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## **“Implementing CCUS Hubs in Greece: A Cost Benefit Analysis”**

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# Outline

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- ❑ Conclusions



# Introduction to IENE

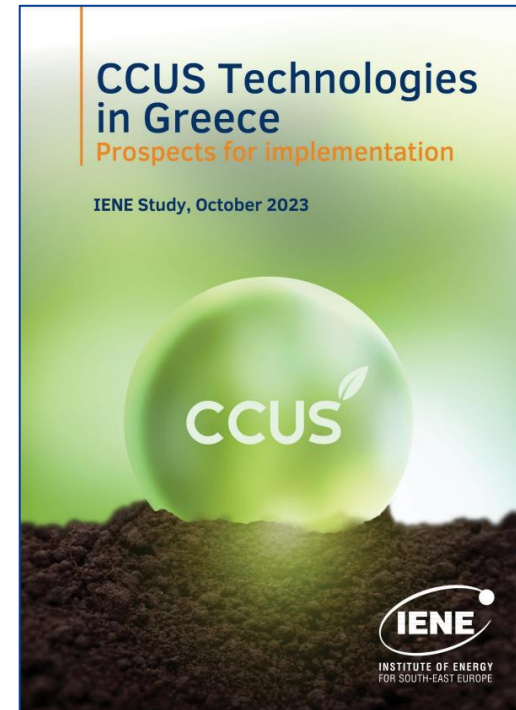
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- ❑ Non-profit organisation, established in 2003, based in Athens
- ❑ Mission and Objectives
  - ❑ Dedicated to studying energy issues
  - ❑ Inform and educate professionals and the public
  - ❑ Support EU strategic goals: sustainable development, energy security, social progress, economic growth, and environmental protection
- ❑ Focus Areas
  - ❑ Efficient production and utilization of energy
  - ❑ Emphasis on: conventional energy, renewable energy, emerging environmentally friendly technologies
- ❑ IENE's key role
  - ❑ raise awareness of critical energy issues
  - ❑ enhance public debate in South-East Europe and Internationally

# Study background

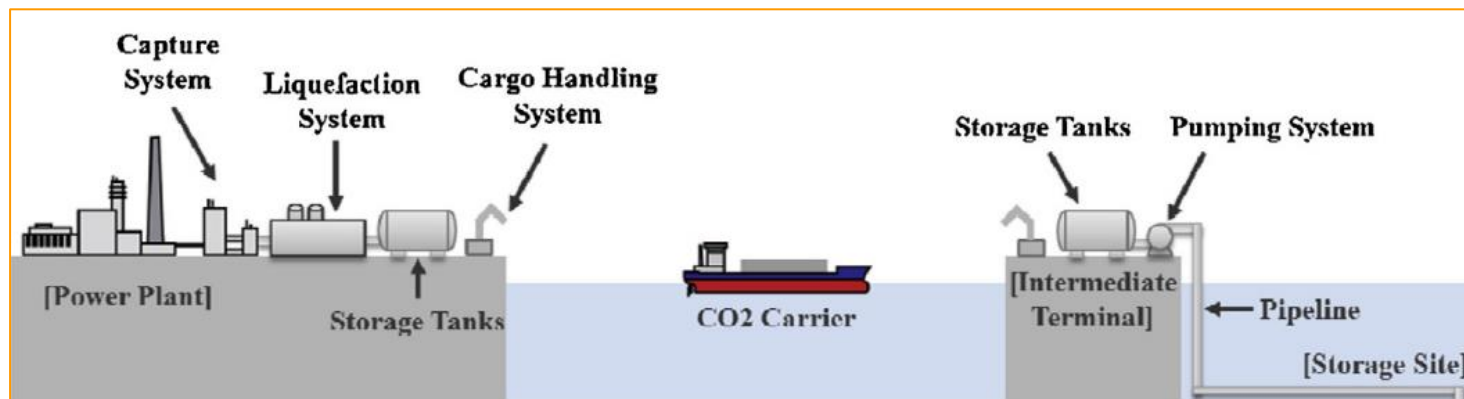
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- ❑ A follow-up study, focuses on the proposed CCUS hub explored in the earlier study
- ❑ Study Objectives
  - ❑ Conduct a comprehensive cost-benefit analysis
  - ❑ Emphasize financial feasibility
- ❑ Purpose and Goals
  - ❑ Equip decision-makers with detailed financial insights towards a CCUS hub implementation
  - ❑ Address questions of viability and sustainability
- ❑ Anticipated Outcomes
  - ❑ Provide stakeholders with essential technical and economic data
  - ❑ Support sustainable energy solutions and informed decisions
  - ❑ Influence the direction of CCUS initiatives for economic and environmental alignment



**Extended summary available at:**  
[https://www.iene.eu/articlefiles/inlene/ccus\\_extendedreport.pdf](https://www.iene.eu/articlefiles/inlene/ccus_extendedreport.pdf)

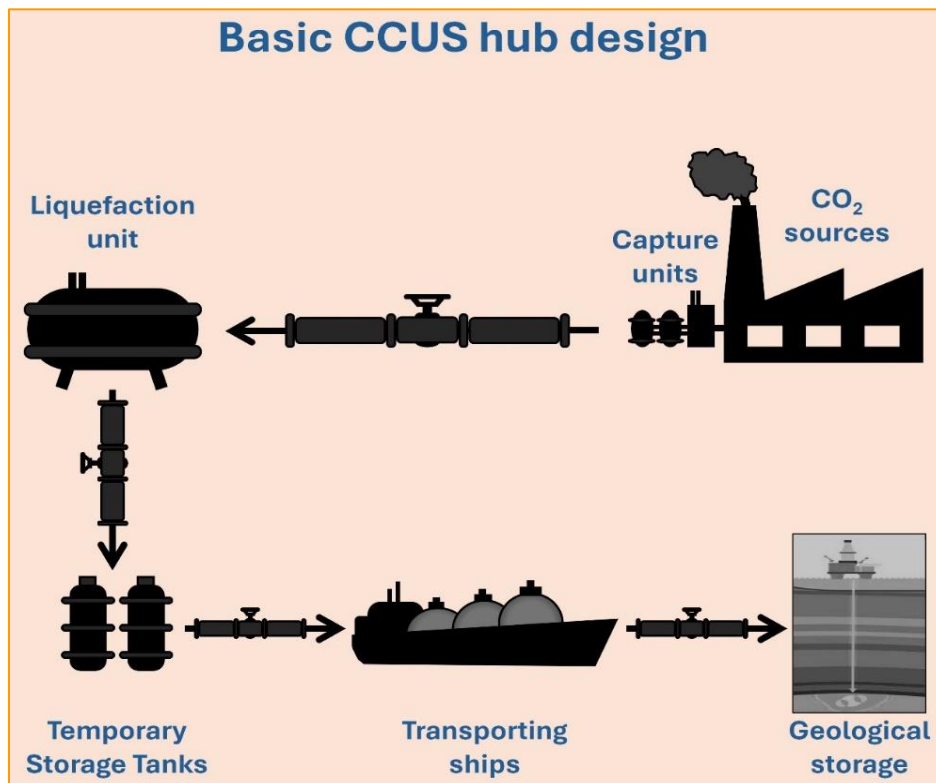
# Establishing CCUS hubs in Greece



Source: Seo et al. (2016)

- ❑ Proposed establishment of multiple CCUS hubs across Greece
- ❑ Purpose of Hubs
  - ❑ Cluster approach: Serve groups of industries in specific locations
  - ❑ Address geographical disparities in underground storage availability
- ❑ Solution?
  - ❑ Advocate for a decentralised hub system to accommodate regional needs

# CCUS hub design



Source: IENE Study (M76), work in progress

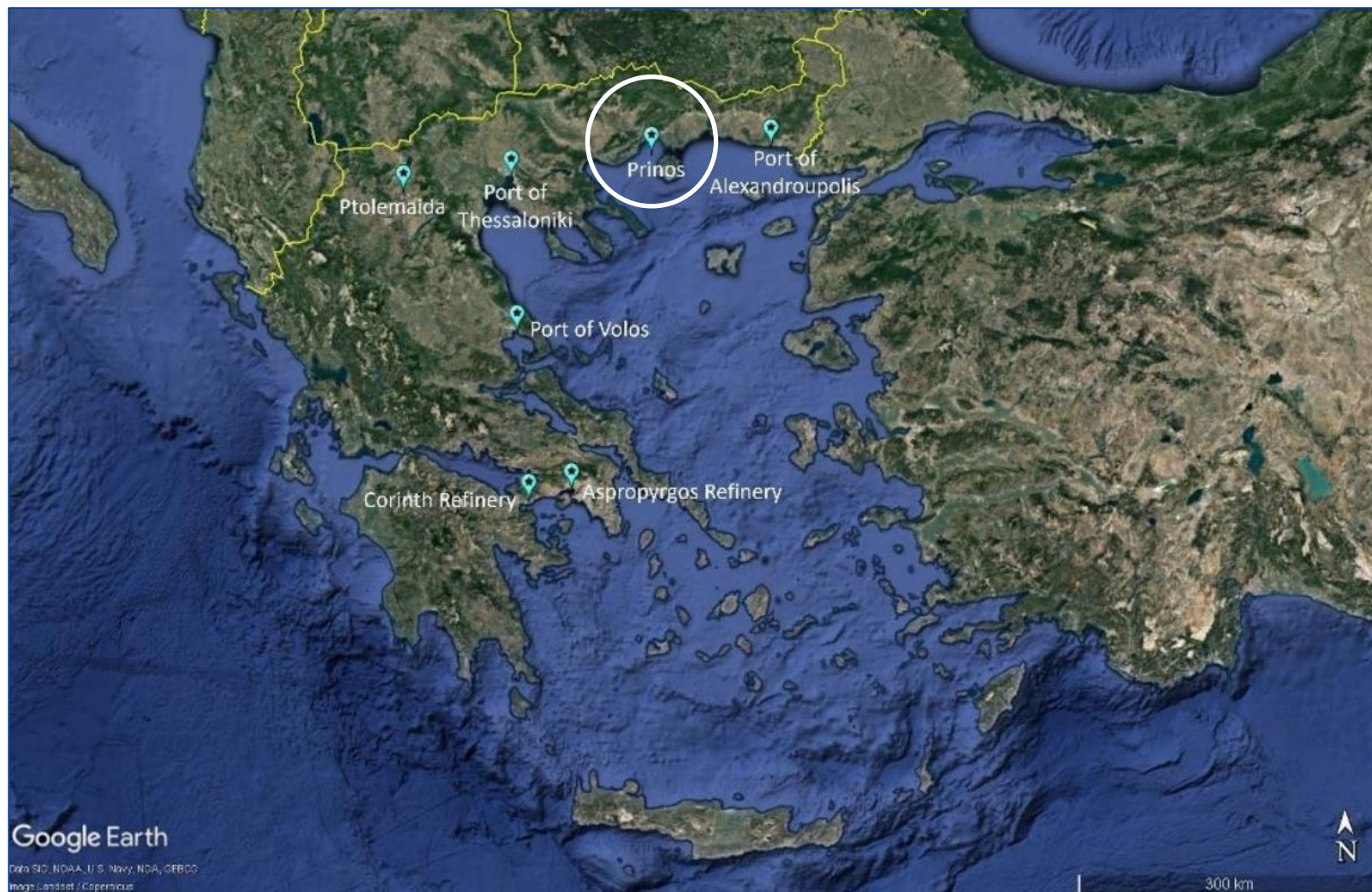
- ❑ Identify emitters
  - ❑ refineries, power plants, cement plants
- ❑ Mainly for Attica, Viotia and Corinth regions
- ❑ Geological storage at Prinos depleted field or elsewhere



Source: Energean website

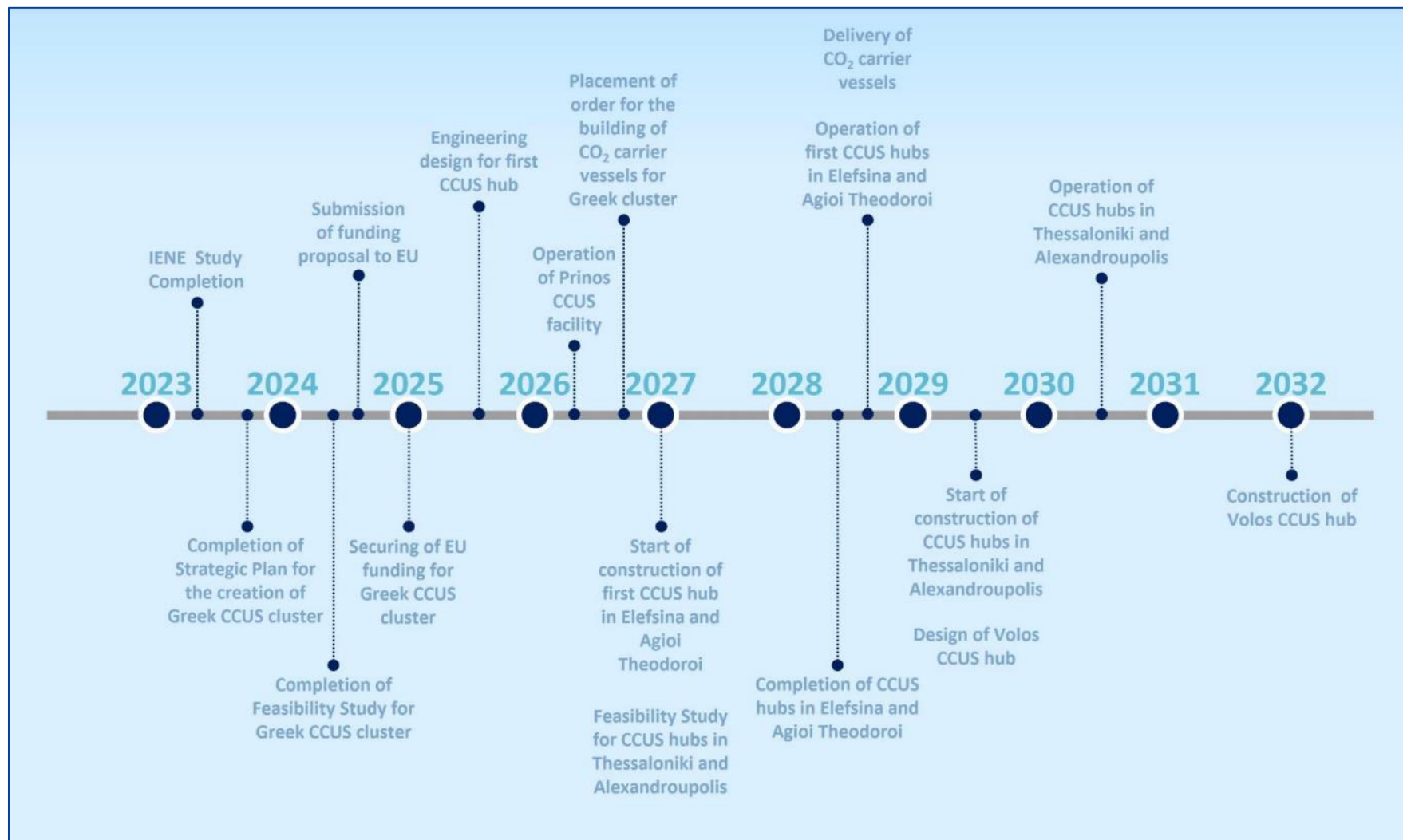


# Proposed hub locations



Source: IENE Study (M64), 2023

# Proposed roadmap for CCUS clusters in Greece





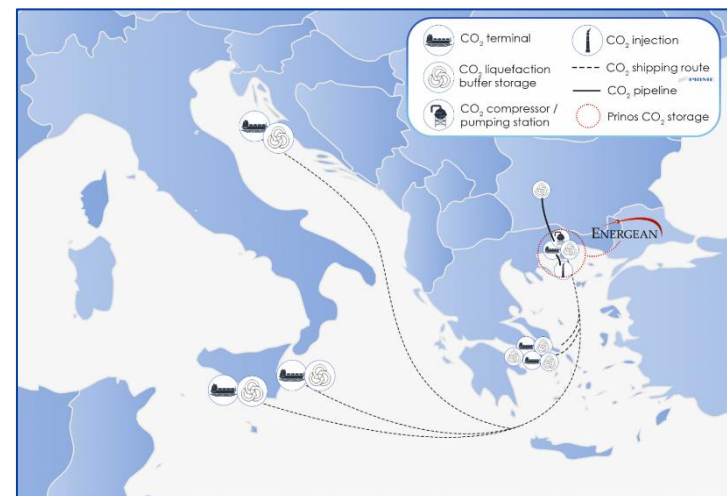
## CCUS hub: Cost-benefit Analysis

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- ❑ From a CCUS hub investor point of look
- ❑ CCUS hub in Attica region
- ❑ Ship transportation to Prinos permanent geological storage
- ❑ 5 MTPA hub capacity
- ❑ The model has a duration of 20 years (2026 onwards)
- ❑ Carbon Capture System has not been included in the financial model as the companies have received funding for it
- ❑ EUR/USD Exchange rate amounts to 0,96
- ❑ Financial Cashflows for Shareholders are deducted by 22% (Greek tax rate)
- ❑ The desired return on equity amounts to 12%
  - ❑ Desired return on equity=20year Greek bond rate+beta1\*Equity Risk1 Premium for Greece=3,74+1\*8,26=12%

## Current CCUS projects in Greece

- Prinos CO<sub>2</sub> storage (Energean) – North Aegean Sea
  - €150 million funding: European Recovery and Resilience Funding (RRF)
  - Phase 1: injection capacity of 1 MtCO<sub>2</sub>/year (2026)
  - Phase 2: injection capacity of 3 MtCO<sub>2</sub>/year (Q4 2028-Q1 2029)
- IFESTOS project (TITAN) – Kamari cement plant
  - €234 million funding: EU's Innovation Fund
  - Capturing ~1.9 MTPA
- IRIS project (Motor Oil) – Corinth refinery
  - €127 million funding: EU's Innovation Fund
  - Low-carbon hydrogen production
- OLYMPUS project (Hercules) – Evia cement plant
  - €124 million funding: EU's Innovation Fund
  - Capturing ~1 MTPA



Source: Energean website

# Conclusions

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- ❑ Development of CCUS hub clusters show the way forward
- ❑ Each hub will serve groups of industries in specific locations
- ❑ Decentralised system
- ❑ Ship transportation of liquefied CO<sub>2</sub>
- ❑ Geological storage in Prinos or elsewhere in Greece and overseas
- ❑ Preliminary CBA results suggest that substantial amounts of “grants”-type funding is necessary for the development and construction of CCUS hubs
- ❑ Four (4) CCUS projects in progress – all funded by EU facilities
- ❑ For the moment CCUS implementation in general is not feasible without subsidies



# Thank you for your attention!

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