

# Harnessing Carbon Capture and Storage (CCS) Technology for a Sustainable Future: *Greece's Role in Advancing Clean Energy Transitions*

**Mariadina Lili-Kokkori**

*Energy Law Associate, Koutalidis Law Firm*

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# I. Introduction

- **Goals** → Global and national objectives of CCS in combating climate change.
- **CCS** → How does this technology fit into the broader climate change mitigation strategy.
- **Presentation's Focus** → Greece's initiatives in CCS and its potential leadership in the Mediterranean region.



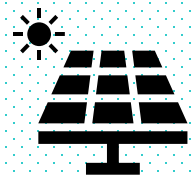
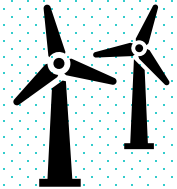


## II. Carbon and Capture Storage (CCS) Technology

- The fundamental **principles** of CCS:
  - i. Capturing carbon dioxide (CO<sub>2</sub>) emissions from industrial processes and energy production.
  - ii. Transporting captured CO<sub>2</sub> to suitable storage sites.
  - iii. Securely storing CO<sub>2</sub> underground or in long-term storage formations.
- Importance of CCS in **mitigating CO<sub>2</sub>** emissions globally.

## III. Integration with Renewable Energy Sources (RES)

- The **synergy** between CCS, renewable energy, and energy efficiency measures. For **example**, CCS can be applied in bioenergy plants, creating a powerful negative emissions technology or a ccs technology can be installed in industrial processes creating a tool to reduce CO<sub>2</sub> emissions from entering the atmosphere and therefore, enhance energy efficiency.
- This integration is crucial for a **sustainable energy** future.



## IV. EU Legal Framework for CCS

### I. CCS Directive 2009/31/C

→ Aims at ensuring that there is **no** significant risk of **leakage of CO<sub>2</sub>** or damage to health or the environment, and to prevent any adverse effects on the security of the transport network or storage sites.

→ **Requirements** covering the entire lifetime of a **storage** site.

→ Provisions on the **capture and transport** components of CCS.

# IV. EU Legal Framework for CCS

## II. ETS Directive - 2003/87/EC

→ The ETS Directive regulated the emissions trading scheme, and includes provisions for CCS applications.

## III. Commission Decision of 8 June 2010

→ Amending Decision 2007/589/EC as regards the inclusion of monitoring and reporting **guidelines** for greenhouse gas emissions from the capture, transport and geological storage of carbon dioxide.

## IV. CRCF

→ On 30 November 2022, the Commission proposed an EU carbon removal certification framework (CRCF).

## V. Greece's Legal Framework for CCS

### I. Ministerial Decision No. 48416/2037/2011

→ On the conditions of CO<sub>2</sub> storage in geological formations. The MD provides that the competent authority, the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA S.A.) will be responsible for **establishing measures, standards and procedures for the supervision and operation of CO<sub>2</sub> storage.**



## V. Greece's Legal Framework for CCS

II. Article 146 of Law 4001/2011 (as amended by Article 228 of Law 4920/2022)

→ Broadens the purpose of the HEREMA S.A. to include the **issuance of CO2 exploration and storage permits.**

III. Article 173 of Law 4964/2022

→ Hydrocarbon licence-holders with necessary geological, geophysical and drilling data on the area they operate have the right to apply for a CO2 Exploration Licence to continue and conclude the exploration of the area for CO2 storage (**example: ENERGEAN PLC**)

## VI. Case Studies and Projects in Greece

- **TITAN CEMENT  
COMPANY S.A.**

### **IFESTOS** - One of the largest CCS projects in Europe

→ The project will produce zero carbon cement through the retrofitting of existing cement kilns, in combination with first and second generation Oxyfuel and post-combustion cryogenic capture technologies.

→ The project is expected to avoid roughly 98.5% of the plant's GHG emissions, making IFESTOS one of the largest carbon capture facilities in Europe.

→ Captured CO<sub>2</sub> will be **liquified** and **transported** to a permanent storage site in Mediterranean, thus kickstarting the CCS value chain in Southern Europe and serving as a model for future large-scale integrated CCS projects.

## VI. Case Studies and Projects in Greece

- **TITAN CEMENT  
COMPANY S.A.**

**IFESTOS** - One of the largest CCS projects in Europe

→ The project has been selected by the **EU Innovation Fund** for funding.

→ The carbon and capture facility will be constructed at TITAN's flagship Kamari plant near Athens.

→ The project could be **operational** and store 360,000 t of Co2 annually **by 2028**.

## VI. Case Studies and Projects in Greece

- **MOTOR OIL  
HELLAS**

**IRIS** - Innovative low Carbon hydrogen and methanol production by large scale carbon capture

→ The project combines the **production of ultra-low carbon hydrogen and methanol** with integration of point-source carbon capture on its current Steam Methane Reforming unit, electrolytic H<sub>2</sub> production and a catalytic process of high selectivity.

→ IRIS will drastically reduce the refinery's carbon footprint while demonstrating an industrial ecosystem of ultra - low carbon hydrogen production and its utilization as a clean energy sector.

→ The captured CO<sub>2</sub> will be combined with green electrolytic H<sub>2</sub> to produce e-methanol as a low-carbon energy carrier for mobility purposes and for other industrial usage.

→ The project has been selected by the **EU Innovation Fund** for funding.

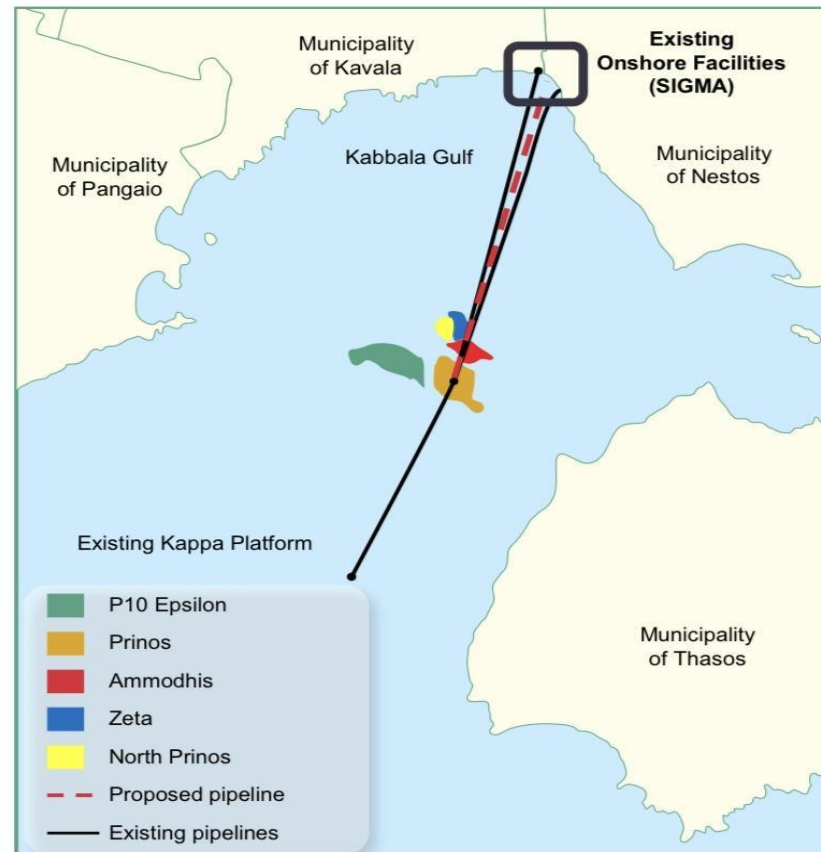
## VI. Case Studies and Projects in Greece

- **HERACLES Group**

- **OLYMPUS**

- A strategic investment in our country, that will exceed 300 million Euros.
- The plant in Milaki, Evia, is being transformed into a zero-carbon facility, significantly reducing the company's environmental footprint.
- With a target operational date of 2028, the project aims to **capture and store 1 million tons of CO<sub>2</sub> annually**.
- In 2023, the project was awarded a grant from the EU Innovation Fund 2021 Large Scale call.

## VII. Prinos CO2 Storage site





## VII. Prinos CO2 Storage site

→ **Why Prinos:** A unique opportunity to decarbonise industries in the **East Med – 8 Existing MoUs with neighboring countries.**

→ An up to **\$1 - billion** scalable project, leveraging onshore and offshore existing infrastructure.

→ Prinos CO2 Storage will **leverage** existing facilities and wells.

→ Project to be developed **in phases** to align with market readiness and demand.

## VII. Prinos CO2 Storage site

→ Prinos CCS will start in **Q4 2025**.

→ CO2 will be received in **compressed form via trucks**.

→ **Phase 1** will provide the opportunity to local emitters with smaller CO2 volumes to take early decarbonization actions.

→ In **Phase 2**, the facilities will be able to accommodate liquid CO2 volumes with a storage capacity of 2.5 mtpa allowing for the storage of 62.5 MT of CO2 in 25 years.

## VIII. Legal challenges

- Lack of experience on CCS projects.
- **Regulatory Framework Finalization:** The regulatory framework is still under development, with the Ministry of Environment and Energy (ΥΠΕΝ) expected to finalize it by the end of 2024.
- **EU Approval for State Aid:** Greece has requested approval for state aid to support the "Prinos CO2 Storage" project. Although the final submission to the Directorate-General for Competition (DG Comp) occurred last year, approval is still pending.
- **Licensing and Permitting Delays:** The storage licensing process, led by HEREMA, involves the evaluation of over 50 studies submitted by EnEarth.
- **Emitter Agreements:** Reaching agreements between EnEarth and CO2 emitters for the use of the CCS infrastructure presents a commercial and legal challenge.
- **Cross-Border CO2 Transport:** The possibility of transporting CO2 across borders requires Greece to adopt international agreements like the London Protocol, and develop legal mechanisms for cross-border CO2 storage.

## VIII. Next Steps

1. **Finalize** regulatory framework by the end of 2024
2. Prepare for EU Commission approval and obtain **EU State Aid Approval**
3. Issuance of **Storage License**
4. **Conclude Emitter Agreements**
5. Continue **development for phase 2** (ongoing studies to assess feasibility for capturing 3 million tons CO<sub>2</sub> and expand capacity and infrastructure)
6. **Develop Cross-Border Transport** (incl. exploring international storage solutions in neighboring countries)
7. **Create Emitter Support Mechanism** (financial support for low carbon prices in alignment with EU State Aid rules)
8. **Expand storage capacity** (explore additional storage sites in Greece and the Med)

## IX. Closing remarks

- CCS's significance in advancing clean energy and reducing emissions - **Optimism** about the role of CCS in Greece's fight against climate change.
- Greece's contributions as a leader in the adoption of CCS technology provides for a unique chance to be at the **forefront** of the CCS story in the Mediterranean.

*THANK YOU!*

Any Questions?

Contact details for further inquiries and future  
collaborations:

[mlilikokkori@koutalidis.gr](mailto:mlilikokkori@koutalidis.gr)