

Integration of the dunkirk co2 terminal on the liquefied natural gas (LNG) terminal site

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CFA ZIBAC - Public summary of the final study report for lot 2.1.1 d

1. Purpose of th study

As part of the development of the liquefaction, ship loading, and CO₂ export terminal project in the Dunkirk area, two sites had been identified: one on the site of the former SRD refinery near ArcelorMittal, and a second near the liquefied natural gas (LNG) terminal. The latter, allowing the use of cold energy (refrigeration) from LNG, was selected for a feasibility study on the integration of this cold energy, carried out in 2022. The configurations studied for the CO₂ terminal were:

2. subcooling of dense liquid CO₂ from the Eqiom, Lumbres, and Lhoist Réty sites (1.5 Mtpa),
3. additional liquefaction of gaseous CO₂, mainly from other emitters in the Dunkirk port area, up to 2.5 Mtpa.

4. Results

The study demonstrated, in all cases, operational cost (OPEX) savings and an investment (CAPEX) premium. This investment premium is linked to:

- units associated with the liquefaction process (integration with LNG liquefaction, and an electric liquefier required to compensate for insufficient LNG cold energy),
- additional technical complexities of this integration (ethylene management, flare network connection, and therefore more advanced integration between the CO₂ terminal and the LNG terminal).

Depending on the CO₂ sources considered, the conclusions were:

- for the dense source only (Eqiom and Lhoist volumes), the total cost increases slightly,
- for a full-capacity development of the terminal (Eqiom, Lhoist, and additional gaseous CO₂ volumes), the savings on the total cost become attractive.

This integration study between the CO2 terminal and the LNG terminal informed a techno-economic comparison, also taking into account other factors:

- availability of an already “developed” site,
- availability of an electricity delivery point (medium or high voltage),
- experience in operating a liquid products terminal,
- feasibility of a connection to the rail network to integrate potential additional emitters into the CO2 hub,
- length of pipelines for dense liquid CO2 and gaseous CO2 transport,
- different design characteristics of the jetty (closed basin vs. open but protected basin),
- duration of ship maneuvers in the port.

Based on this techno-economic comparison, the LNG terminal site was selected at the end of 2022 to benefit from the industrial synergies outlined above.

Since the integration of cold energy was not competitive for dense CO2 volumes only (Eqiom and Lhoist sources), and given the uncertainties regarding gaseous CO2 volumes at that time, the implementation of this cold energy integration was not pursued. This integration may be considered for potential future development phases of the terminal.

RÉSUMÉ

The ZIBAC DKarbonation project study evaluated the integration of the Dunkirk CO₂ terminal on the LNG terminal site to benefit from industrial, particularly energy, synergies. Techno-economic analyses showed potential operational cost savings, offset by an investment premium. Considering all the criteria studied, the LNG terminal site was selected, while the integration of cold energy was not implemented at this stage but remains possible for future developments.

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