

## Systems design and analysis of LNG value chain with liquid air as a cold carrier

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In general, the cold energy of Liquefied natural gas (LNG) is wasted to seawater during the regasification process, and recovering the cold energy of LNG is an important issue. This study aims to develop a sustainable LNG value chain using liquid air as a cold carrier. In the LNG importing section, the LNG regasification process is integrated with the cryogenic energy storage(CES) process. The LNG cold energy is transferred in two forms: shaft work transfer by LNG direct expansion to compress the air, and cold transfer by heat exchange to liquefy air. The produced liquid air can be transported to the LNG exporters to use liquid air as a supporting refrigerant of the natural gas liquefaction process. The proposed system is investigated by thermodynamic analyses in terms of energy consumption and overall exergy efficiency. This study also highlights the advantages of the proposed value chain and further possibilities for performance enhancement.

Acknowledgments: This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No.2020R1F1A1050617).