

Hydrohub HyChain 2 - Cost implications of importing renewable electricity, hydrogen and hydrogen carriers into the Netherlands.

A high-level model to evaluate these import costs and their dependencies on the various input parameters.



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Incentive

Hydrogen could play a vital role in future renewable energy systems, especially for applications where electrification proves difficult. We do however not yet know how and at what costs we can best supply renewable hydrogen to the Dutch industry and beyond.

Objective

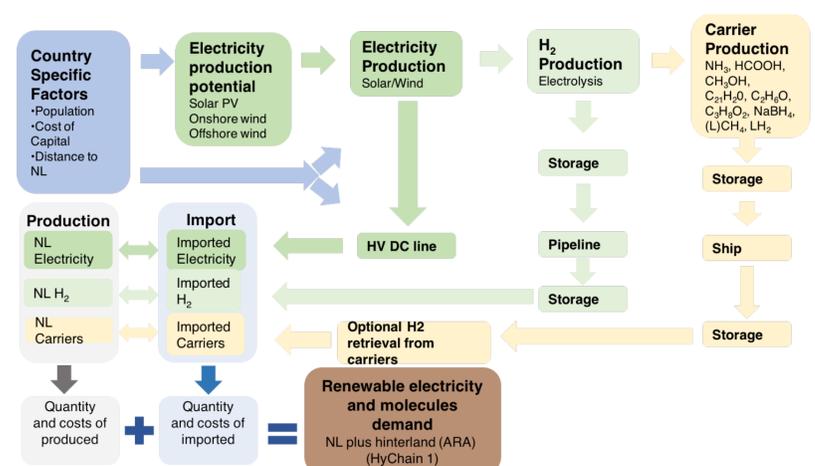
HyChain 2 looks at the cost implications of importing renewable electrons and molecules to the Netherlands

The main research question of this project is:

Which flows of renewable energy carriers derived from sustainable electricity (and in what format), could, based on lowest costs, flow through the Netherlands?

Approach

We developed a model to quantify and explore the costs of importing renewable electrons and molecules into the Netherlands and compare those to local production costs. We considered three import routes: a) via high voltage direct current electricity cables with hydrogen production in the Netherlands, b) via hydrogen gas pipelines and c) via a hydrogen carrier/molecule which is shipped to the Netherlands (with possible reconversion upon arrival). The model assumes a green field approach, works on a levelised cost basis and focuses on 2050.



Results

With standard settings the model shows that the cheapest hydrogen, competitive with local production, is imported from Europe or North Africa via gas pipelines and sometimes via HV DC cables. Molecule import via ships is cost competitive as well, but hydrogen import via this route is not.

The parameter with the largest impact on import costs is the cost of financing (WACC). If this is equal for all countries, cost competitive hydrogen import from many more countries is possible, also by ship.

The country profiles which ECN part of TNO made however show that in the countries with a good export potential (on a cost and volume basis) the plans and developments to develop this supply chain are still lacking.

Next steps

Currently the ISPT is setting up project 4, which is going to combine the work done in HyChain 1, 2 and 3 to develop more detailed scenario studies on the renewable hydrogen supply chain.

