

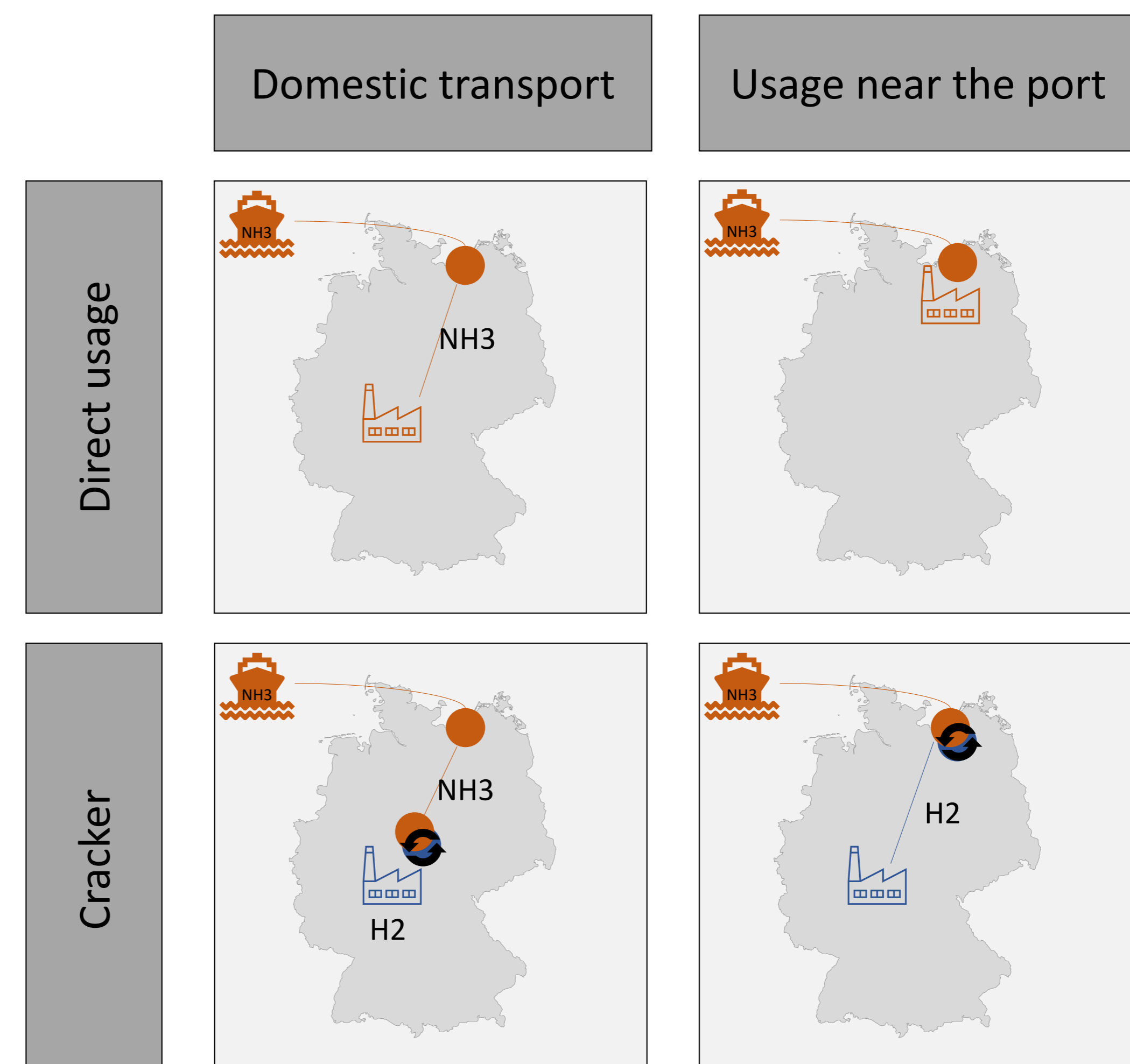
The role of ammonia in the renewable energy system for the development of hydrogen infrastructure

Study background

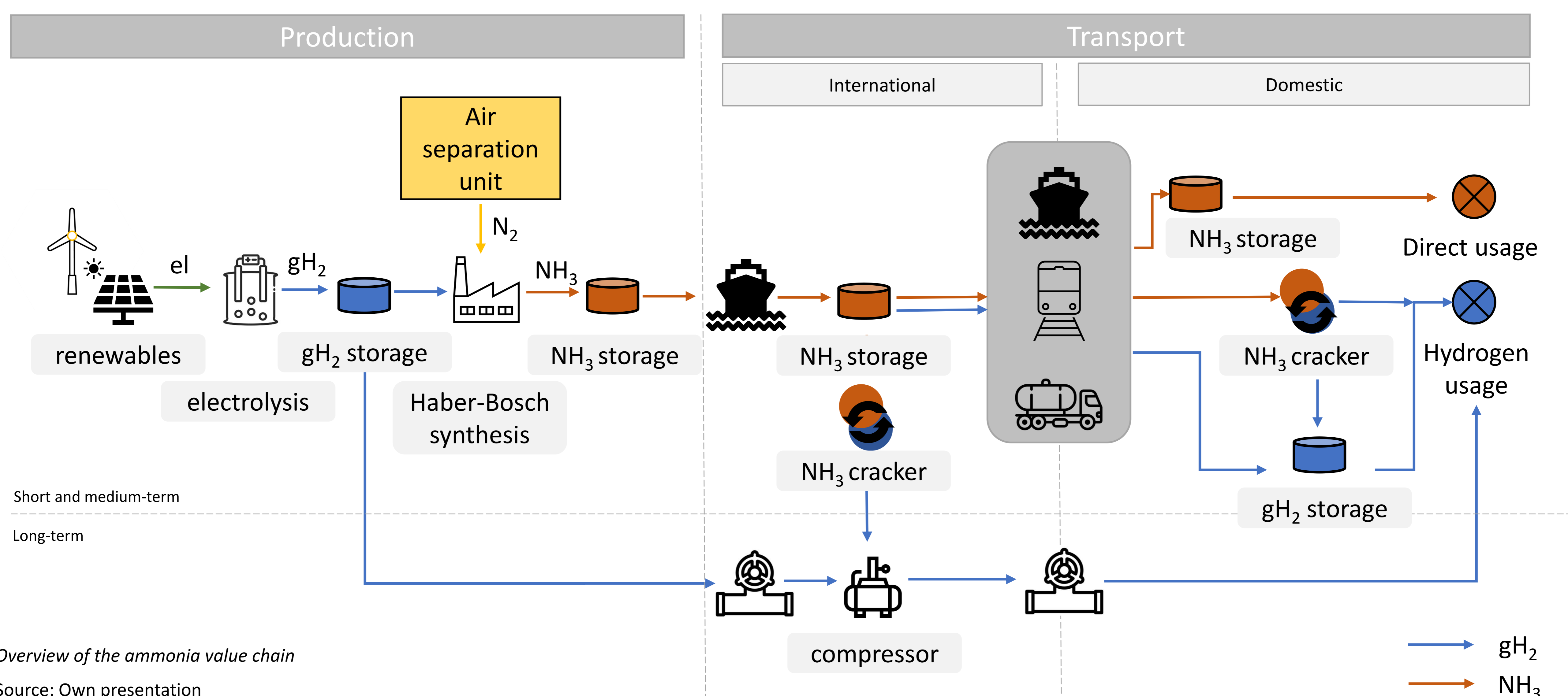
- Literature illuminates single aspects of ammonia, a systemic view of the importance of ammonia for the hydrogen ramp-up is missing
- Study explores the system integration of ammonia and outlines four options for the use of ammonia:
 - domestic transport and direct usage** of ammonia,
 - direct usage of ammonia near the port**,
 - domestic transport of ammonia** and **decentralized** reconversion into hydrogen on-site,
 - reconversion of imported ammonia into hydrogen** in a large-scale cracker near the port

Status Quo and Methodology

- literature focuses on ammonia as an import vector for hydrogen
- pipeline-based hydrogen import will be the most cost-effective transport option
- Systemic approach is needed to disclose the corresponding advantages and disadvantages of several use cases of ammonia



Integration paths of ammonia imports into the energy system, systematized by type of use and location; Source: Own illustration



Overview of the ammonia value chain
Source: Own presentation

Lessons learned

- Ammonia (NH₃) is a carbon-free energy carrier that can be considered as an early import option for hydrogen.
- The direct use of ammonia, both materially, e.g. in fertilizer production, and energetically, e.g. in power plants, is diverse. Depending on the application and location, there are path dependencies for infrastructures to be built.
- Regarding the current state of science on the systemic role of ammonia, it is necessary for energy systemic models to consider ammonia endogenously as an energy vector.
- The analysis of industrial needs shows that ammonia is already accepted and established as an early decarbonization option on a global scale. At the same time, aspects of the timeframe for implementation should be examined more closely.

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