GENERATING
A CLEANER
FUTURE

Wasserstoff von Rotterdam ins Rheinland

Wege der Versorgung für Mobilität und Industrie

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AIR PRODUCTS

Air Products auf einen Blick

23 000 Mitarbeitende

83 Jahre am Markt

50+ Länder

750+ Produktionsstätten

110+ Wasserstoffproduktionsanlagen

9 000+ Tonnen Wasserstoff pro Tag

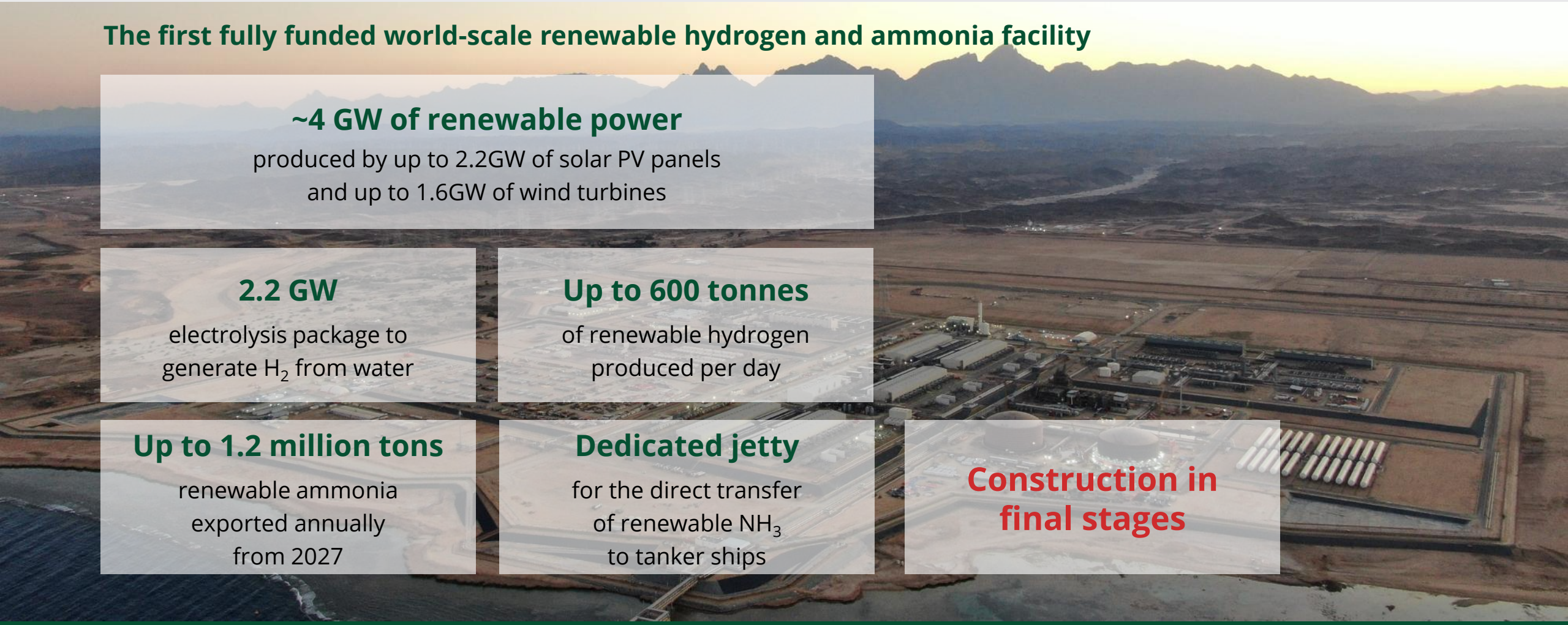
109+ TWh Wasserstoffproduktion pro Jahr

und

65 Jahre sicherer Betrieb von Wasserstoff



Neom Green Hydrogen Company
Scaling Renewable Hydrogen Globally



The first fully funded world-scale renewable hydrogen and ammonia facility

~4 GW of renewable power
produced by up to 2.2GW of solar PV panels
and up to 1.6GW of wind turbines

2.2 GW
electrolysis package to
generate H_2 from water

Up to 600 tonnes
of renewable hydrogen
produced per day

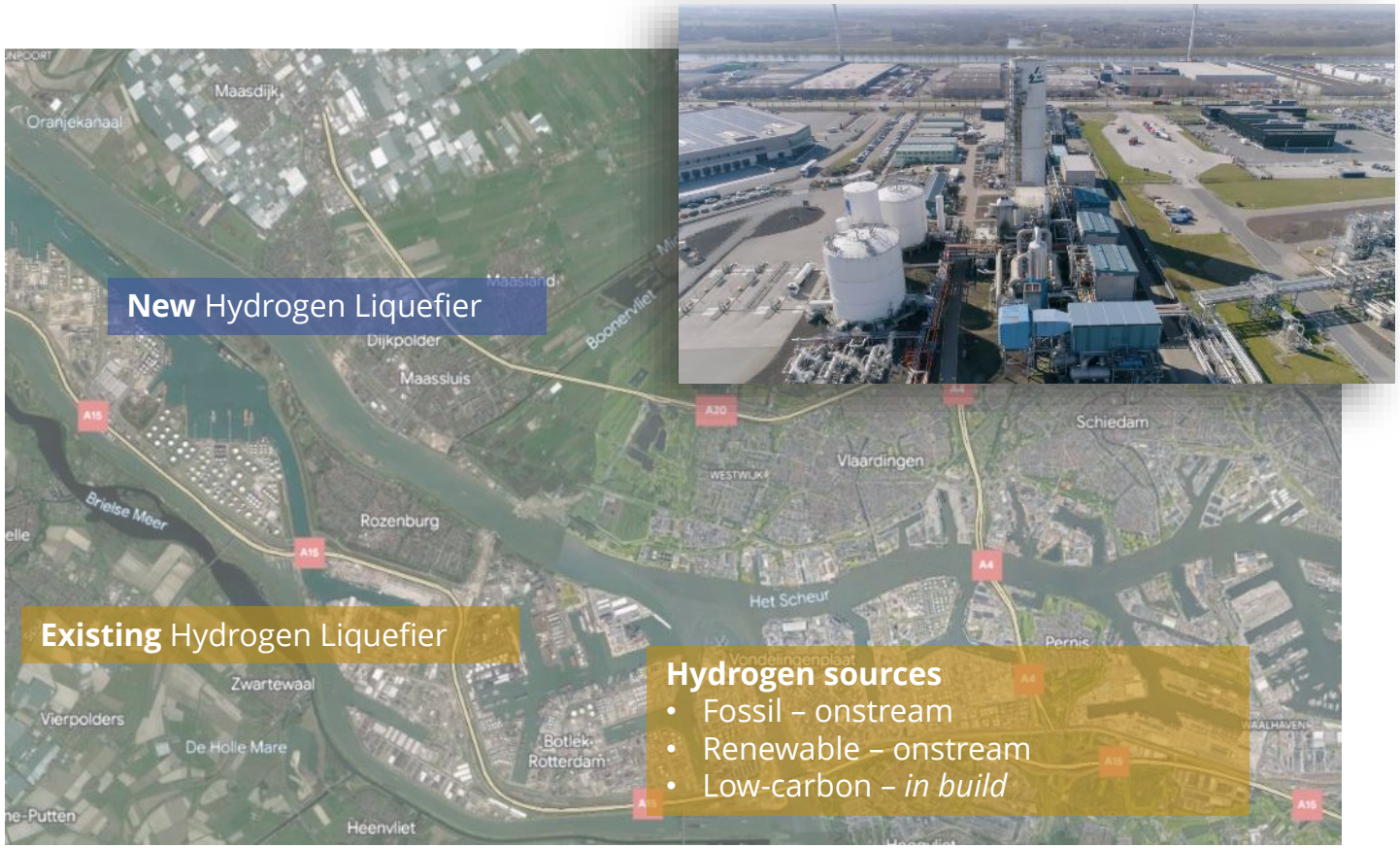
Up to 1.2 million tons
renewable ammonia
exported annually
from 2027

Dedicated jetty
for the direct transfer
of renewable NH_3
to tanker ships

Construction in final stages

Air Products Rotterdam – an existing H2 hub since 1970's





- **First hydrogen franchise** in Europe created in the **1970s**
- First **European liquid hydrogen facility in 1987** (6 t/day)
- Air Products continues to **expand capabilities and H_2 availability** from the strategic location



AIR PRODUCTS

Gas Supply Industries Applications Shop Retail Network My Account

Air Products and Nobian Sign Long-term Agreement for RFNBO-compliant Hydrogen

RFNBO-compliant hydrogen from Nobian's Rotterdam chlor-alkali plant, building on a 30-year relationship.

Combines Nobian's ISCC EU-certified hydrogen production capability with Air Products' established hydrogen infrastructure, market reach and distribution capabilities in gaseous and liquid form.

Supports early RED III compliance needs in the Netherlands with national renewable energy obligations for mobility and industry.

Hydrogen supply options

Liquefaction gives **3x more density** than gaseous hydrogen at 300 bar

DELIVERED · COMPRESSED GAS



Cylinder Packs

19.1 kg/pack
0.64 MWh
300 bar

- **Installation:** Temporary
- **Requires:** Connection hose, fork-lift truck
- **Options:** Can connect multiple packs (18 cylinders each)



Multipacks

30 kg/pack
~1 MWh/pack
200–300 bar

- **Installation:** Permanent
- **Requires:** Pressure let-down station and fill stanchion
- **Options:** Can connect many packs together and stack 2 high



Tube Trailer

400–1,500 kg/trailer
13–50 MWh/trailer
200–640 bar

- **Installation:** Either
- **Requires:** Pressure let-down station and fill stanchion
- **Options:** Trailers can be swapped in-kind; can provide an operator

DELIVERED · LIQUID



Bulk Delivery

3,500 kg/trailer
140,000 kWh/trailer
3–10 bar

- **Installation:** Permanent tank (standard), temporary (non-standard)
- **Requires:** Tank & vaporiser (if gas use)
- **Options:** Various sizes depending on need

GENERATED ON SITE



Onsite Generation

200–2,200 kg/day
300–3,000 kW output
100–1,000 Nm³/hr

- **Installation:** Permanent
- **Requires:** Feedstock input (e.g. natural gas, water or ammonia); power & space

Hydrogen from Rotterdam: available now and scaling up



COMING ONSTREAM IN ROTTERDAM

New Hydrogen Liquefier

Air Products significantly increases its existing liquid hydrogen capacity

AVAILABLE NOW

RFNBO hydrogen, ready today

Delivered from Rotterdam by trailer:

300 bar	640 bar	Liquid

SECTORS WE SUPPLY

Hydrogen for every sector

- Maritime
- Road transport
- Refineries
- Industry
- Electronics
- And more

Contact Air Products
for RFNBO and liquid hydrogen supply →

Air Products - Distribution modes match the end user need

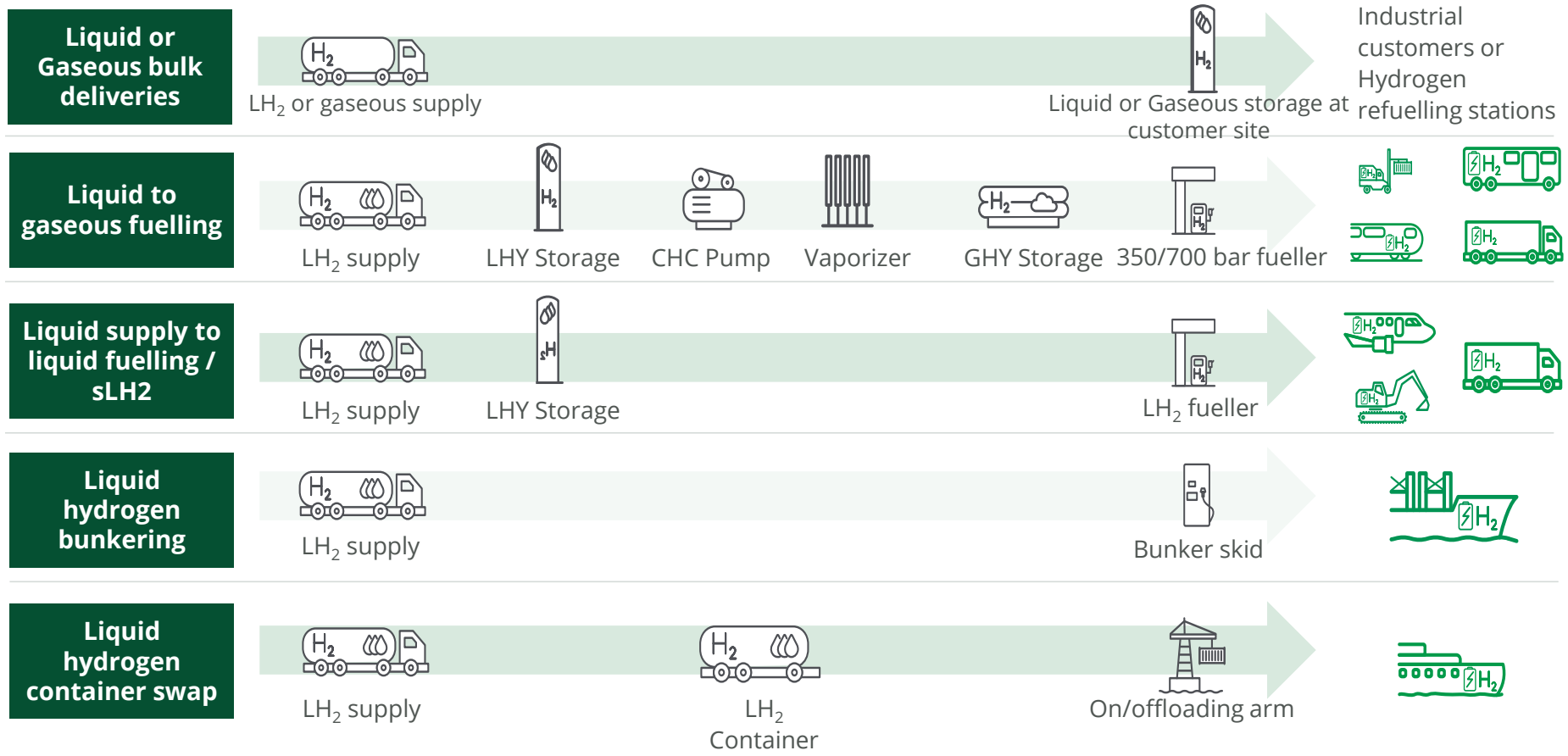


Hydrogen can already be distributed via all these methods **today**.

Hydrogen is already **shipped** in liquid ISO containers efficiently.

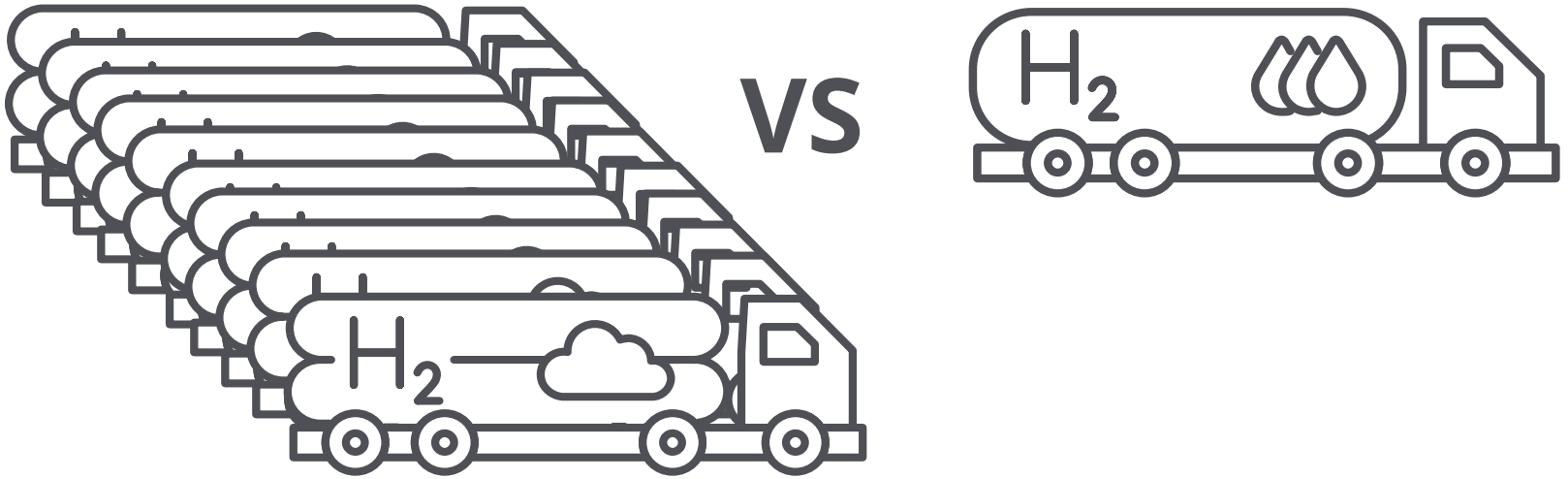
Drivers and tankers are **ready** and trained.





Warum Flüssigwasserstoff ?

Wie viel mehr Wasserstoff kann ein LH_2-Trailer im Vergleich zu einem 200-bar-Gas-Trailer transportieren?



10 x 350 kg **3500 kg**

From Rotterdam to NRW: RFNBO hydrogen at the pump

THE SUPPLY ROUTE



Rotterdam, NL

LIQUID H_2
3,500 kg
per tanker trip

BULK H_2
1,600 kg
800 kg compressionless per tanker trip

NORTH RHINE-WESTPHALIA, DE · 3 AIR PRODUCTS STATIONS

1. **Duisburg**
   Liquid Hydrogen refuelling station in operation
2. **Hürth**
   RVK / Stadtwerke Hürth buses · open to the public soon
3. **Meckenheim**
   350 bar for RVK buses · open to the public soon

HOW IT WORKS

1. **Produce**
   RFNBO-certified renewable hydrogen from Rotterdam, our European H_2 hub since the 1970s
2. **Liquefy**
   Liquid hydrogen made in Rotterdam since 1987; new liquefier under construction
3. **Deliver**
   Liquid tankers carry up to 10 x more hydrogen than 200 bar gas, so fewer deliveries are needed
4. **Refuel**
   Air Products supplies, operates and maintains the stations for your fleet

RFNBO	Grade D	70 years
Grey and low-carbon H2 also available	ISO 14687 fuel-cell purity	safely operating hydrogen

Contact Air Products for liquid RFNBO hydrogen in NRW →

Tankstelle Meckenheim:

Hier tankt der RVK: Größte H2 Busflotte Deutschlands mit 160 + H2 **Einheiten**

Kompressorfreie gasförmige Tankstelle Versorgung mit 640 bar Trailer

50 Busse täglich - parallele Betankung an 2 Zapfsäulen mit 2kg/ min



Tankstellen in Hürth:

Hürth 1: In Betrieb seit 2010

Hürth 2: Inbetriebnahme 2026

Versorgung der SWH seit **2010**: Start mit 2 Bussen. Aktuell ca. **18 Busse** und **300 kg/ Tag**

Durchschnittlich etwa **360 Busbetankungen** pro Monat

Neue Tankstelle für **30 Busse** und **1000 kg/ Tag**





LHY für Trucks: Daimler Truck

Betankung von Daimler GenH2 Flüssigwasserstoff-Lkw **Duisburg** (DE)

Tägliche Betankung seit 1,5 Jahren in Duisburg

Mobile Betankungslösung Next GenH2-Trucks an verschiedenen Standorten

DAIMLER TRUCK





LHY für Busflotten: Metrobusflotte Crawley (UK)

Größte Busflotte Großbritanniens

Effiziente Versorgung mit Füssigwasserstoff + CHC Pumpe + Verdampfereinheiten

Bis zu **54 Busse und 950 kg vertankt** in einem Tankfenster

METROBUS

WRIGHT



Summary

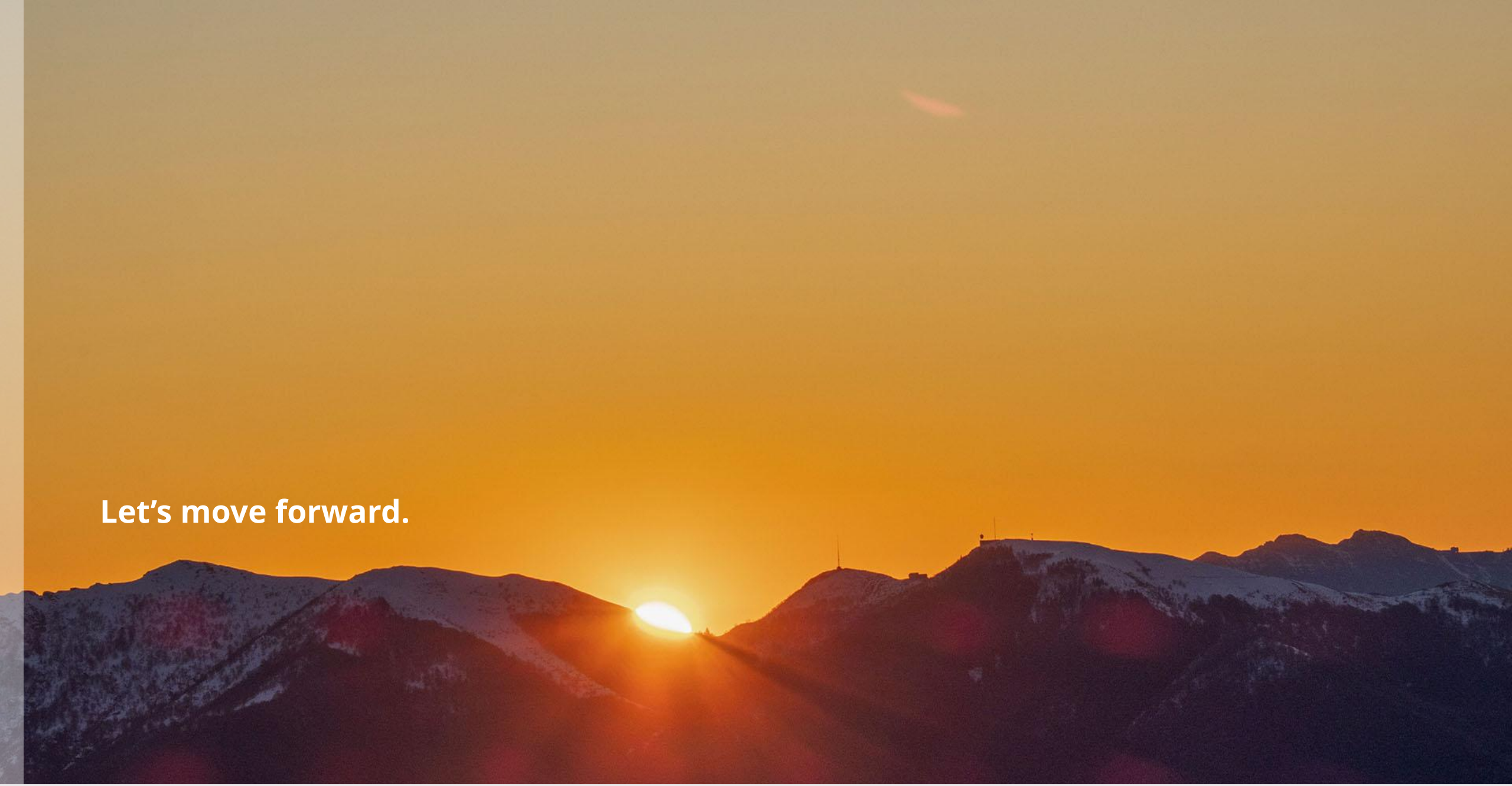
Der Wasserstoff kommt nicht erst mit der Pipeline ins Rheinland.

Er kommt bereits heute. Die Pipeline ist der nächste Skalierungsschritt einer bereits funktionierenden Lieferkette.

Trailer, LH_2 und Pipeline werden nebeneinander existieren und unterschiedliche Bedarfe bedienen.

FAZIT:
Es gibt viele Möglichkeiten:
Am Ende kommt es immer auf den passenden Transport für Ihr Projekt an.




Let’s move forward.