

# ESTIMATING GLOBAL PRODUCTION AND SUPPLY COSTS FOR GREEN HYDROGEN AND HYDROGEN-BASED GREEN ENERGY COMMODITIES

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**1** Motivation & Methodology

**2** Transport costs

**3** Case Study: Green ammonia for Germany -  
produce or import?

# 1

## Motivation & Methodology

Provide global and country-specific...

Production costs

Potentials

Supply costs

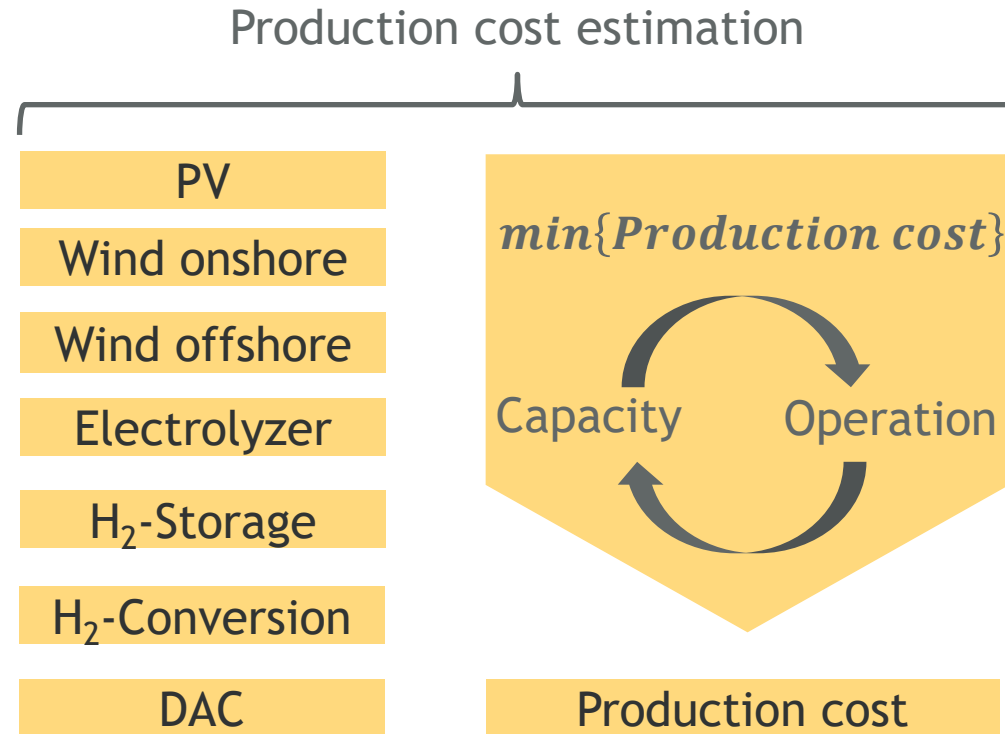
Comparability

Cost composition

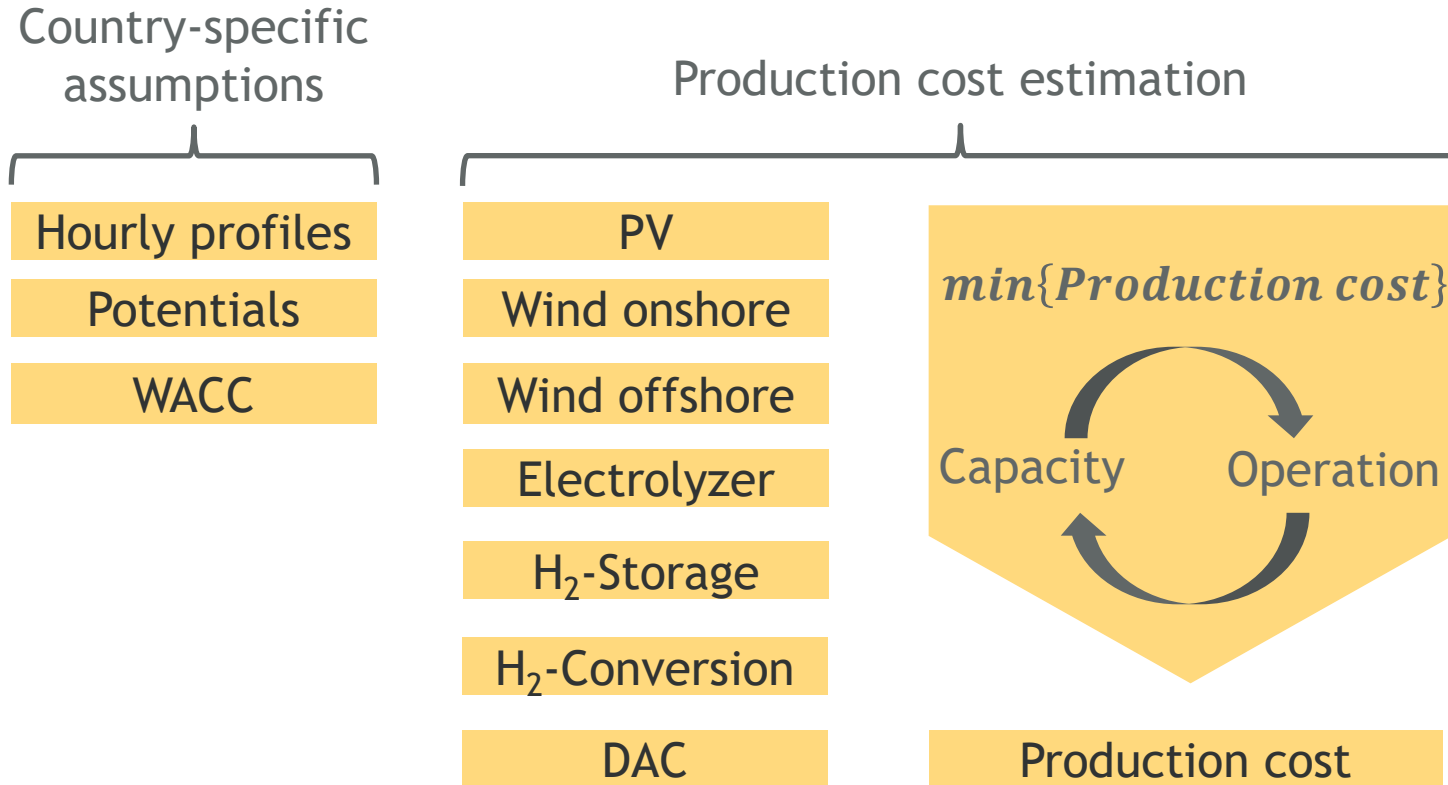
Data basis

... for green hydrogen and hydrogen-abased green energy commodities

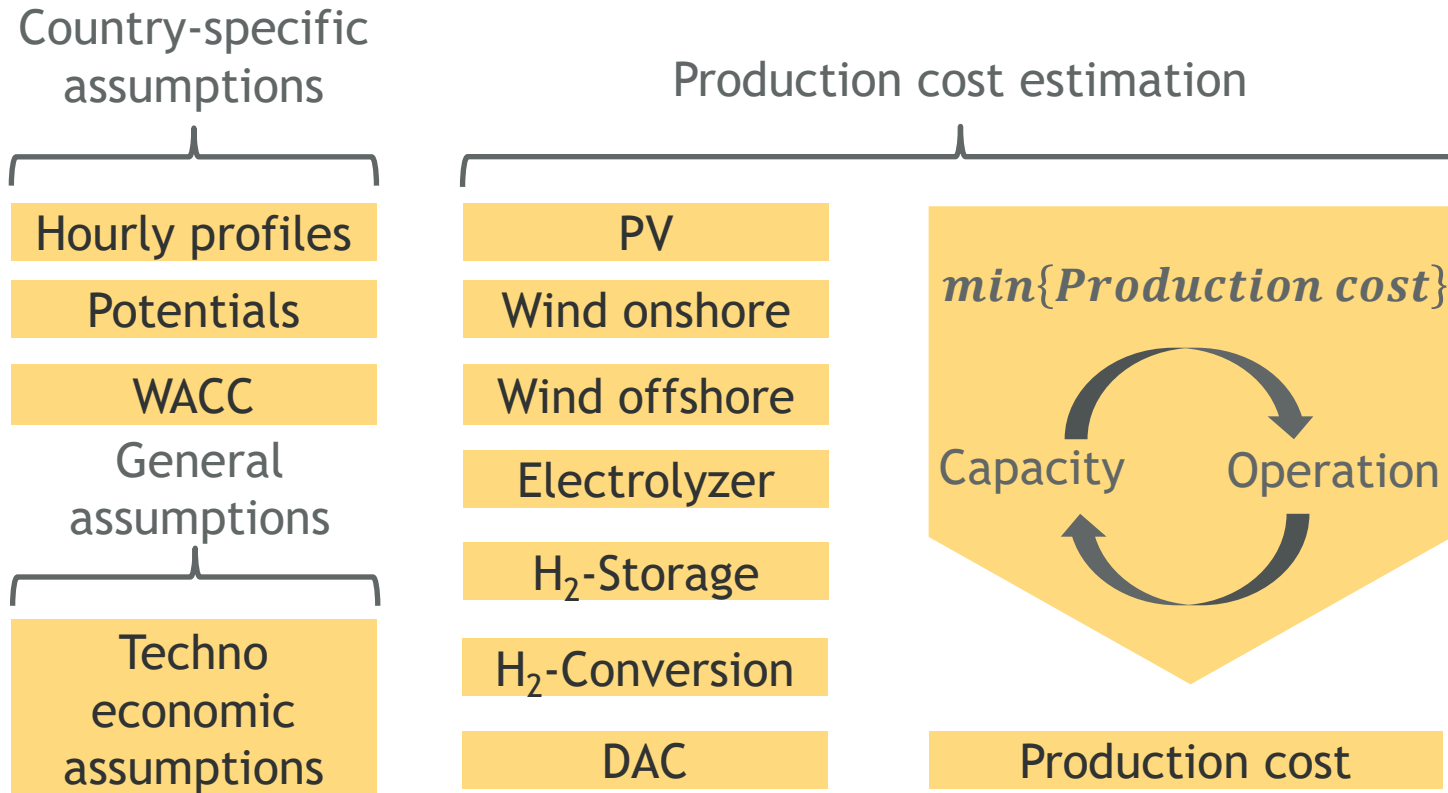
# METHODOLOGY FOR SUPPLY COST ESTIMATION



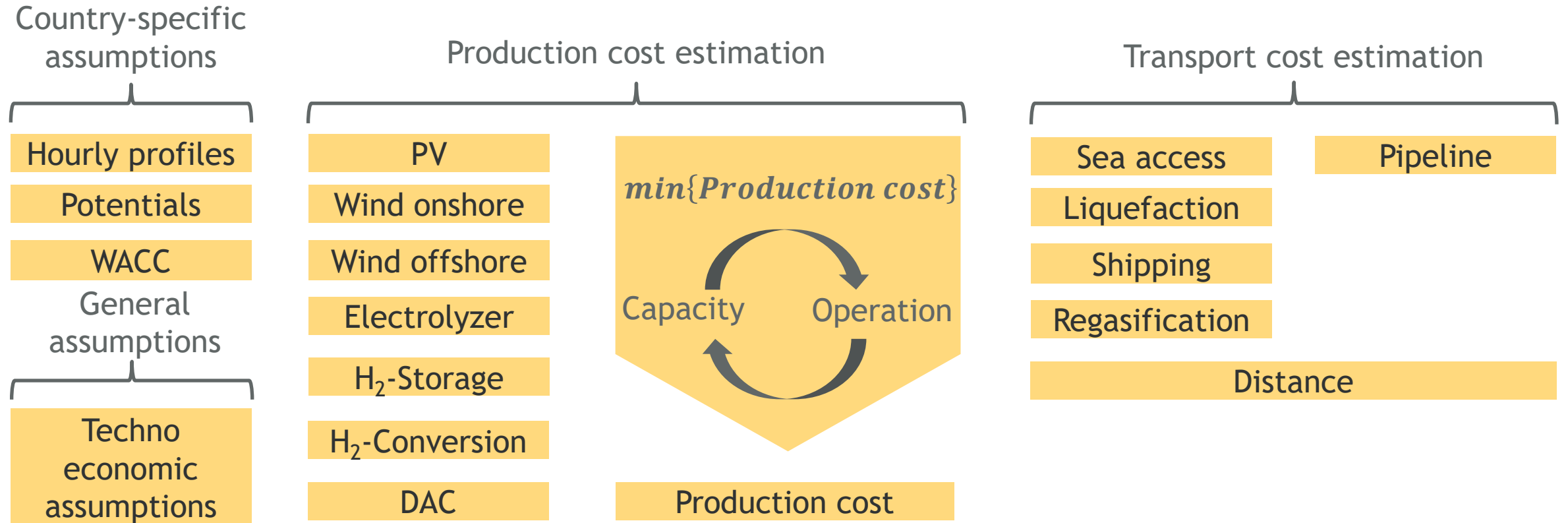
# METHODOLOGY FOR SUPPLY COST ESTIMATION



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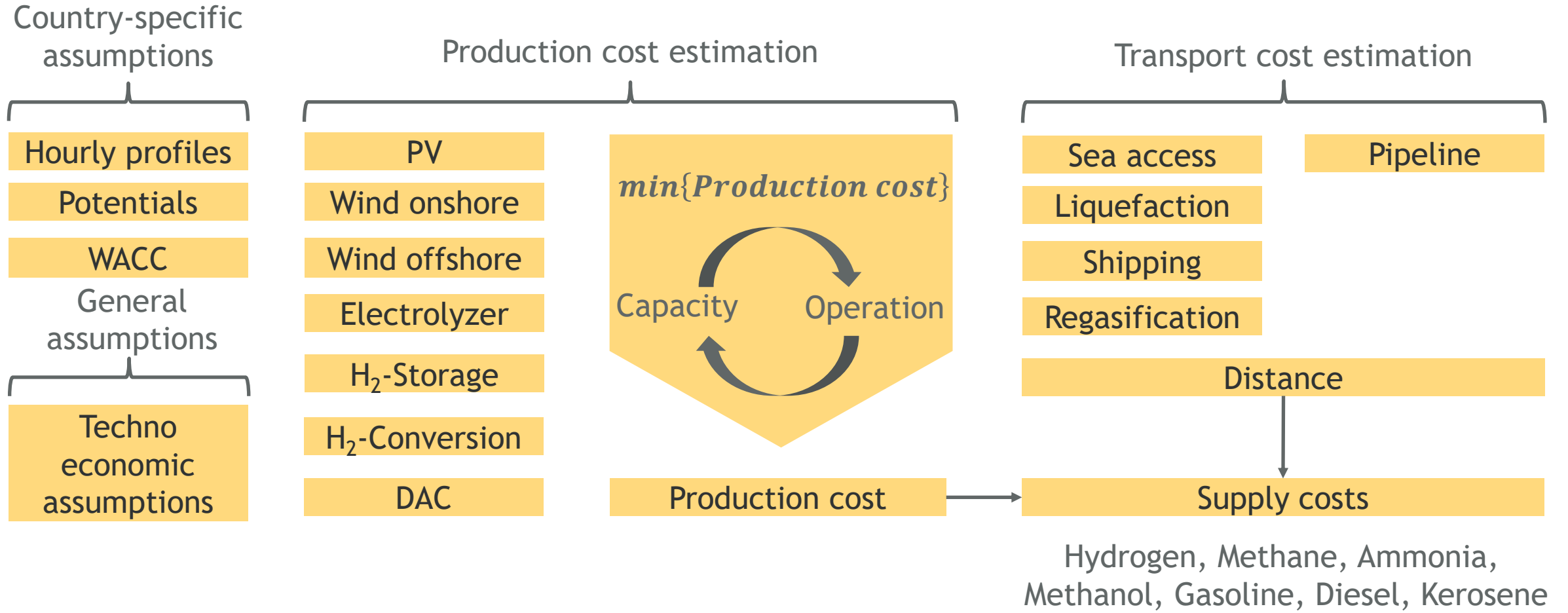


# METHODOLOGY FOR SUPPLY COST ESTIMATION





# METHODOLOGY FOR SUPPLY COST ESTIMATION



Customizable analysis of global and country-specific production and supply costs for green hydrogen and hydrogen-based green energy commodities

General Control Panel	
	Orange cells request input
CO <sub>2</sub> production cost calculation	Greenfield via DAC
Custom CO <sub>2</sub> costs in \$/t CO <sub>2</sub>	450
Ammonia use case	Direct use
Prioritize power generation in origin countries	yes

Transport Control Panel	
<b>General</b>	
Transport infrastructure	greenfield
<b>Pipeline</b>	
H <sub>2</sub> pipeline cost scenario	retrofitted
WACC (%)	8%
Economic lifetime (a)	55
Onshore vs offshore pipeline cost factor	1.96
<b>Shipping (Expert)</b>	
Freight rate (LNG) (\$/d)	48800
Freight rate (Ammonia) (\$/d)	50000
Freight rate (Liquids) (\$/d)	14000
Port entry/exit fees (Ammonia) (\$/t)	0.58
Port entry/exit fees (Liquids) (\$/t)	0.58
Port handling fees (Ammonia) (\$/t)	1.59
Port handling fees (Liquids) (\$/t)	0.49
WACC (LH <sub>2</sub> tanker) (%)	8%
Economic lifetime (LH <sub>2</sub> tanker) (a)	30
<b>Liquefaction/Regasification (Expert)</b>	
Economic lifetime (LH <sub>2</sub> /LNG liquefaction) (a)	30
Economic lifetime (LH <sub>2</sub> regasification) (a)	30

**ewi** Institute of Energy Economics at the University of Cologne

**Title**  
Estimating global production and supply costs for green hydrogen and hydrogen-based synthetic fuels

**Authors**  
Michael Moritz  
Max Schönfisch  
Simon Schulte

**Cite as**  
Moritz, Michael; Schönfisch, Max; Schulte, Simon. 2021. Estimating global production and supply costs for green hydrogen and hydrogen-based synthetic fuels. Comprehensive Excel Database.

**Version**  
1.2

This tool estimates the production and supply costs of green hydrogen, ammonia, synthetic natural gas, methanol and Fischer-Tropsch fuels under varying assumptions. A detailed description of the underlying methodology for renewable energies and hydrogen costs and inputs can be found in <https://doi.org/10.1016/j.apenergy.2021.117481>. A detailed documentation of the methodology for ammonia, synthetic natural gas, methanol and Fischer-Tropsch fuels is forthcoming. All costs are given in \$<sub>2019</sub>. Thermal

Changes to customize your scenario should only be made in the orange boxes in the "control panel", "global" and "country-specific" sheets.

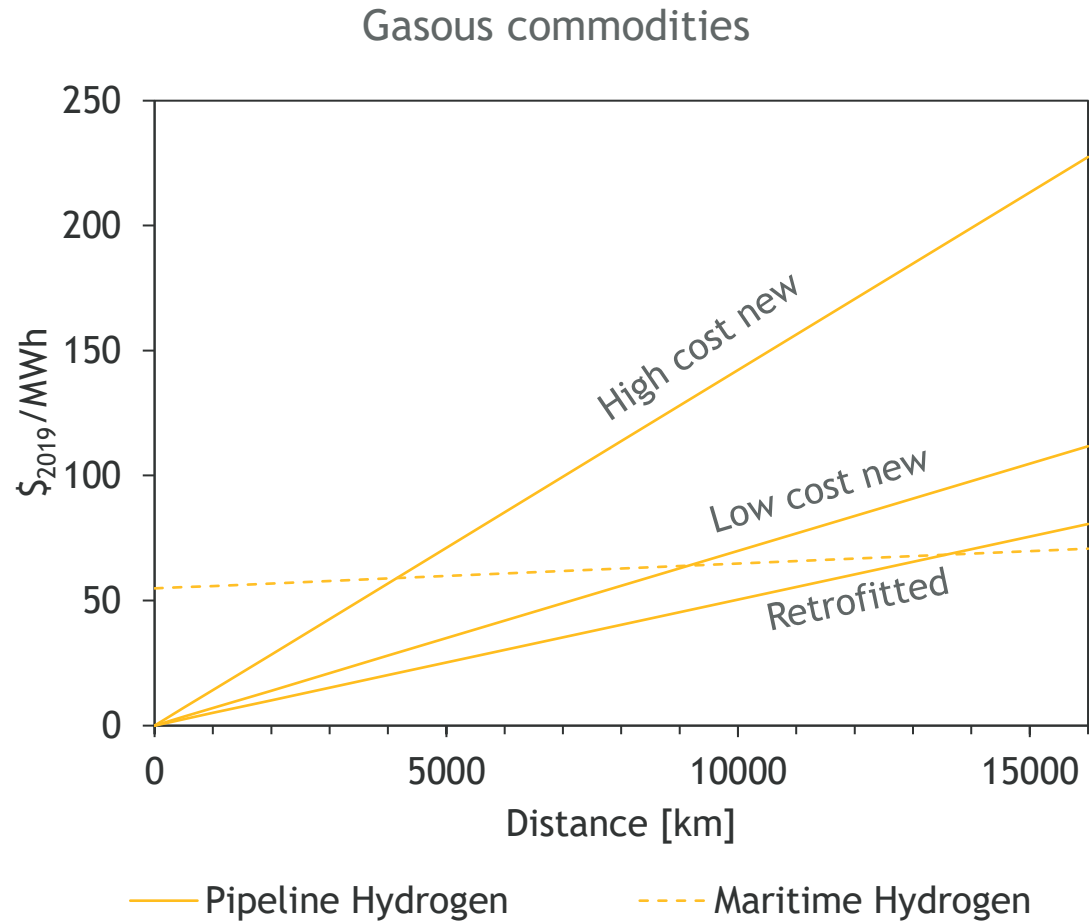
<https://www.ewi.uni-koeln.de/en/tools/global-es-ptx-produktions-und-importkostentool/>

# 2

## Transport costs

# TRANSPORT COST

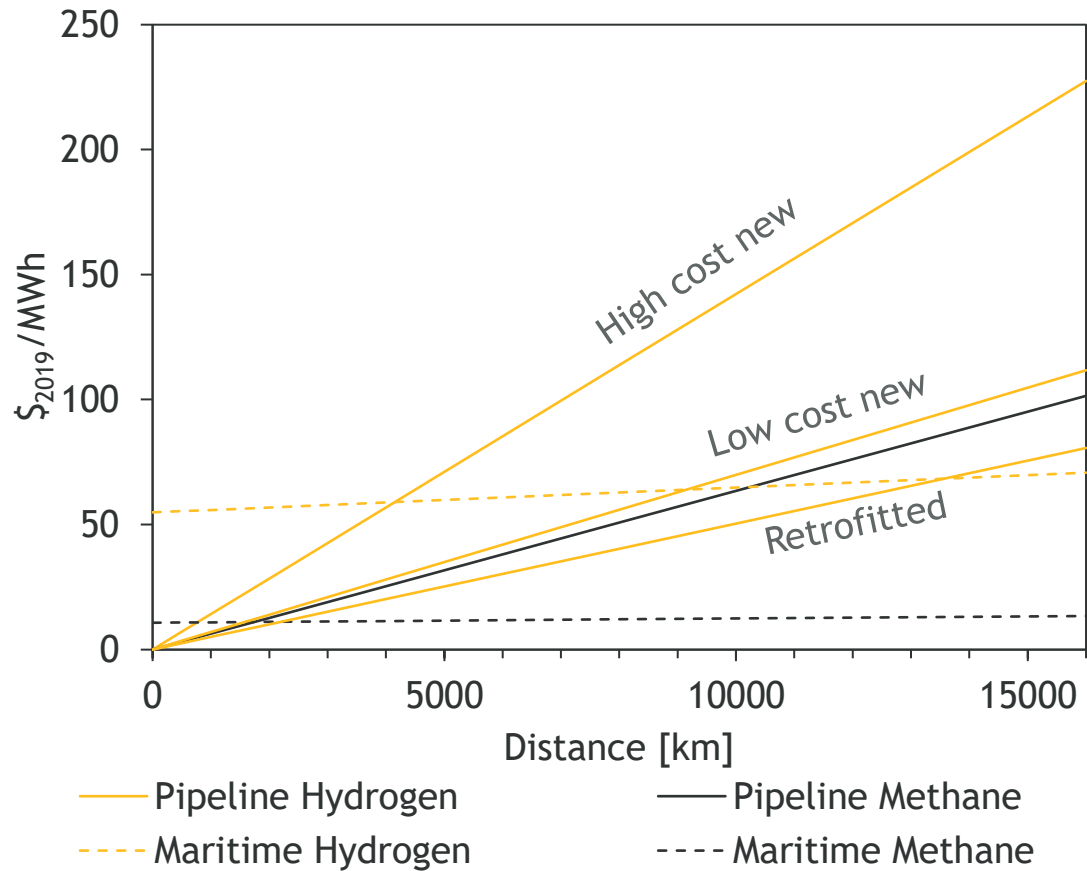
## Comparison of gaseous and liquid commodities



# TRANSPORT COST

## Comparison of gaseous and liquid commodities

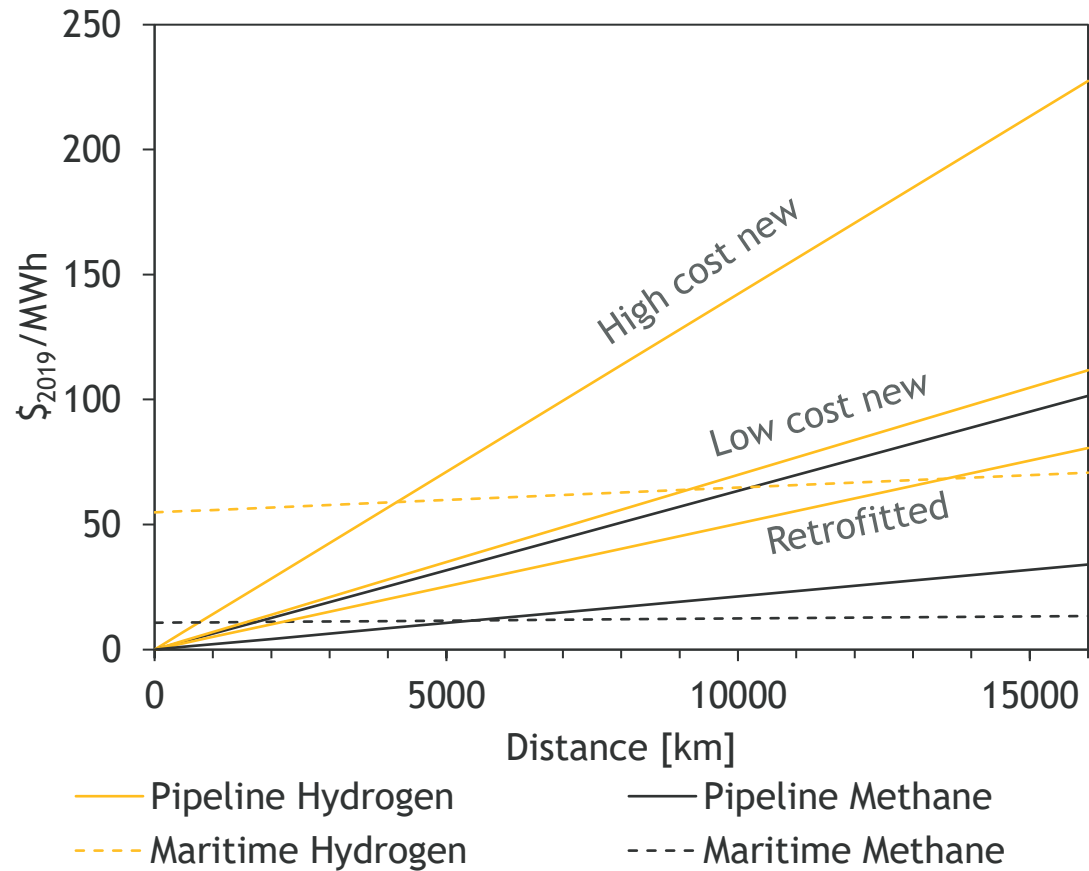
Gasous commodities



# TRANSPORT COST

## Comparison of gaseous and liquid commodities

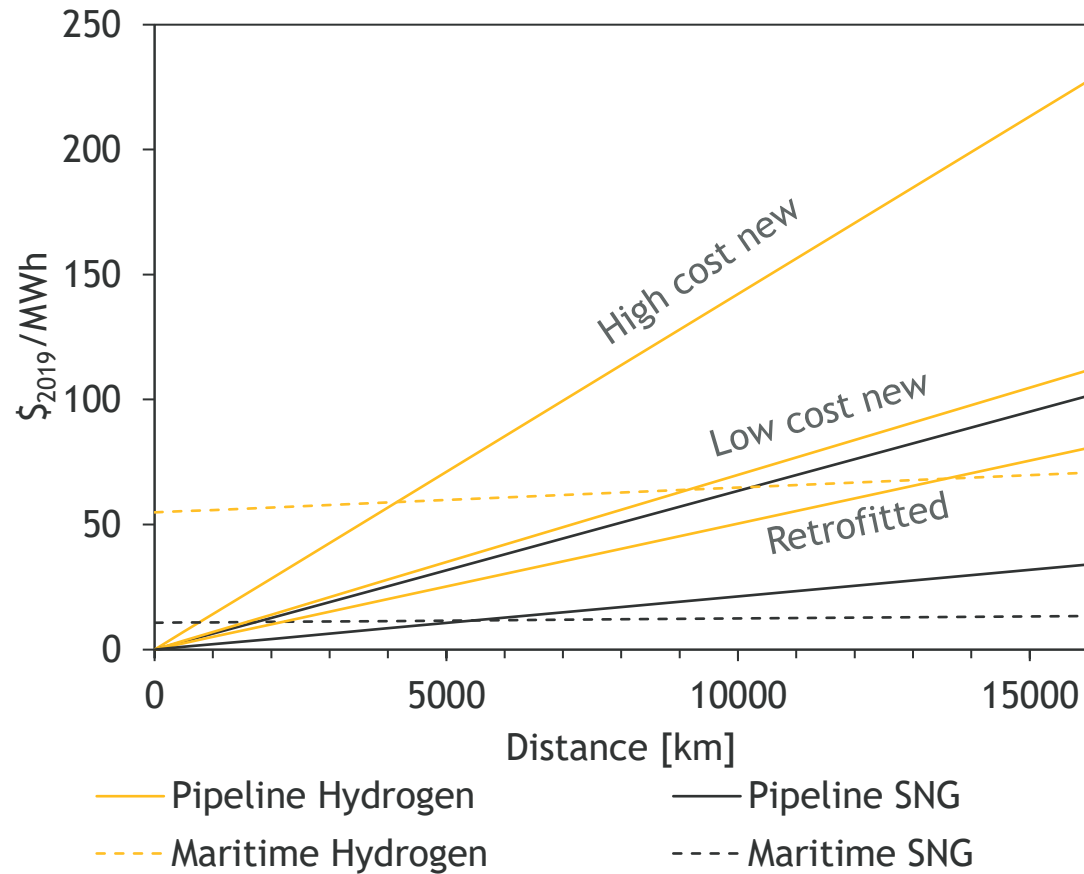
Gasous commodities



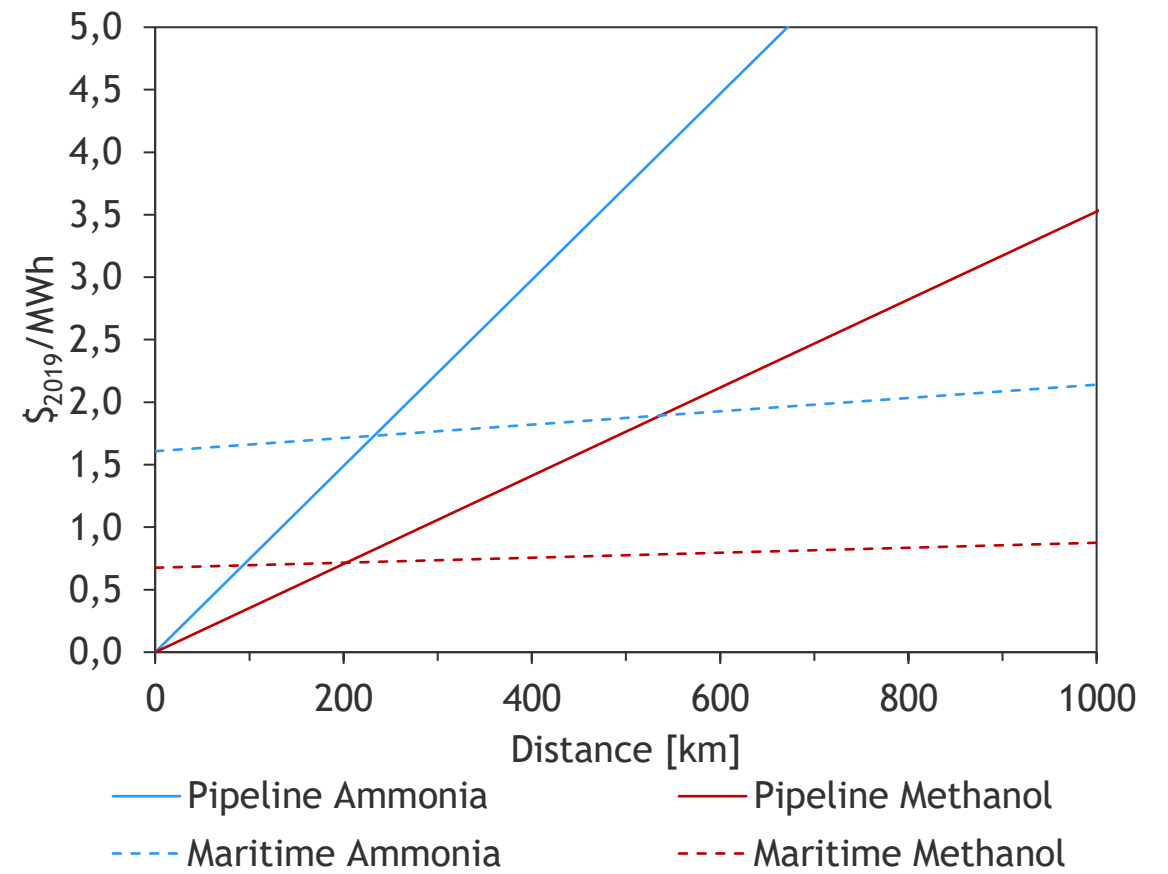
# TRANSPORT COST

## Comparison of gaseous and liquid commodities

### Gasous commodities

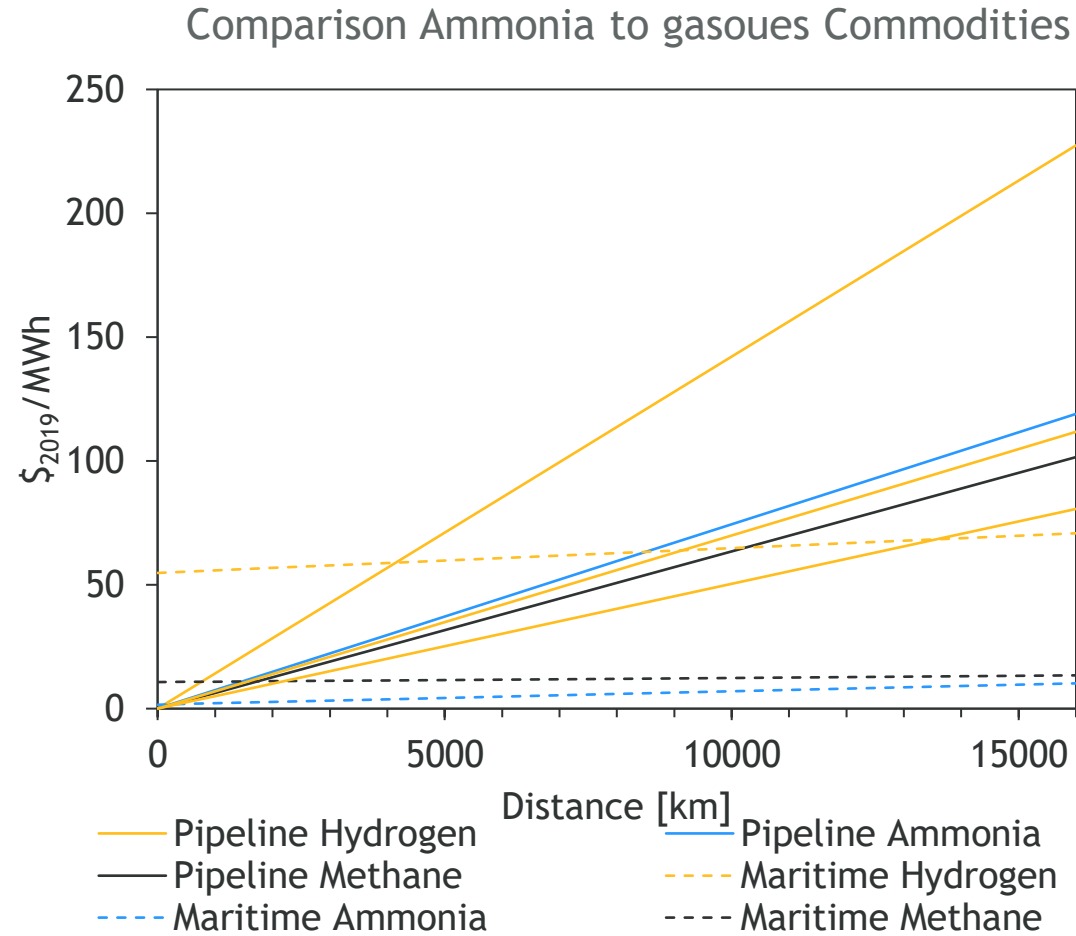


### Easily liquefiable or liquid commodities



# TRANSPORT COST

## Comparison of gaseous and liquid commodities





# 3

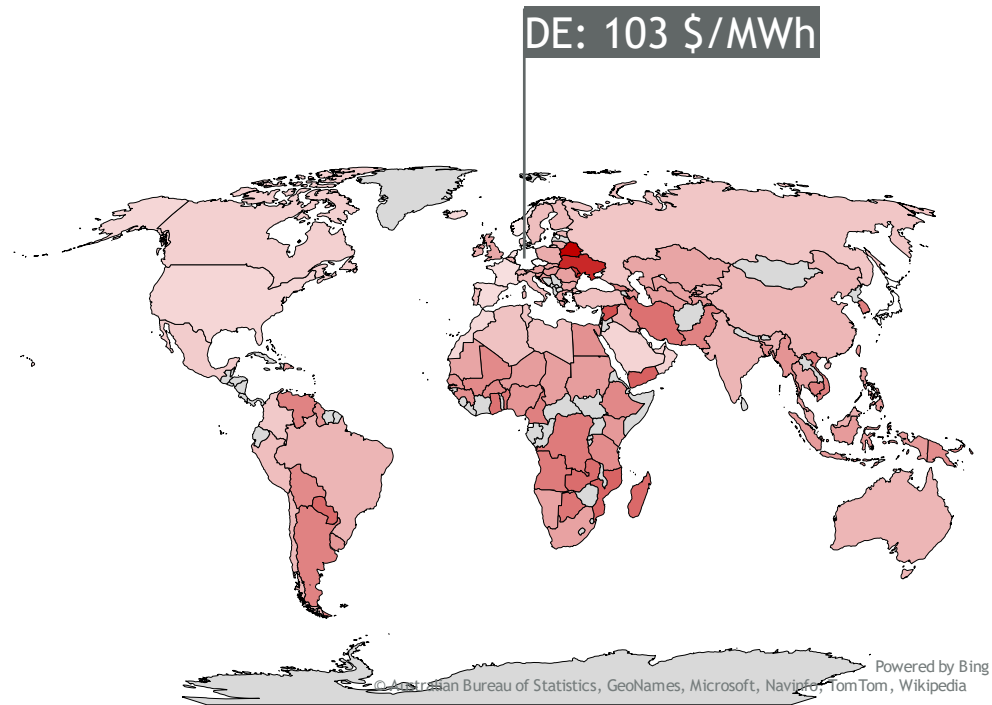
## Case Study: Green ammonia for Germany

### - produce or import?

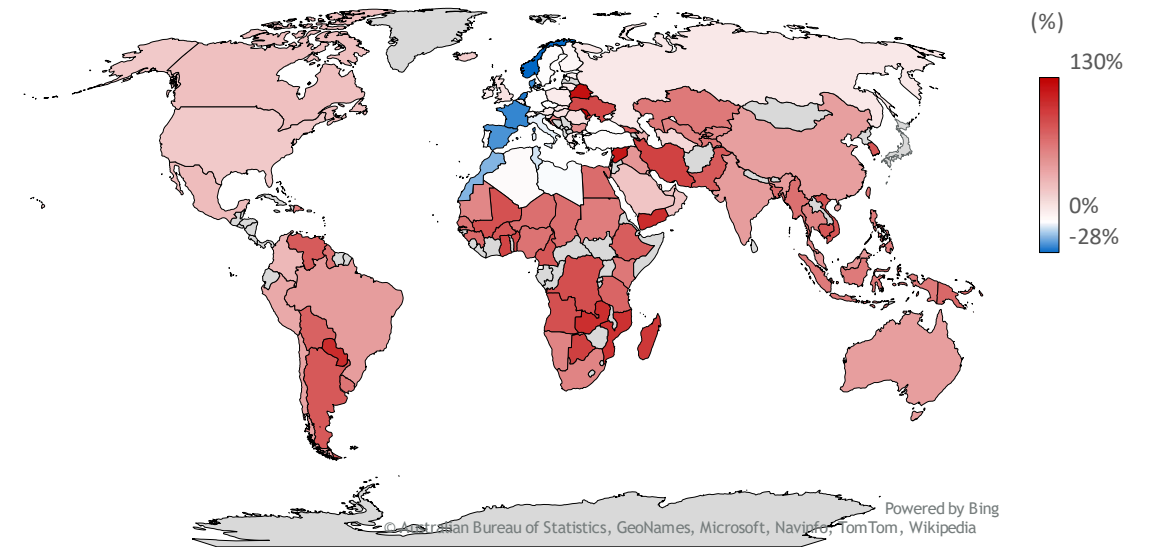
# GLOBAL SUPPLY COST ANALYSIS IN 2030

## Supply costs relative to the production costs in Germany

Hydrogen - Maritime transport only



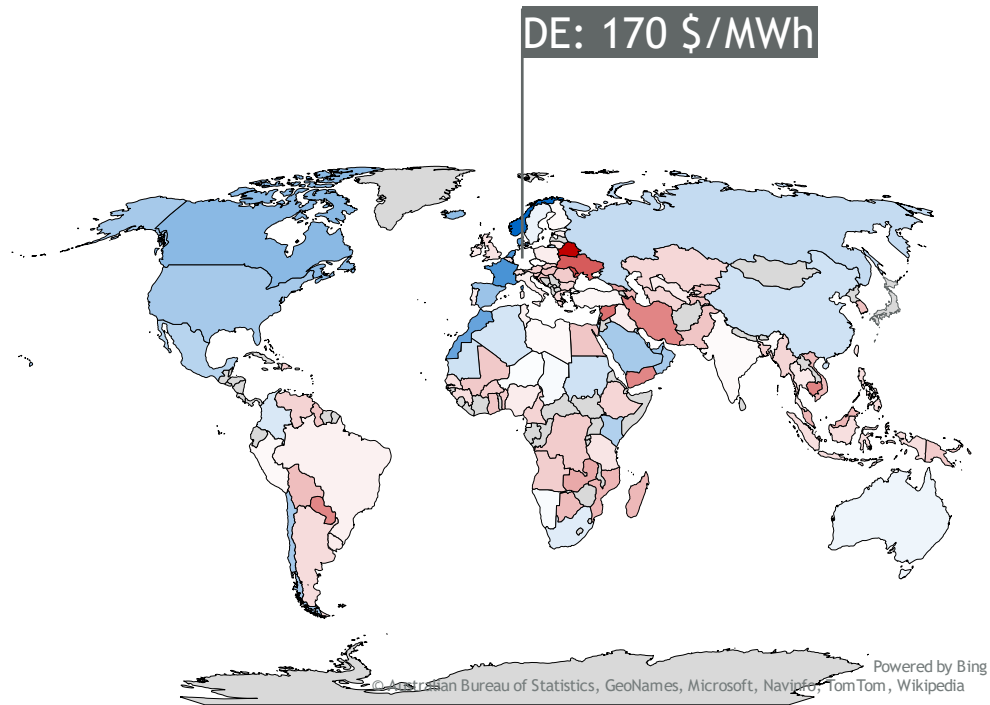
Hydrogen - Maritime transport & pipeline transport via retrofitted NG pipelines



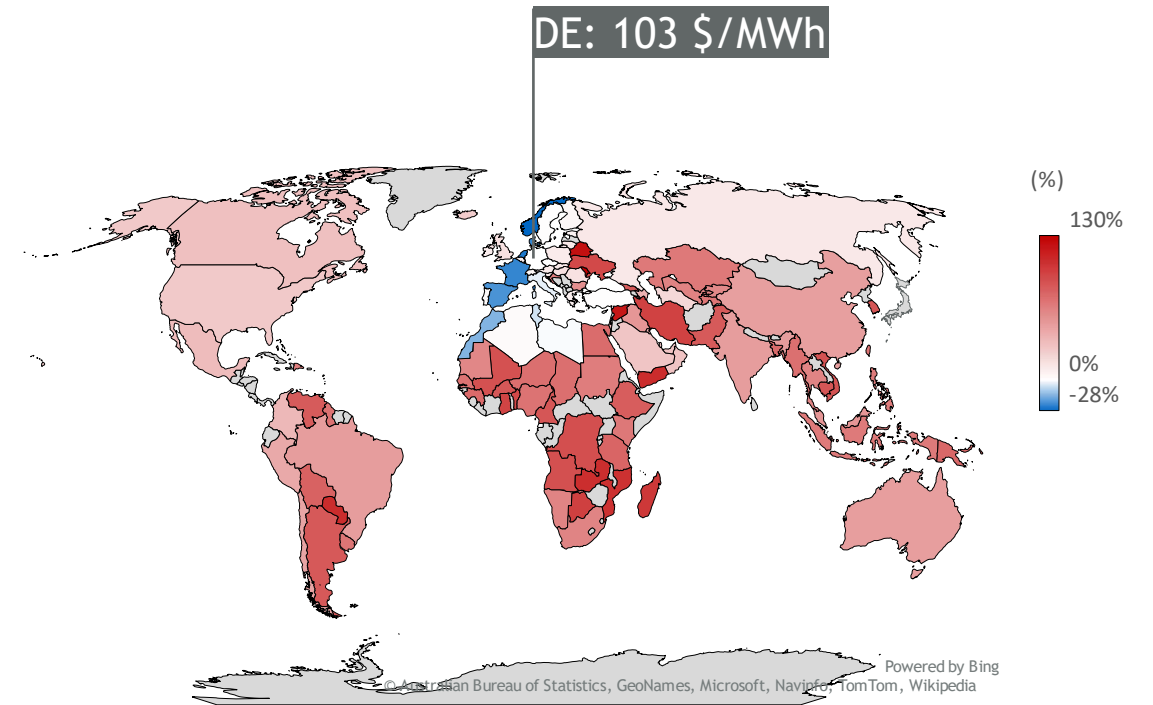
# GLOBAL SUPPLY COST ANALYSIS IN 2030

## Supply costs relative to the production costs in Germany

Ammonia



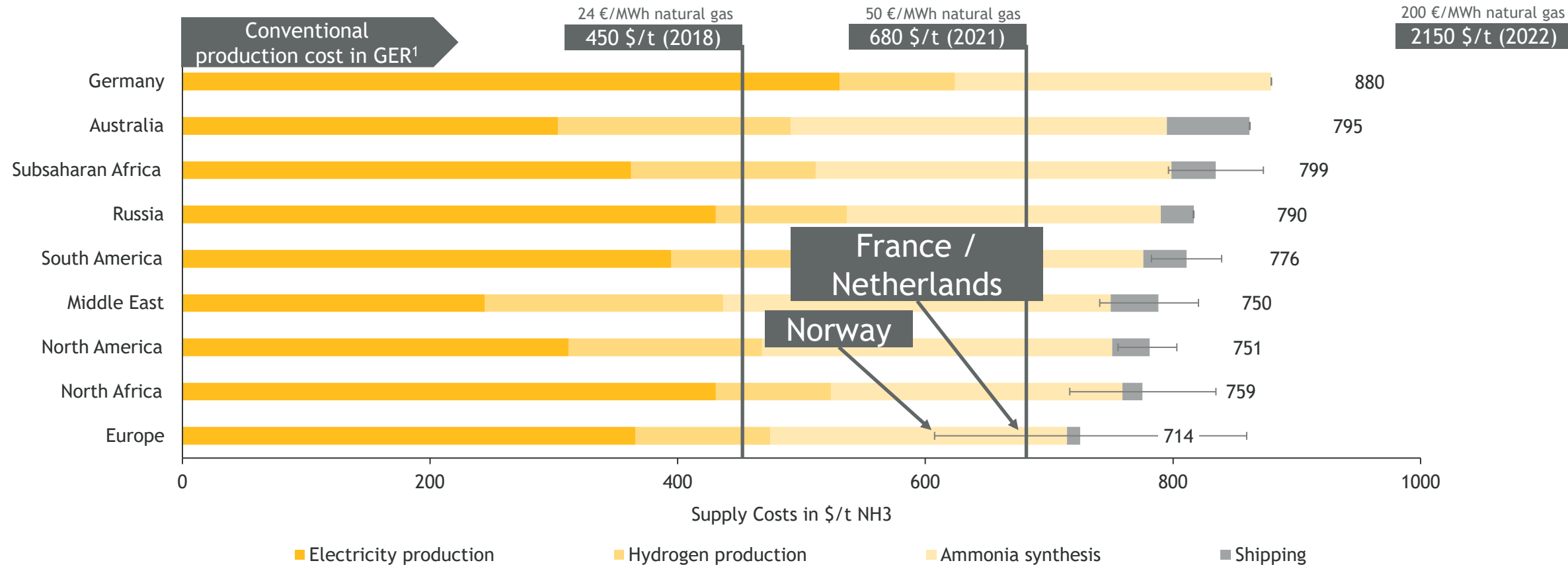
Hydrogen - Maritime transport & pipeline transport via retrofitted NG pipelines



# GREEN AMMONIA SUPPLY OPTIONS FOR GERMANY

## Supply costs by world region

Average supply costs of countries from which import costs are lower than domestic production cost in Germany



<sup>1</sup> IHS Markit (2020): Levelized cost of low-carbon ammonia and methanol production – V1.0

# Thank you for your attention!

## KONTAKT

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