

# Moving **H**ydrogen – by Road, Rail, Sea or ... Alchemy?

**Make it; Move it; Use it**

**wood.**



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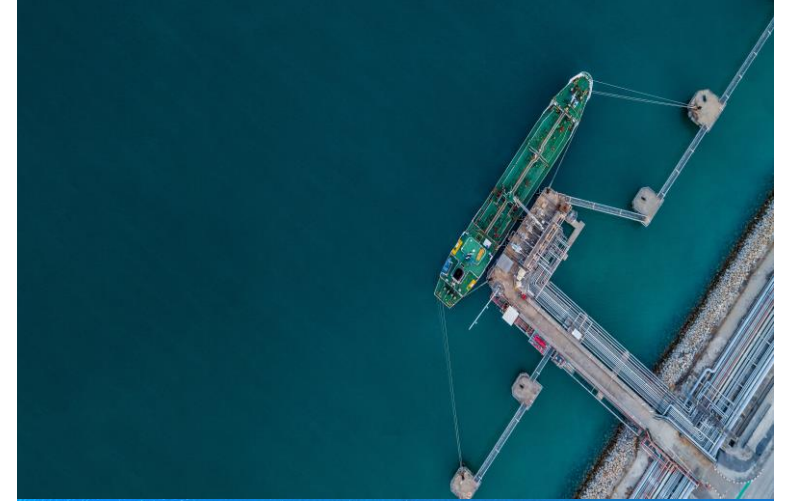
# Hydrogen Vectors



- Compressed hydrogen via tube trailer
- Liquid hydrogen via tube trailer



- Compressed hydrogen via pipeline
- Ammonia via pipeline

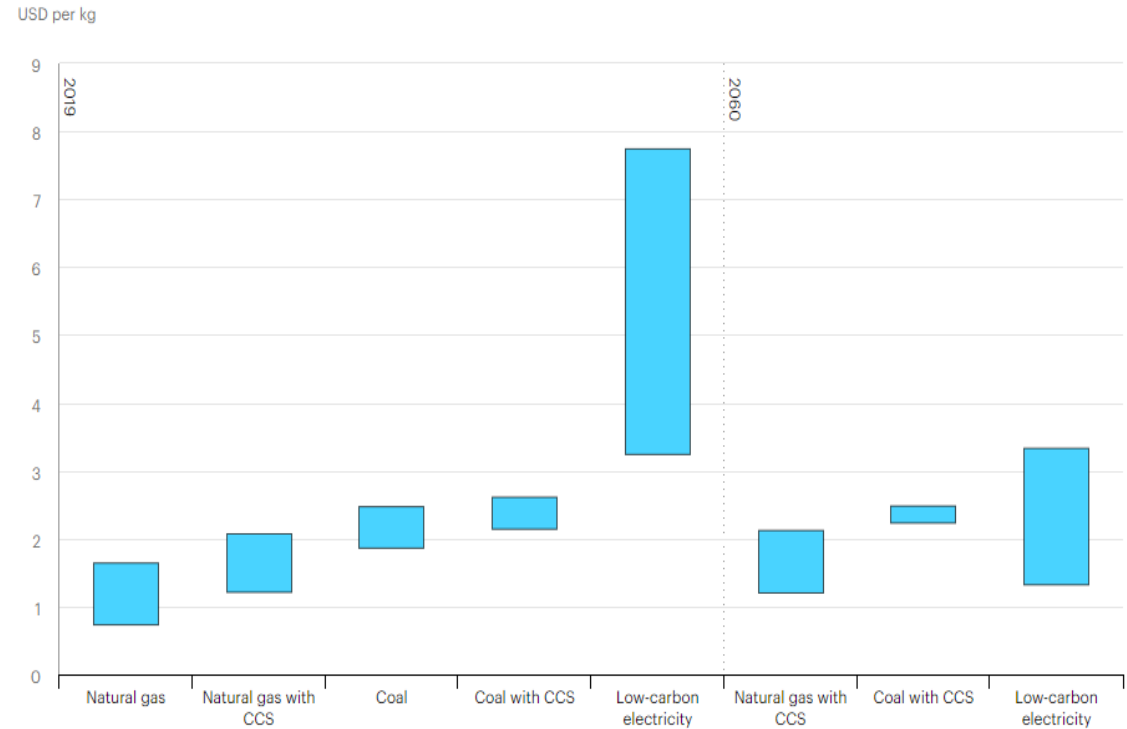


- Liquid hydrogen via shipping
- Ammonia via shipping
- Methanol via shipping

# Production costs and centralisation

- Cost of renewable electricity massive factor
- Highly variable
- Trending down
- Supports centralised production
- Puts emphasis on lowering transport and distribution costs

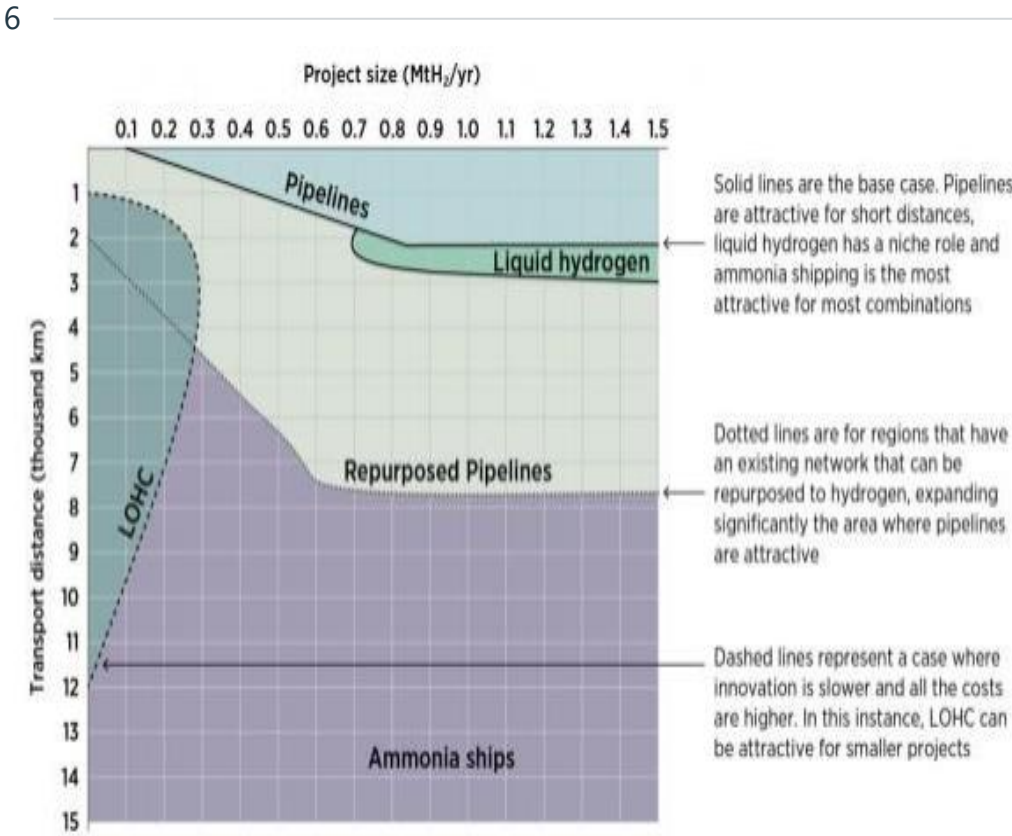
Hydrogen costs by production method



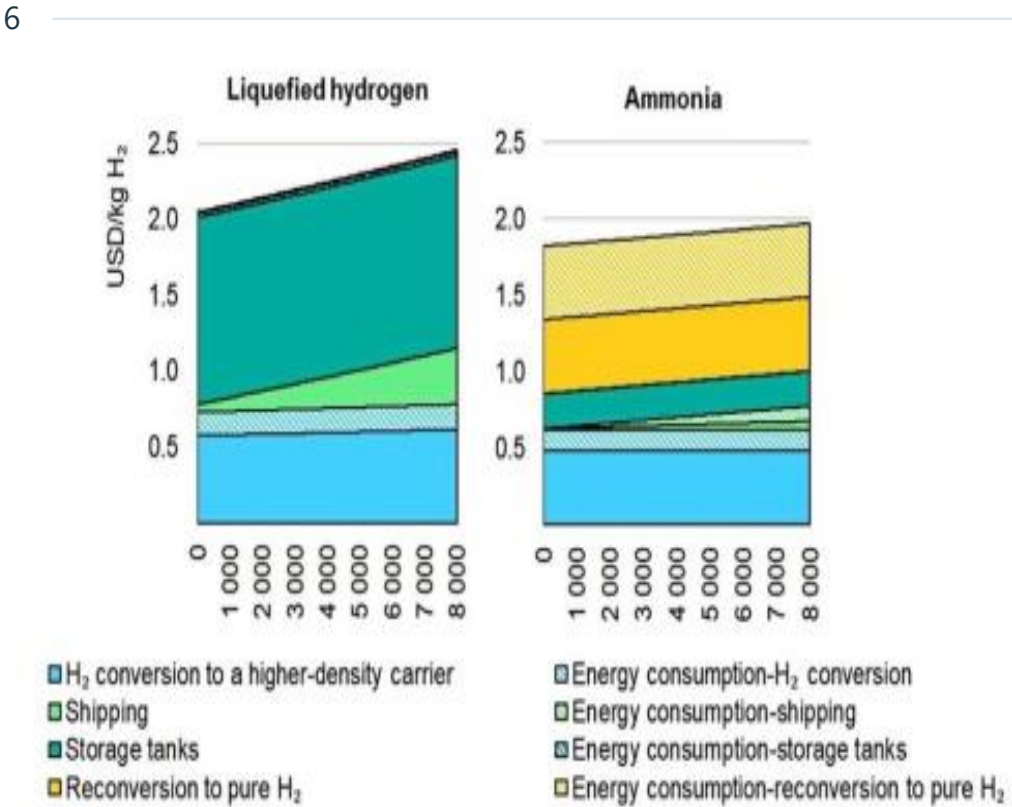
IEA. Licence: CC BY 4.0

# Current Literature

Vector Comparison, IRENA (2022)

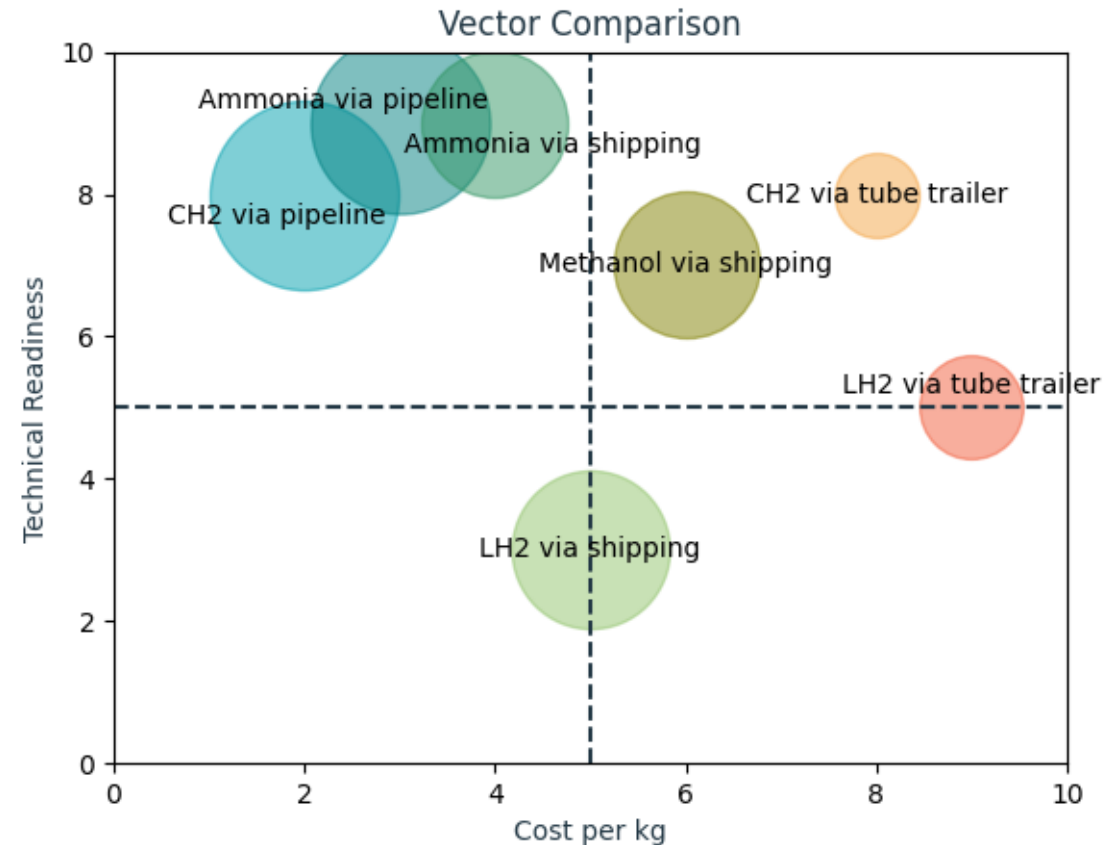


Component Breakdown, IEA (2023)

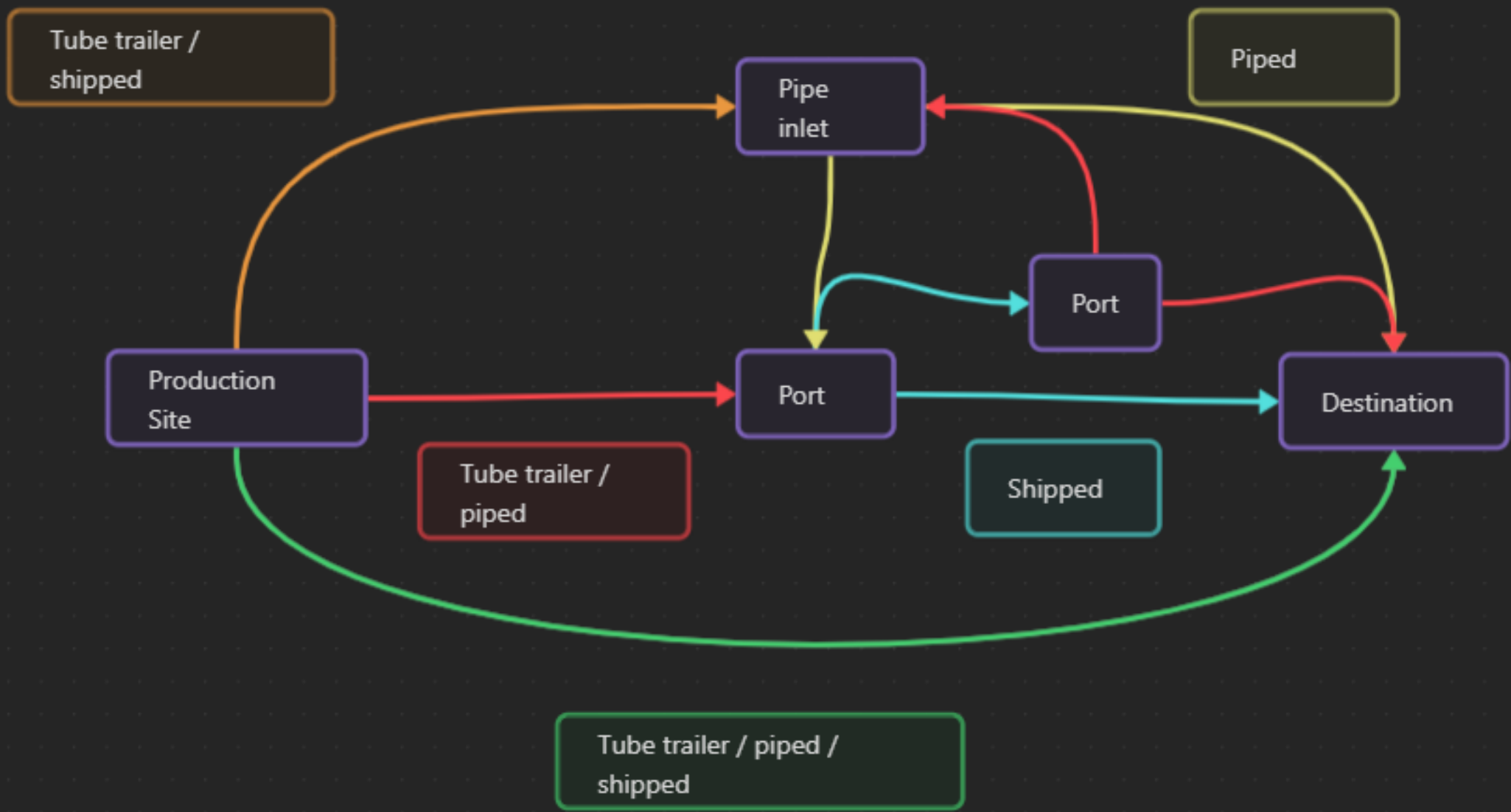


# Qualitative Vector Comparison

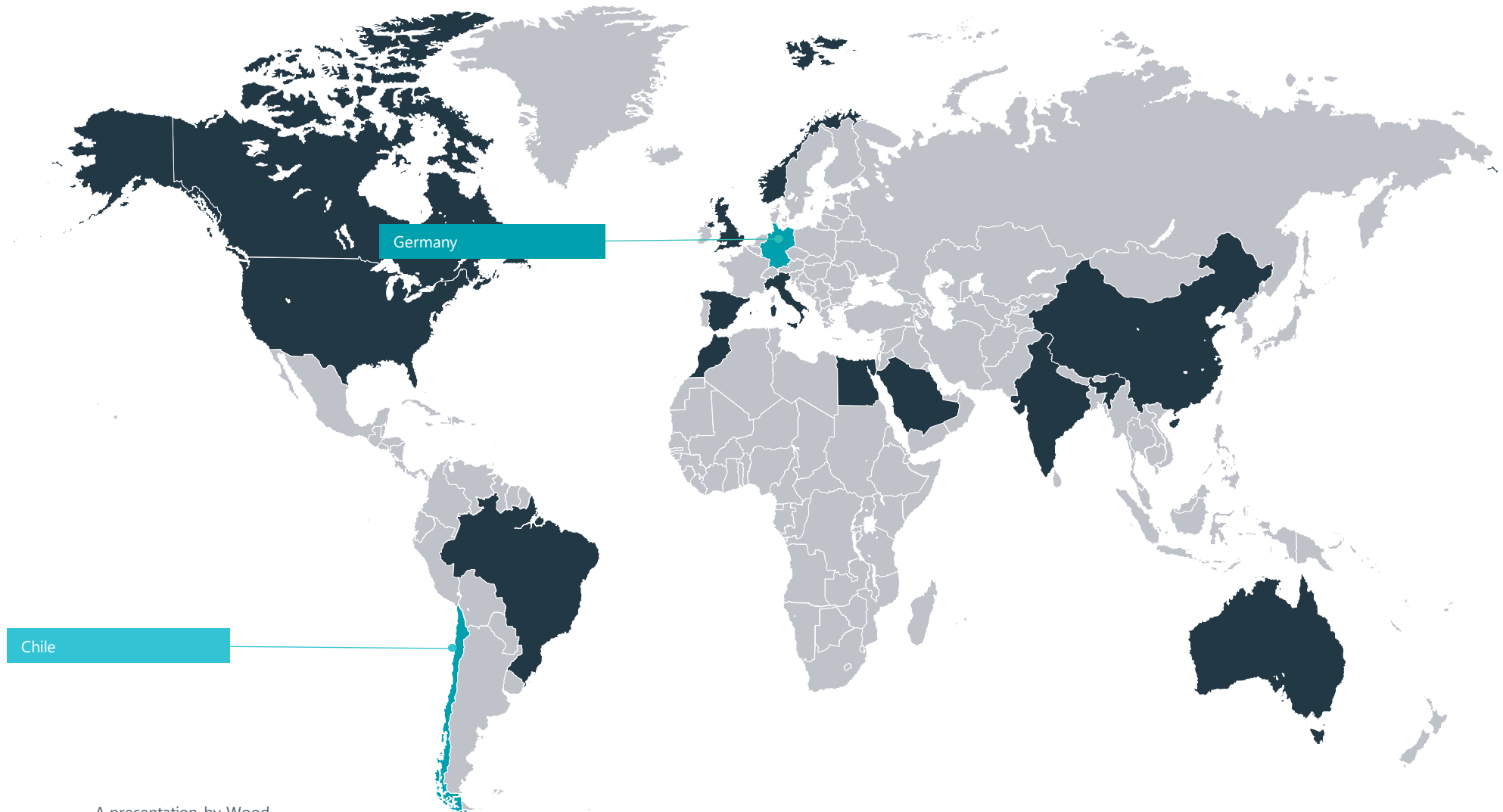
- Current focus on low CAPEX, proven technology such as tube trailers
- Pipelines and ammonia shipping likely to be cost-effective options once production has scaled sufficiently
- Carriers such as LH2 and methanol may have niche roles



# Hydrogen Pathways



# Chile to Germany





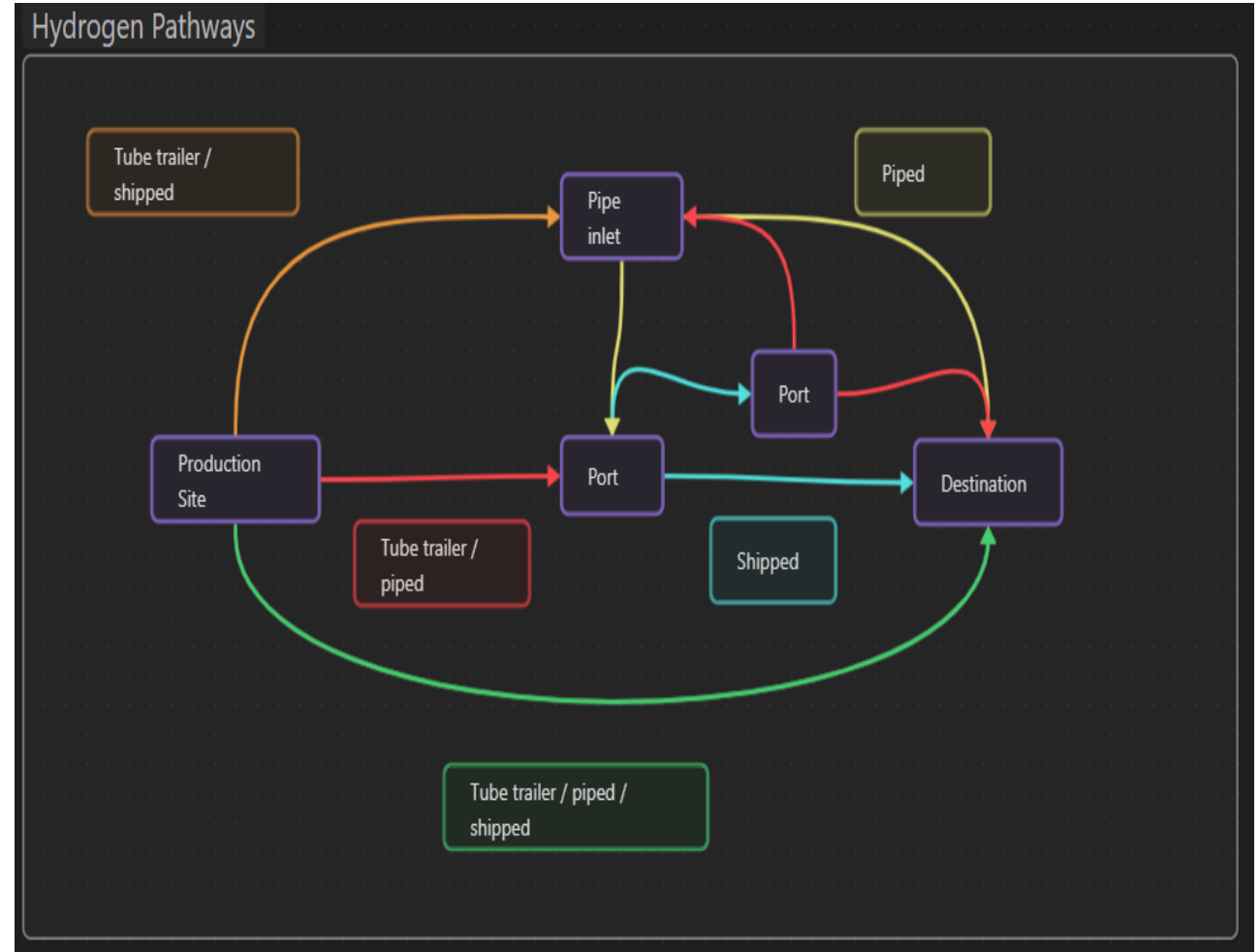
# Example: Chile to Germany



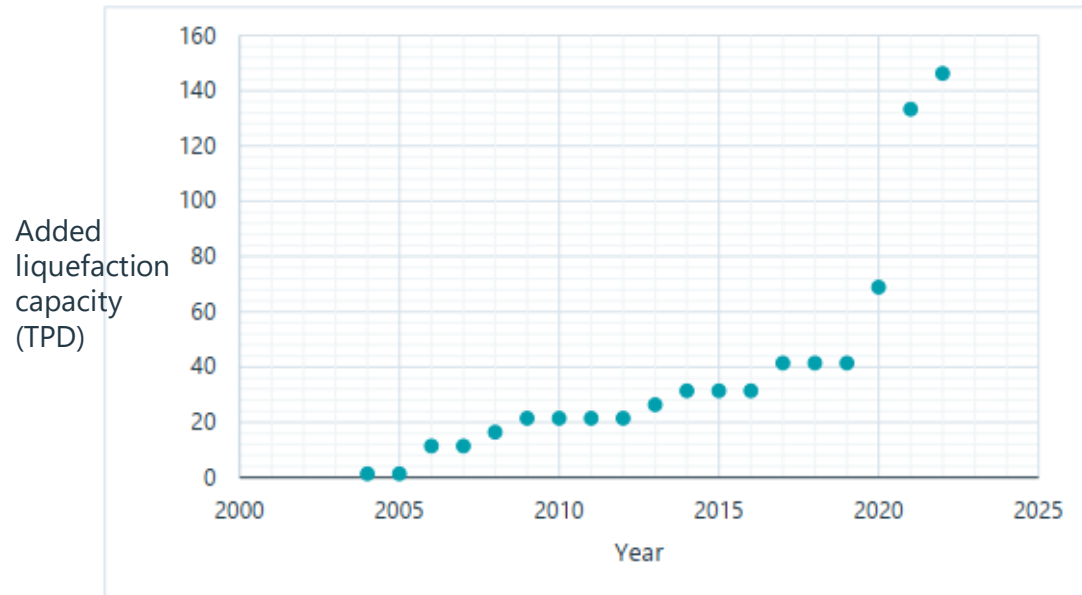


# Summary

- Many hydrogen vectors to choose from
- Low regional renewable electricity cost promotes centralisation of hydrogen production
- Real projects likely to be multi-vector
- Savings and efficiencies may be realised by considering the combinations of vectors used



# All vectors picking up pace, including LH2



MF Hydra



- LH2 fuel cells
- 300 passengers
- 80 cars

Offshore-energy.biz

wood.