sacro Cuore, local authorities of Piacenza and companies. LEAP carries out research, consultancy and services in the field of Energy and the Environment. LEAP is part of the Emilia-Romagna High Technology Network and is the managing body the Piacenza Technopole. [www.leap.polimi.it](http://www.leap.polimi.it)

**EUCORE:** – European COoperation in Research and Education – is a consulting firm that offers partner design, administrative management, reporting and research services to universities, research centers, companies, public administrations, non-profit organizations wishing to participate in research and cooperation projects funded by the European Union or other national and international initiatives. [www.eucore.eu](http://www.eucore.eu)

**ENERGEAN:** established in 2007, Energean is an energy company, among the independents that lead the energy transitions, listed in London and Tel Aviv with operations in 7 countries and focus on the Mediterranean Sea basin. Energean has ca. 1 billion boe 2P reserves and produced 41k boe per day in 2022 (>70% gas). The company explores and invests in new ideas and solutions to increase its natural gas and oil production, targeting 200k boe per day in the mid-term, and develop energy efficiently, sustainably, and safely for the ecosystem and the community. Energean was among the first companies - in the industry - to commit to the 2050 goal of zero net emissions. [www.energean.com](http://www.energean.com)

**BUZZI UNICEM:** Buzzi Unicem SpA is an international multi-regional group with headquarters in Casale Monferrato in Piedmont, Italy, focused on the production of cement, concrete and natural aggregates. The group operates in 14 countries and employs around 10,000 people. There are 11 plants in Italy and more than 1,500 direct employees. The Group has a long-term strategic vision and a dedicated management that operates with a view to sustainable development and quality production facilities. Buzzi pursues value creation through deep and proven know-how and the production efficiency of its plants. [www.buzziunicem.it](http://www.buzziunicem.it) | [www.buzziunicem.com](http://www.buzziunicem.com)

**TITAN:** TITAN Cement Group is an international provider of building materials and innovative construction solutions for a sustainable world. With the majority of its revenue generated in the USA, the Group employs over 5,000 people and is present in more than 15 countries, with leading positions in Greece, the Balkans, and the Eastern Mediterranean. Throughout its 120-year history, TITAN has aspired to serve the needs of society, while contributing to sustainable growth with responsibility and integrity. With a net zero goal for 2050, TITAN was one of the first building materials companies worldwide to have its CO<sub>2</sub> reduction targets validated by the Science Based Targets initiative (SBTi). The Group is listed on Euronext and the Athens Exchange. [www.titan-cement.com](http://www.titan-cement.com)

**SUMITOMO SHI FW:** (SFW) is a global provider of solutions and services that drive the decarbonization of energy. Our solutions include energy from biomass and waste, long duration energy storage, recycling of waste to valuable end

products, carbon capture, flue gas cleaning, waste heat boilers, as well as related services to digitalize, optimize, and decarbonize assets that we deliver to the global power and industrial markets. We strive to provide sustainable energy solutions for customers in a wide range of industries including energy, waste, chemicals, metal, sustainable fuels, cement and pulp and paper. SFW's excellence in delivering projects worldwide rely on our 1,800 talented people, across 20 locations in 14 countries, with deep know-how and experience in the industry. [www.shi-fw.com](http://www.shi-fw.com)

**AIR LIQUIDE:** a world leader in gases, technologies and services for Industry and Health, Air Liquide is present in 75 countries with approximately 66,400 employees and serves more than 3.8 million customers and patients. Oxygen, nitrogen and hydrogen are essential small molecules for life, matter and energy. They embody Air Liquide's scientific territory and have been at the core of the company's activities since its creation in 1902. With ADVANCE, its strategic plan for 2025, Air Liquide is targeting a global performance, combining financial and extra-financial dimensions. Positioned on new markets, the Group benefits from major assets such as its business model combining resilience and strength, its ability to innovate and its technological expertise. The Group develops solutions contributing to climate and the energy transition—particularly with hydrogen—and takes action to progress in areas of healthcare, digital and high technologies. [www.airliquide.com](http://www.airliquide.com)

**FRAUNHOFER ISI:** - Fraunhofer Institute for Systems and Innovation Research - analyzes the origins and impacts of innovations. Fraunhofer ISI researches the short- and long-term developments of innovation processes and the impacts of new technologies and services on society. On this basis, Fraunhofer ISI is able to provide their clients from industry, politics and science with recommendations for action and perspectives for key decisions. The expertise is founded on scientific competence as well as an interdisciplinary and systemic research approach. [www.isi.fraunhofer.de/en](http://www.isi.fraunhofer.de/en)

**POLITECNICO DI MILANO:** (POLIMI) is one of the best scientific-technological universities in the world according to the prestigious QS World University Rankings 2022, which classified it 1st in Italy and 139th worldwide. In the QS World University Rankings by Subject 2022, Politecnico di Milano is among the top universities in the world in all three specific areas: 13th in Engineering, 10th in Architecture and 5th in Design. [www.polimi.it](http://www.polimi.it)

**BOSTON CONSULTING GROUP:** (BCG), founded in 1963, is today a leader in strategy consulting, with more than 90 offices in 50 countries and 22,000 professionals. BCG works side by side with clients in different sectors and geographies to identify together the opportunities with the greatest added value, address critical challenges, and help them in business transformation. Present in Italy for over 30 years, BCG Italia operates through its two offices in Milan and Rome and leads the EMC System. [www.bcg.com](http://www.bcg.com)

**CONSEJO SUPERIOR DE INVESTIGACIONE SCIENTIFICA:** CSIC- Spanish National Research Council – is the largest public research organisation in Spain, consisting of 121 research institutes. CSIC's research falls into three core areas of knowledge, Society, Life and Materia. Instituto de Carboquímica (ICB-CSIC) is the CSIC's institute participating in HERCCULES, whose main research is devoted to the development of sustainable energy conversion routes and storage solutions of renewable resources. [www.csic.es](http://www.csic.es)

**CELITEMENT GMBH:** founded in 2009 as part of a collaboration between research (Karlsruhe Institute of Technology) and industry (SCHWENK Zement KG), in 2020 became a 100% subsidiary of SCHWENK Building Materials Group. CELITEMENT GmbH produces high-quality, hydraulic binders that are manufactured using a globally patented, energy-efficient process. Compared to Portland cement clinker, they are characterized by a specifically lower limestone consumption and lower process temperatures (in an autoclave). CELITEMENT GmbH & Co KG is developing and optimizing this new type of hydraulic binders with the aim of obtaining marketable products and thus contributing to reducing the CO2 intensity of the cement production. [www.celitement.de](http://www.celitement.de)

**UTRECHT UNIVERSITY:** founded in 1636, has evolved into a modern and leading institution with a strong international reputation. It is consistently positioned in the top 15 in continental Europe and the worldwide top 100 of international

rankings, and member of the renowned League of European Research Universities. The Copernicus Institute of Sustainable Development, which is part of the Faculty of Geosciences and where HERCCULES projects sits, is ranked as the foremost sustainability research institute in the Netherlands and offers a vibrant environment where an interdisciplinary project finds a natural position. [www.uu.nl](http://www.uu.nl)

**WIETERSDORFER ALPACEM GMBH:** The Alpacem umbrella brand comprises the cement & concrete business line and is thus one of a total of five business lines in the Wietersdorfer Group. All activities related to the development, production, processing and distribution of cement and concrete are located here. The six regional companies in Austria, Slovenia and Northern Italy employ over 650 people at 21 locations. With a turnover of 199 million euros (2021), the annual capacities are about two million tonnes of cement & binders or over 350,000 cubic metres of ready-mixed concrete. Alpacem's headquarters are located in Klagenfurt. [www.alpacem.com](http://www.alpacem.com)

**ARTIDEK:** is a research and production enterprise from Kyiv, Ukraine. Since 2013, ARTIDEK investigates and produces building materials (dry mixes) based on non-conventional binder materials, with the goal of returning forgotten ancient building technologies to their well-earned place. Also, the company develops technologies that allow converting industrial wastes into useful products (especially for the building industry). [www.artidek.com](http://www.artidek.com)

**SHOGenergy:** is a non-profit private research-based and innovation consulting and education company, established in 2021 by the TalTech researchers, the best experts in the field of CCUS and petrophysics in the Baltic States. Company founders have 17 years expertise in CCUS international projects, research, education, networking and advising to policymakers, ministries, energy and industrial companies. SHOGenergy is a member of the ENeRG network. [www.shogenergy.eu](http://www.shogenergy.eu)

**LUT UNIVERSITY:** was founded in 1969 and is currently a forerunner in research and teaching of clean and sustainable technologies, with main campuses located in Lappeenranta and Lahti, Finland. The participating laboratory of Thermal Engineering has been a partner in innovative calcium looping projects funded by EU since 2010 and is currently active in 2 EU-projects on this topic. LUT University is contributing to process modelling, which will support process analysis, engineering and up-scaling of the calcium looping technology. [www.lut.fi](http://www.lut.fi)

**TECNO PROJECT INDUSTRIALE | SIAD Group:** (TPI) is the SIAD Group company in charge of carbon dioxide capture, recovery and liquefaction technologies with a know-how of more than 600 plants installed worldwide. TPI has also gained extensive experience in the biogas sector by developing its own solution for biogas upgrading and biomethane liquefaction with recovery of both biomethane and food grade CO<sub>2</sub>. [www.tecnoproject.com](http://www.tecnoproject.com) / [info@tecnoproject.com](mailto:info@tecnoproject.com)

**CLUST-ER ENERGIA E SVILUPPO SOSTENIBILE:** the Energy and Sustainable development Clust-ER Greentech is an association of public and private bodies: companies, research centres and training institutions that share skills, ideas and resources to support the competitiveness of the energy and environmental sector. The Emilia-Romagna Region has found in the Clust-ERs the subjects capable of multiplying innovation opportunities through a collaborative approach, as they focus their activity in R&D strategic sectors. Together with the Technopoles and the High Technology Network laboratories, they are one of the key players in the regional innovation ecosystem coordinated by ART-ER, the Emilia-Romagna consortium company for innovation and sustainable growth. Today Greentech has more than 100 members, 60% of them are private companies. [greentech.clust-er.it/en](http://greentech.clust-er.it/en)

**CRES:** founded in 1987, is the national body for renewable energy sources (RES), rational use of energy (ROE) and energy saving (ES). CRES has been designated as the national coordination centre in its field of activity and is active:

- As a National Energy Centre, it works on energy planning and energy policy in accordance with the policy of the Ministry of Environment and Energy and develops the necessary infrastructure for the implementation of investment plans.
- As a Research and Technological Centre, through applied research in new energy technologies and technical support for the penetration and application of these technologies in the market. Numerous national and international

research projects and actions make CRES an indispensable stakeholder in energy planning processes with the aim of reducing the environmental burden on the production/transport/use of the energy chain. [www.cres.gr](http://www.cres.gr)

**A2A:** listed on the Stock Exchange, with about 13,000 employees, the Group manages the generation, sale and distribution of energy and the sale and distribution of gas, district heating, the waste cycle, electric mobility and smart services for cities, public lighting and the integrated water service. Sustainability is at the heart of A2A's industrial strategy: in order to promote the country's sustainable growth and make the energy transition and the circular economy a concrete reality, the industrial plan envisages 16 billion euro of investments to 2030 in projects aligned to the UN Agenda and the achievement of net zero by 2040. [www.gruppoa2a.it](http://www.gruppoa2a.it)

**ENI:** Eni is an integrated energy company with more than 30,000 employees in 69 countries around the world. In 2020, the company launched a new strategy, further accelerated in the following years, that will enable it to reach the target of zero net emissions by 2050 and to provide a variety of fully decarbonized products, combining environmental and financial sustainability, focusing on the technological leadership that has been built up over years of research and innovation. Eni is actively involved in the development of major CCUS projects in Italy (CCS Ravenna Hub) and UK (Hynet North West), mainly in the role of Transport and Storage Operator, to provide hubs for the storage of emissions from nearby industrial clusters in Eni depleted reservoirs. In addition to the new business models, Eni's strategy is also based on the synergy with stakeholders and the development of proprietary and breakthrough technologies to meet the challenge of decarbonization. [www.eni.com](http://www.eni.com)