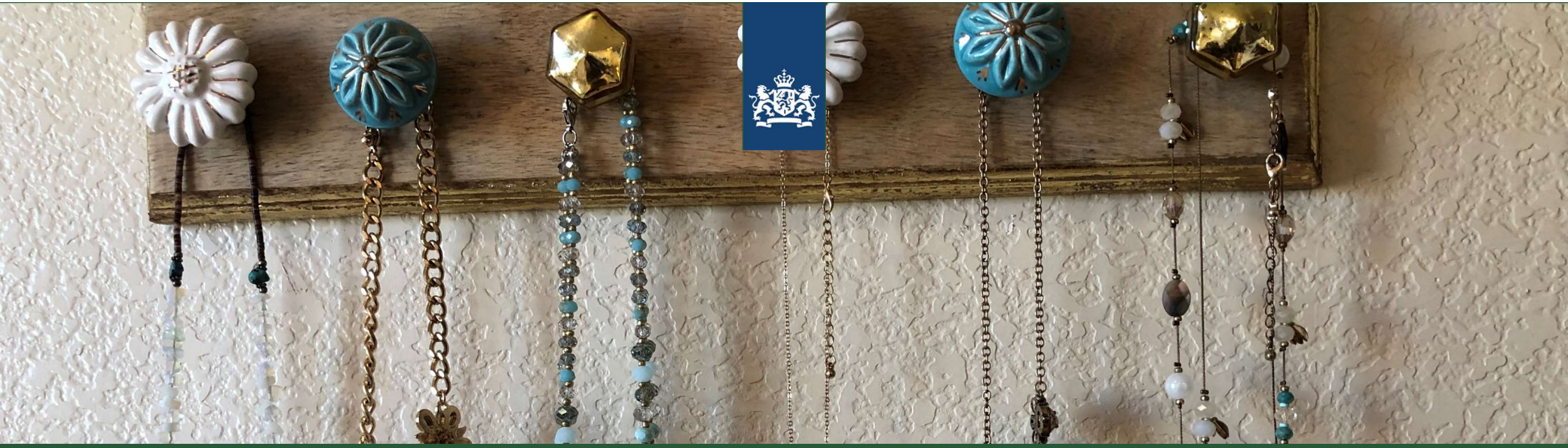


Infrastructure & Supply Chains

Role of hydrogen in the energy system

Fenna van de Watering (RVO)

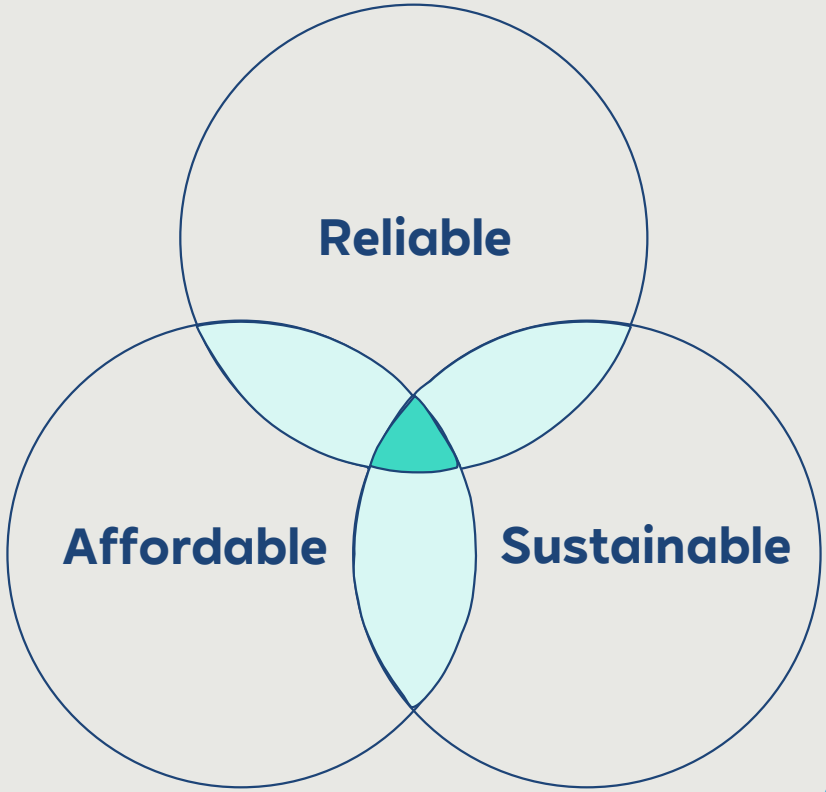
2-10-2025

RWE

From air to gas

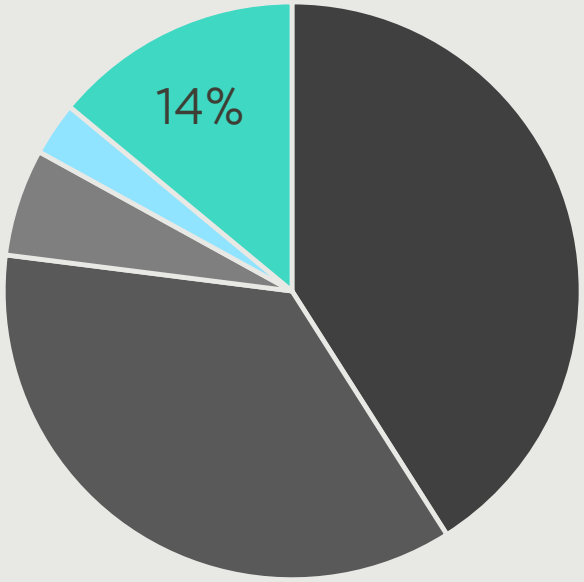
Hydrogen enables the rollout of offshore wind

Bas Jansen
Programme manager OranjeWind Knowledge


Reliable
Affordable
Sustainable

Primary energy use

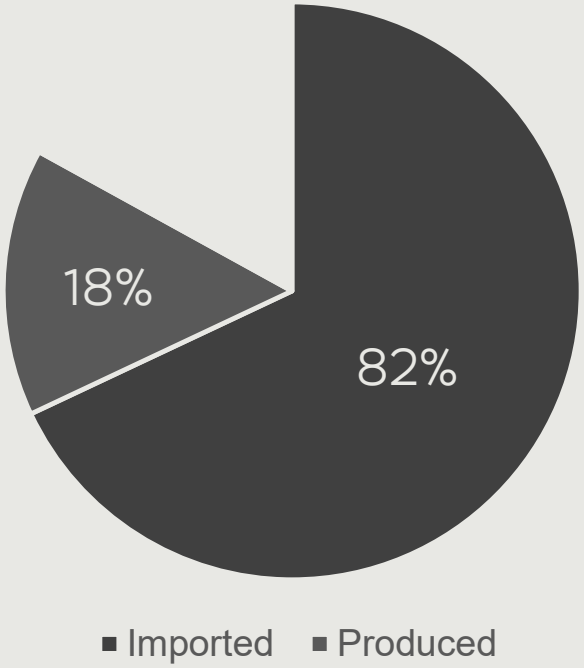
NL, 2023



Source: EBN 2025

Primary energy use

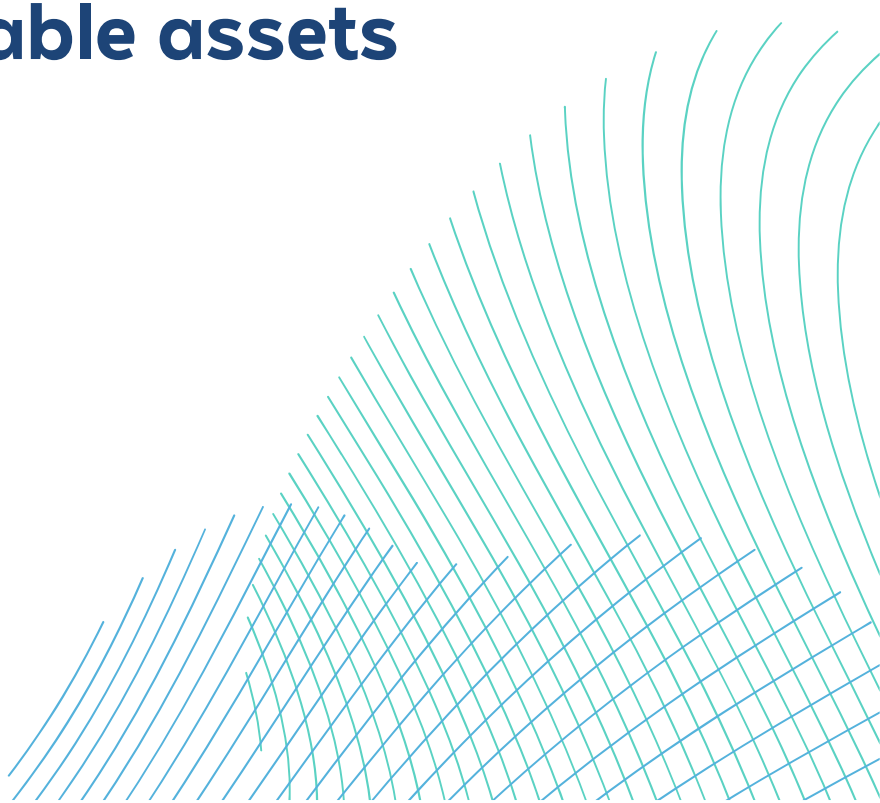
NL, 2023



Source: EBN 2025

We need to

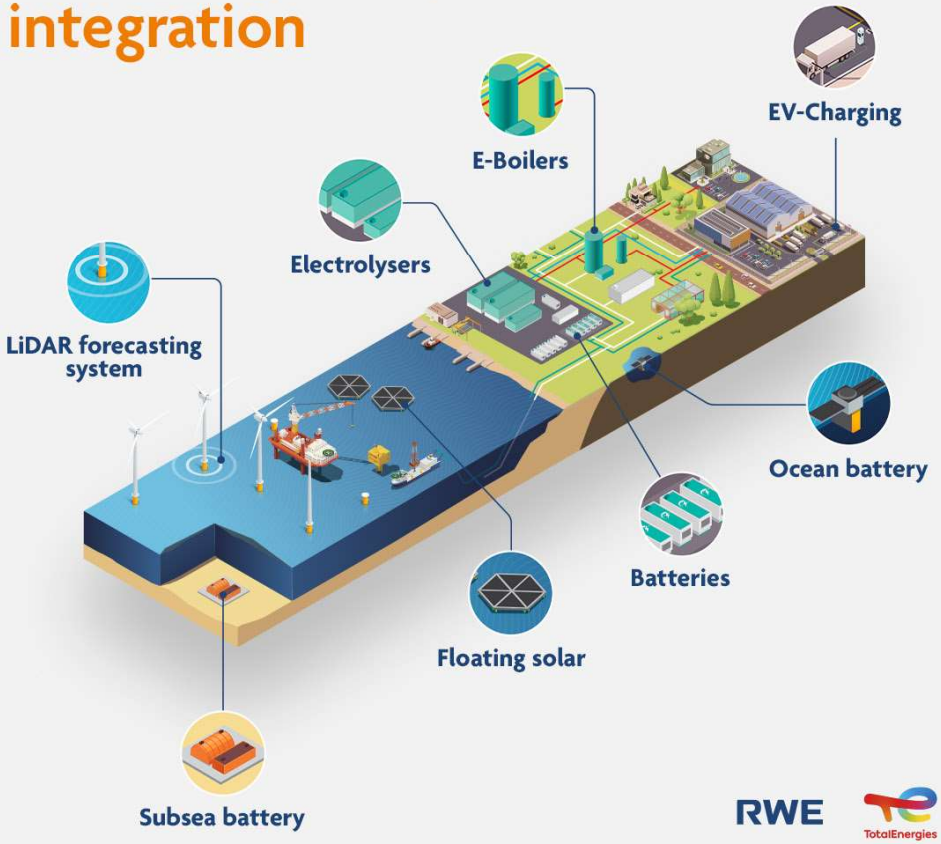
build renewable assets



RWE

oranjewind

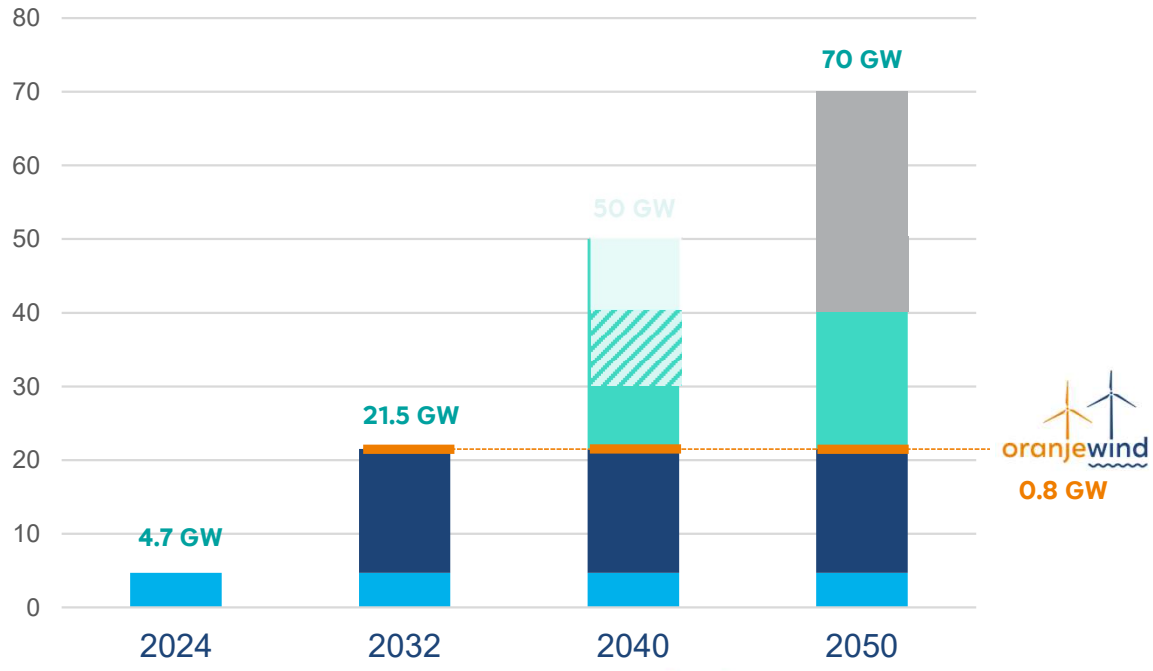
The perfect match
Unlocking full system integration

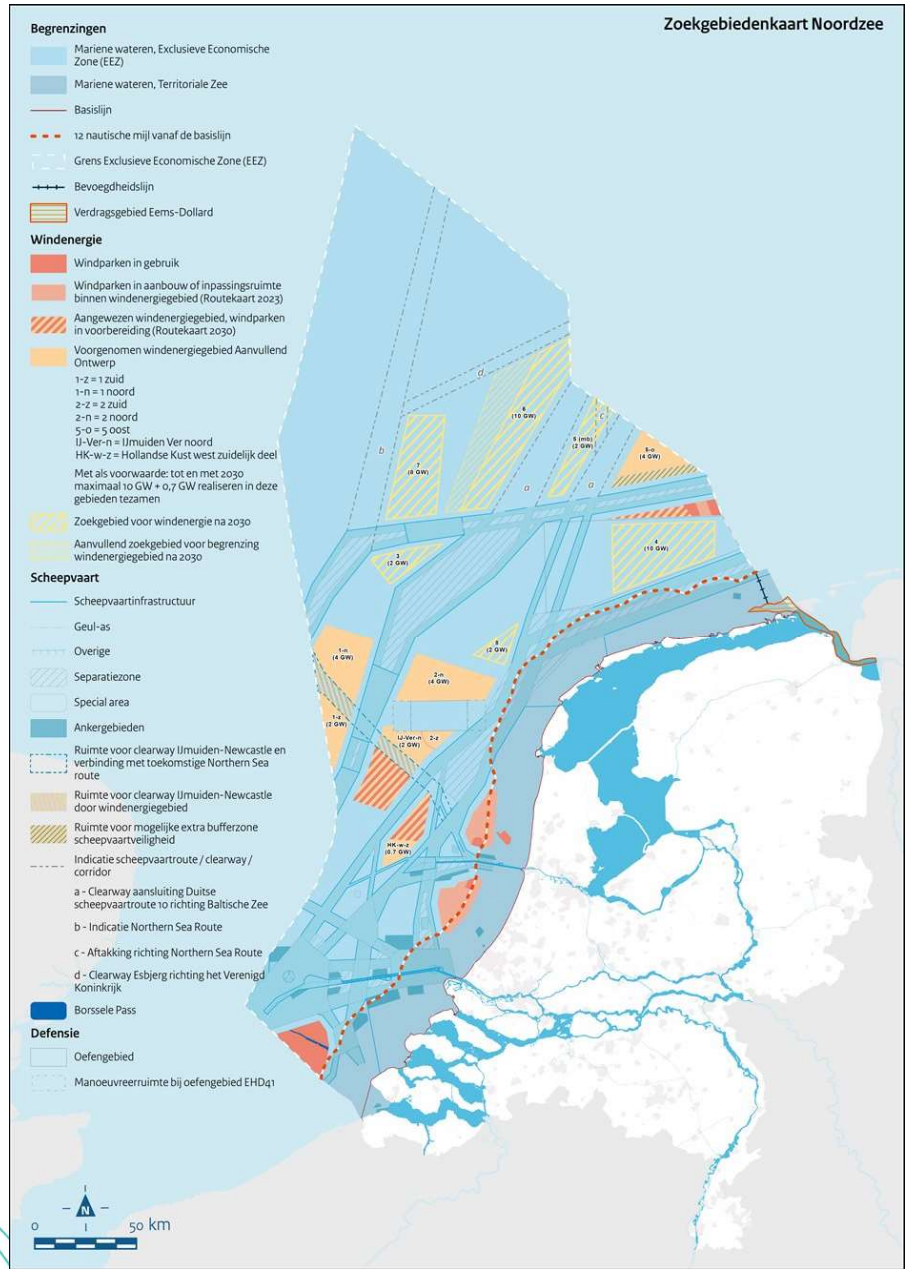


RWE TotalEnergies

build renewable assets

Dutch ambitions for offshore wind

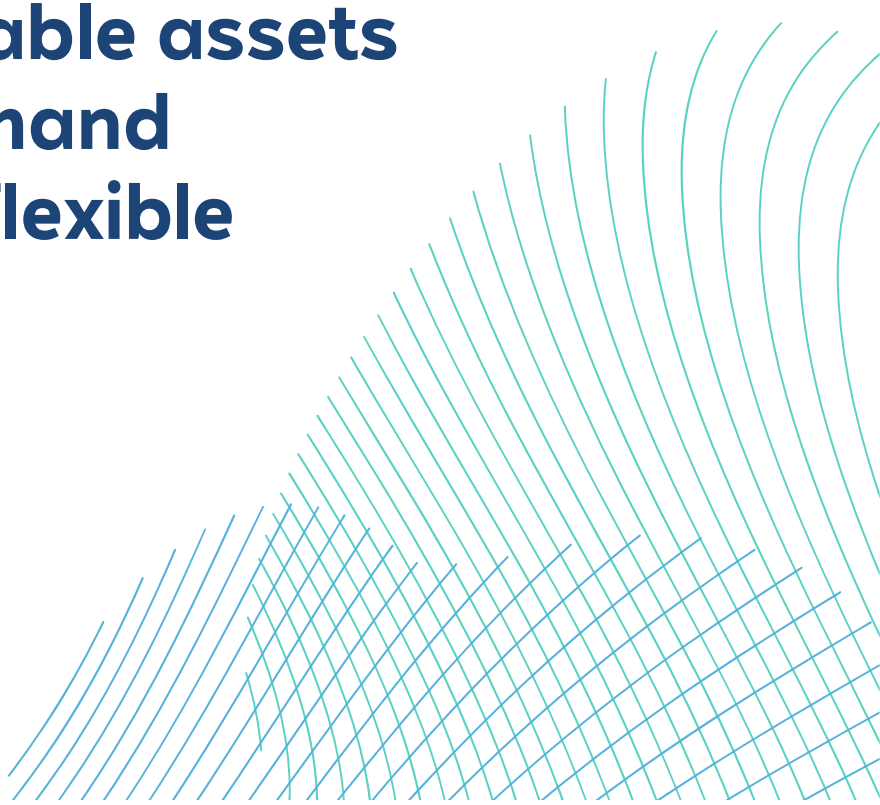




RWE

We need to

- build renewable assets
- electrify demand
- use energy flexible



RWE

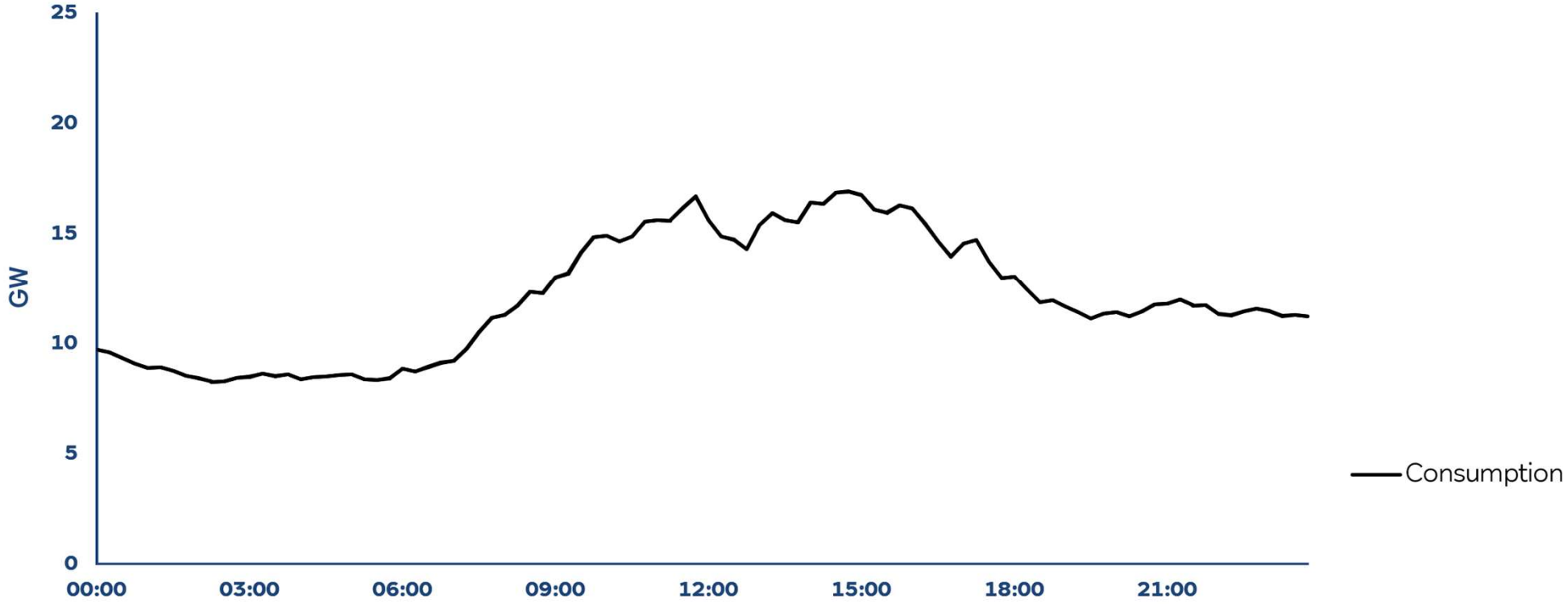
Electricity generation

NL, 26-09-2024

RWE

Electricity generation

NL, 26-09-2024

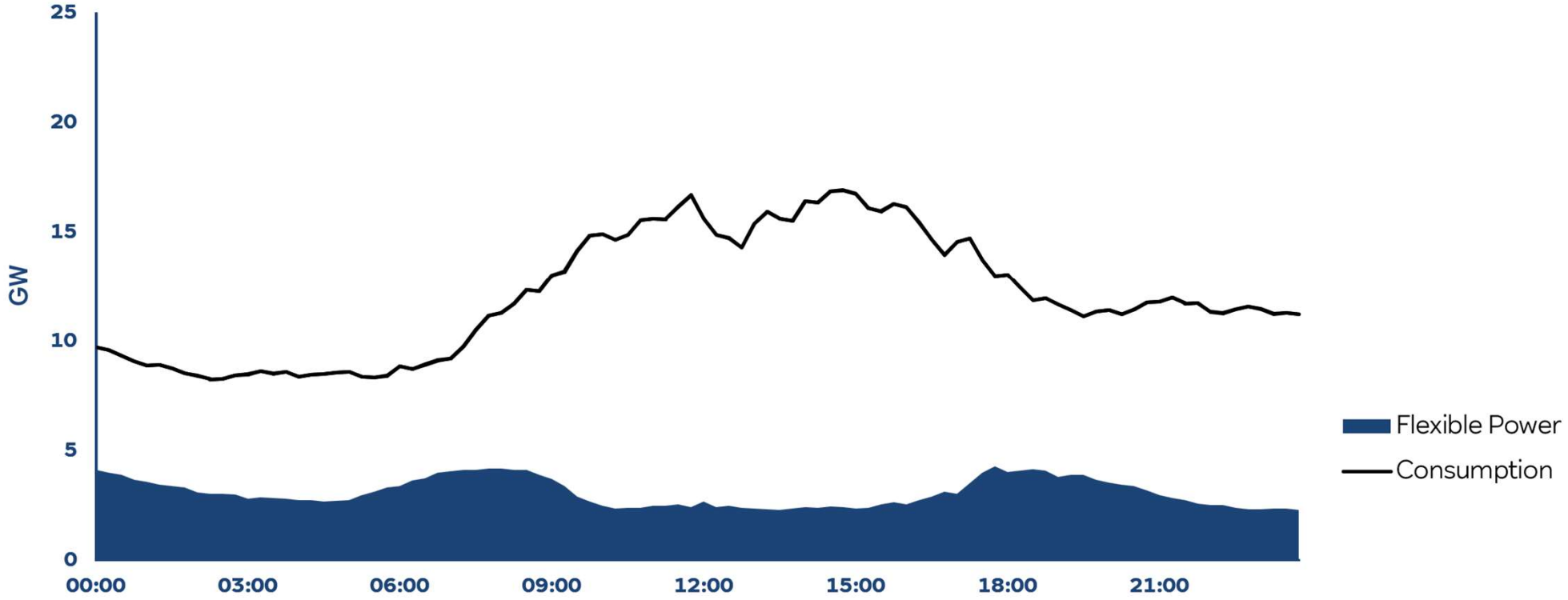


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

Electricity generation

NL, 26-09-2024

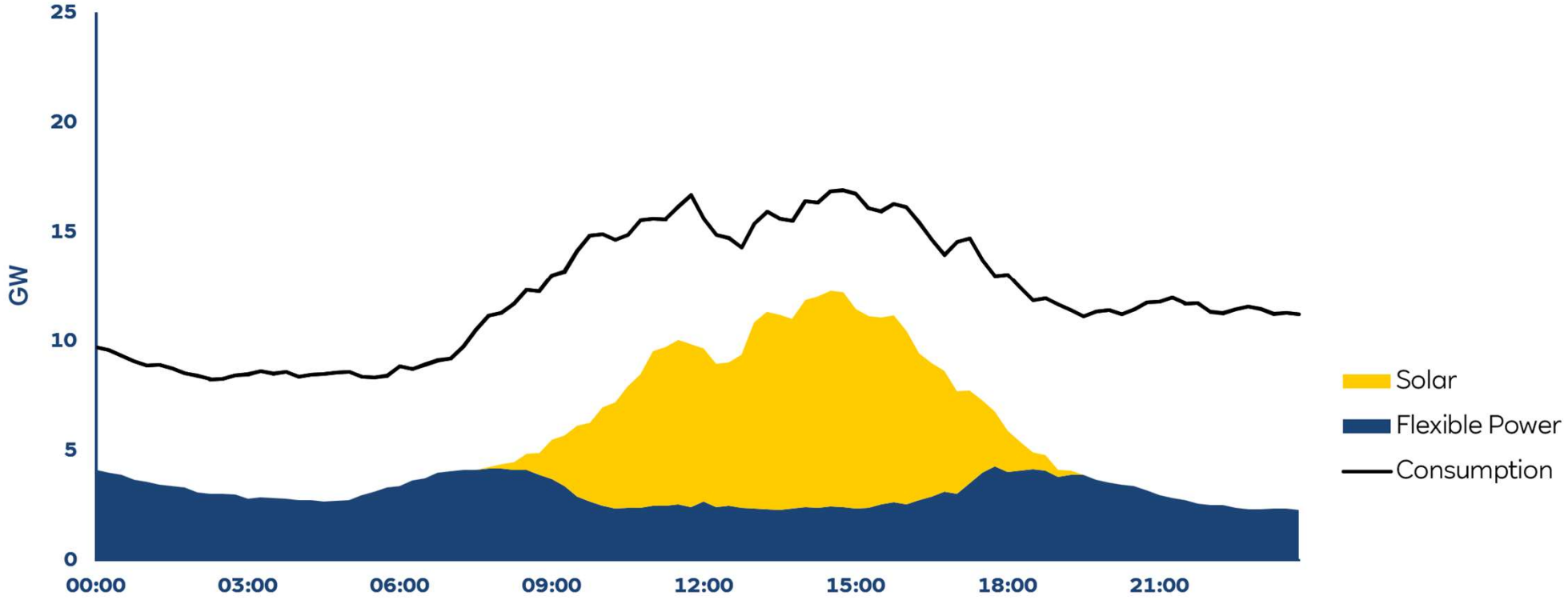


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

Electricity generation

NL, 26-09-2024

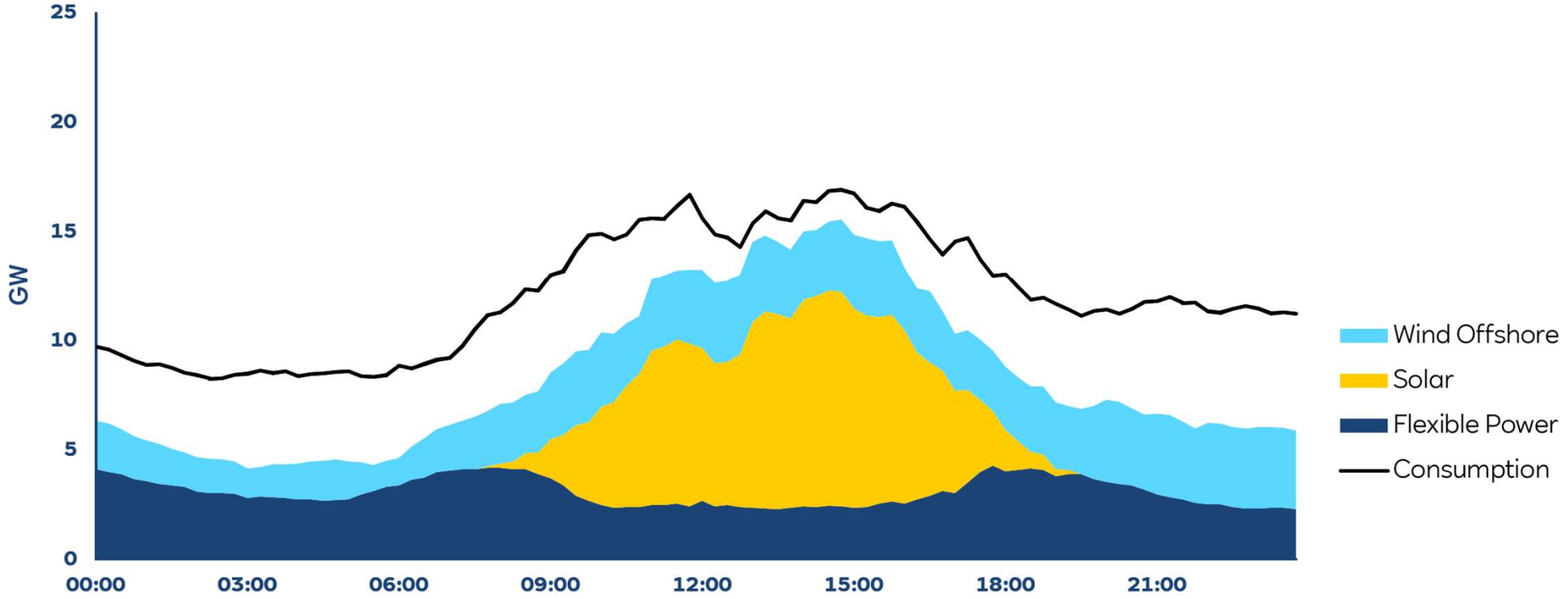


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

Electricity generation

NL, 26-09-2024



RWE

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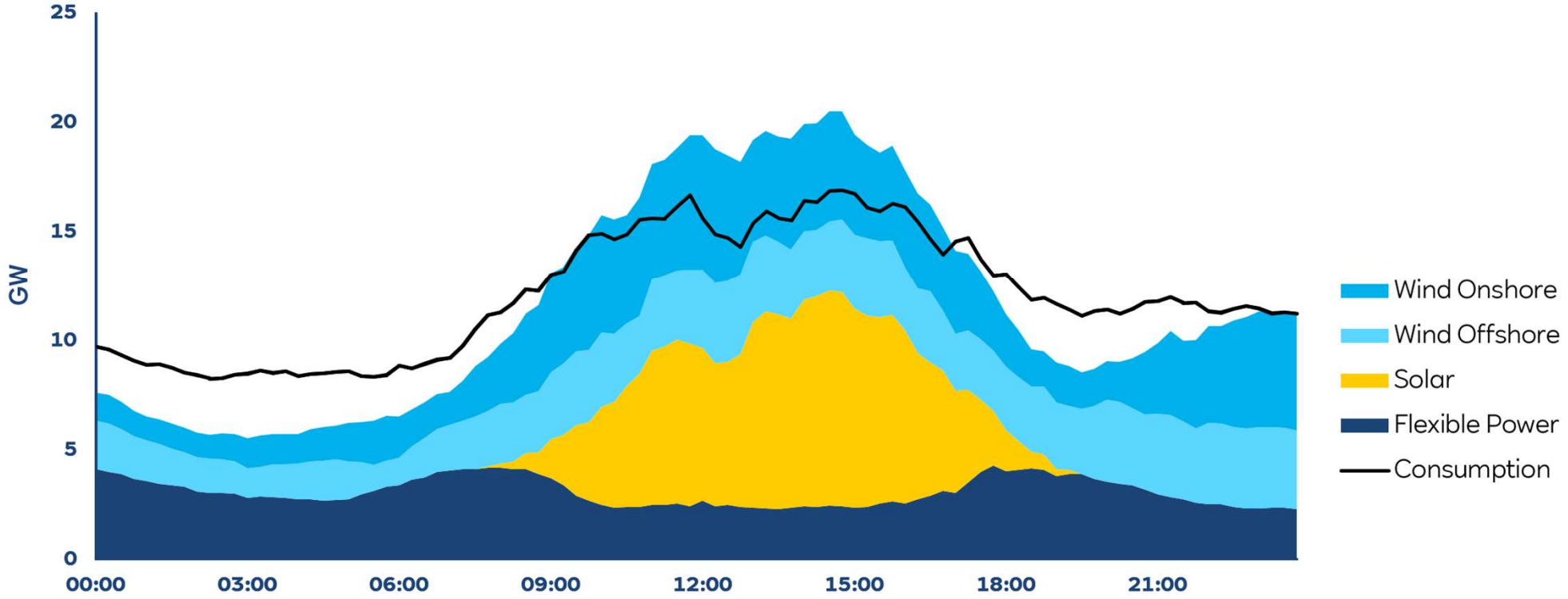
Electricity generation

NL, 26-09-2024



RWE

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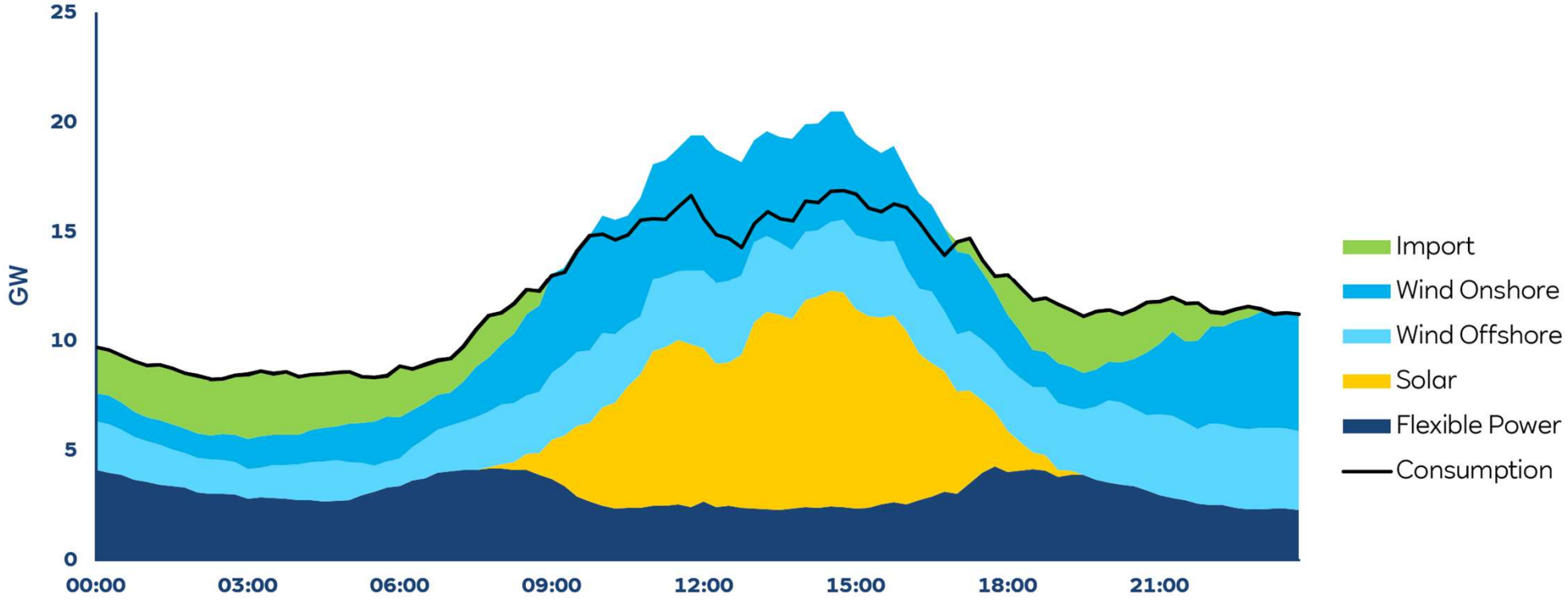
Electricity generation

NL, 26-09-2024

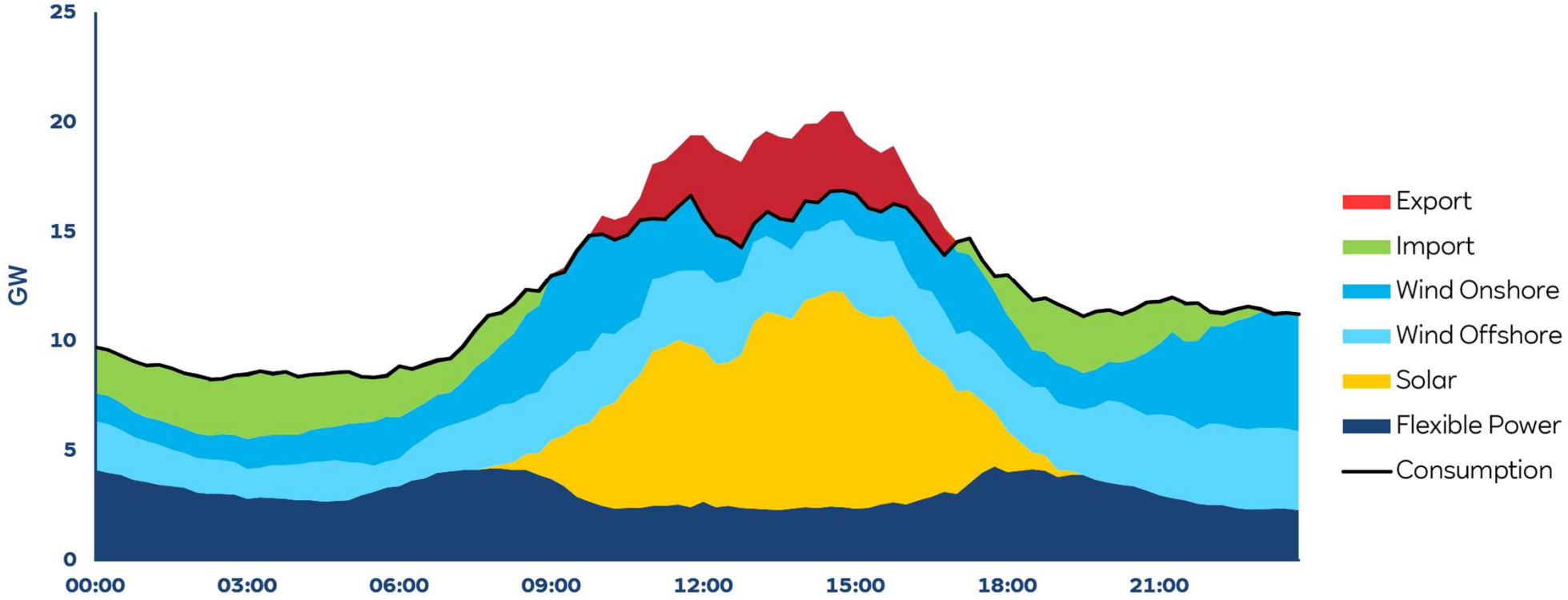


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

Electricity generation

NL, 26-09-2024

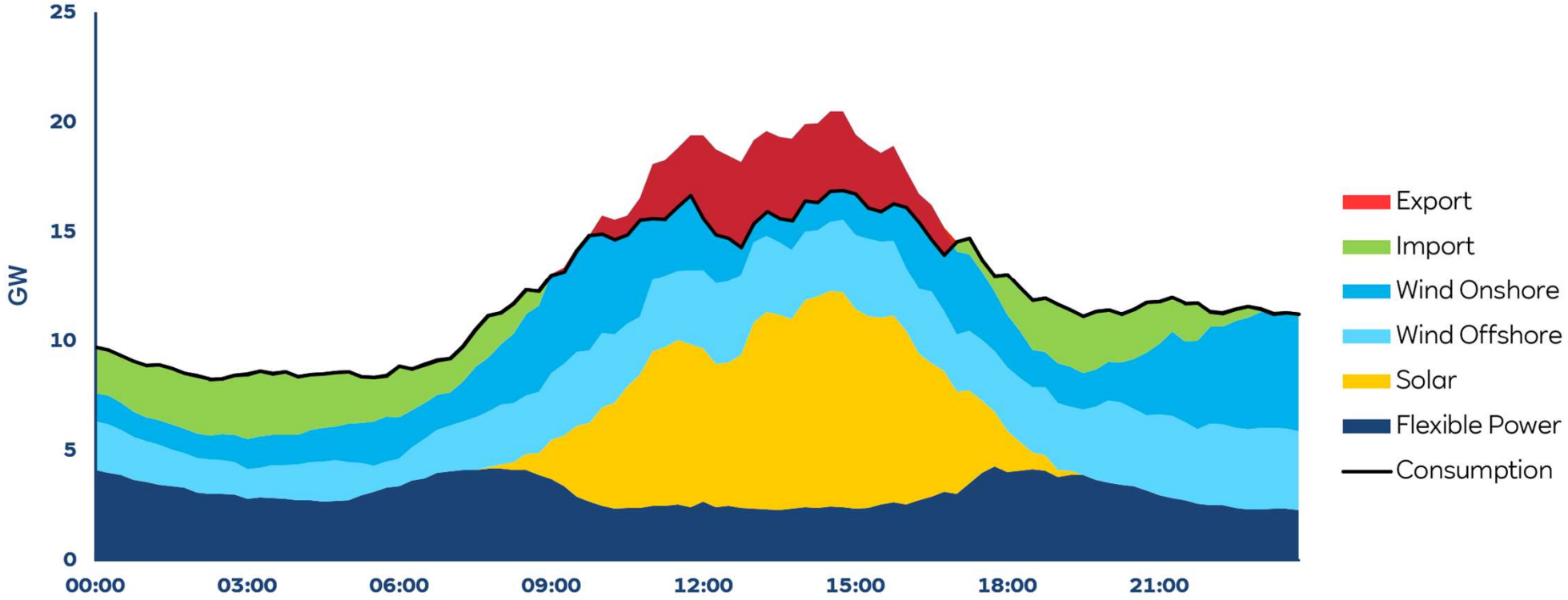


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

Electricity generation

NL, 26-09-2024

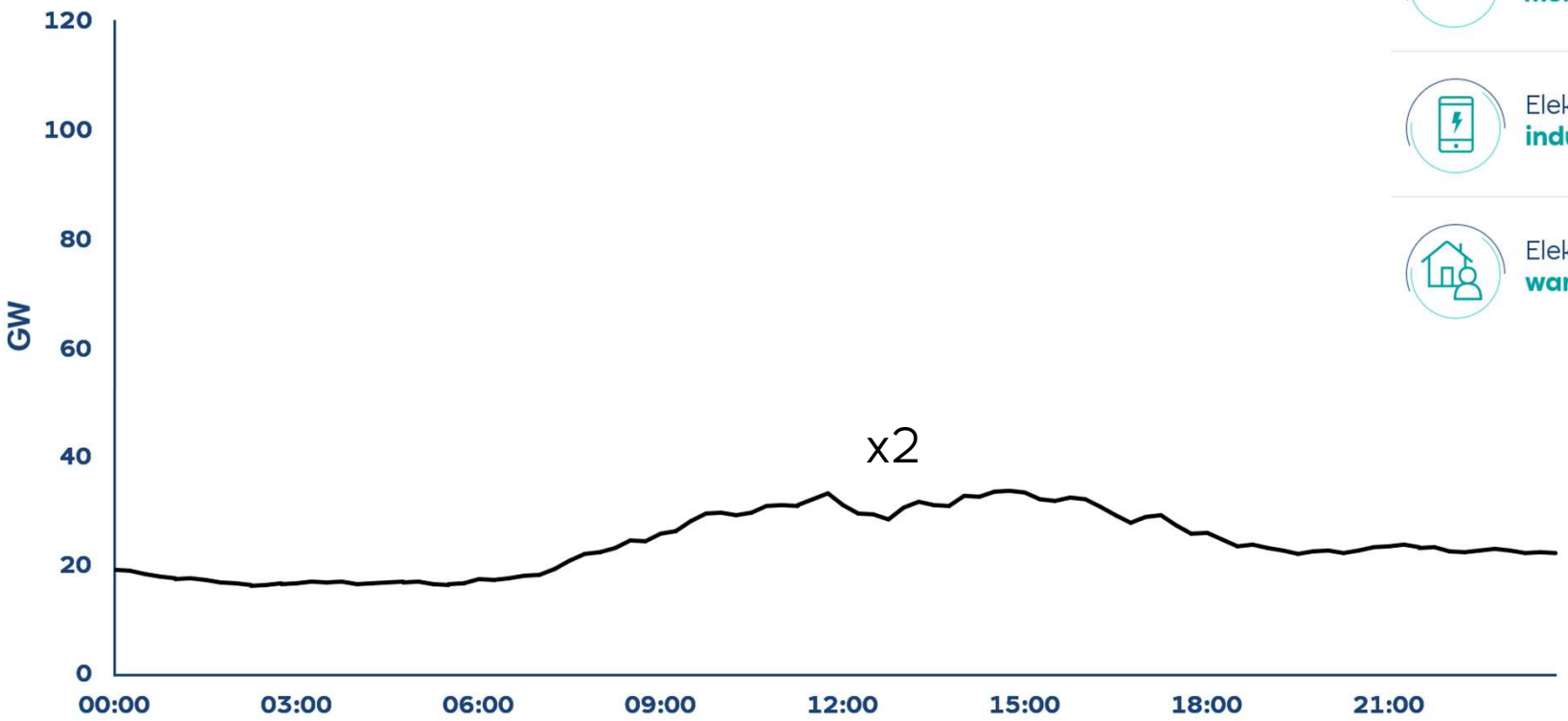


RWE

Bronnen: ENTSO-e, EnergieOpwek.nl

What could this look like in 2050?

Electricity generation
NL, 2050



Belangrijkste trends in de sector

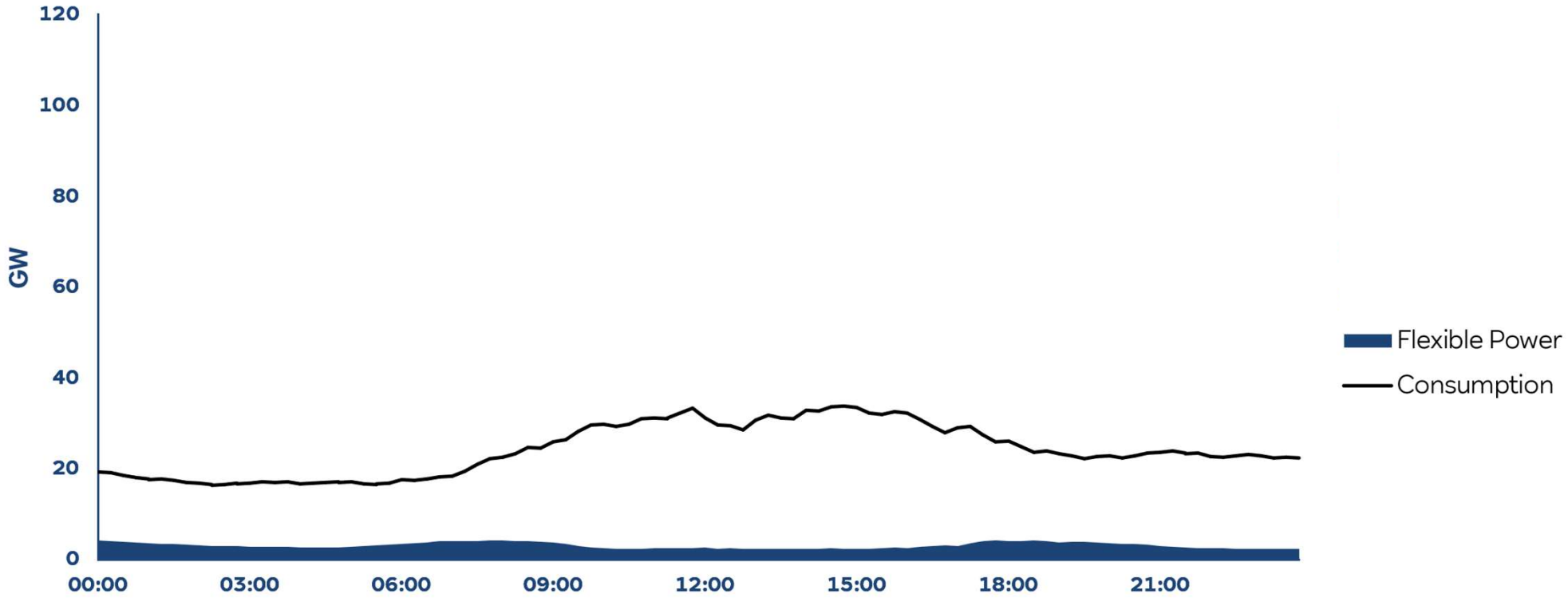
- Elektrificeren **mobiliteit**
- Elektrificeren **industrie**
- Elektrificeren **warmtevoorzieningen**

RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

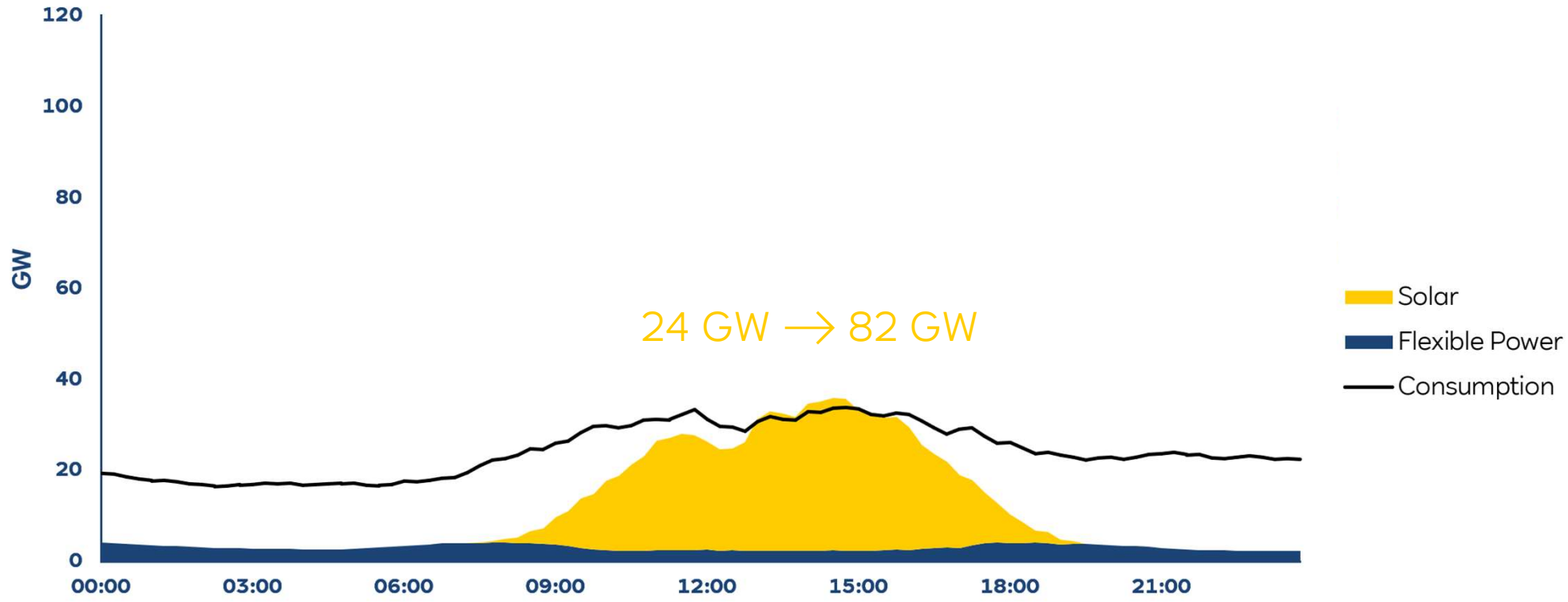


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

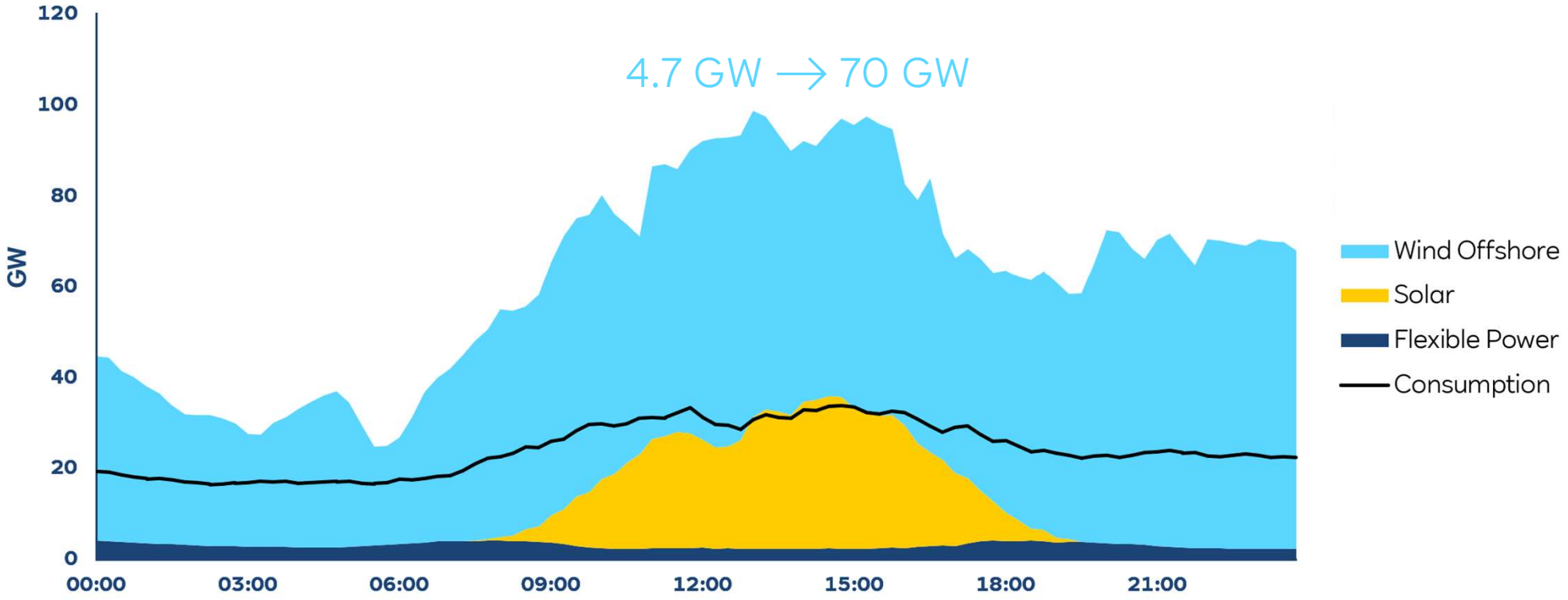


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

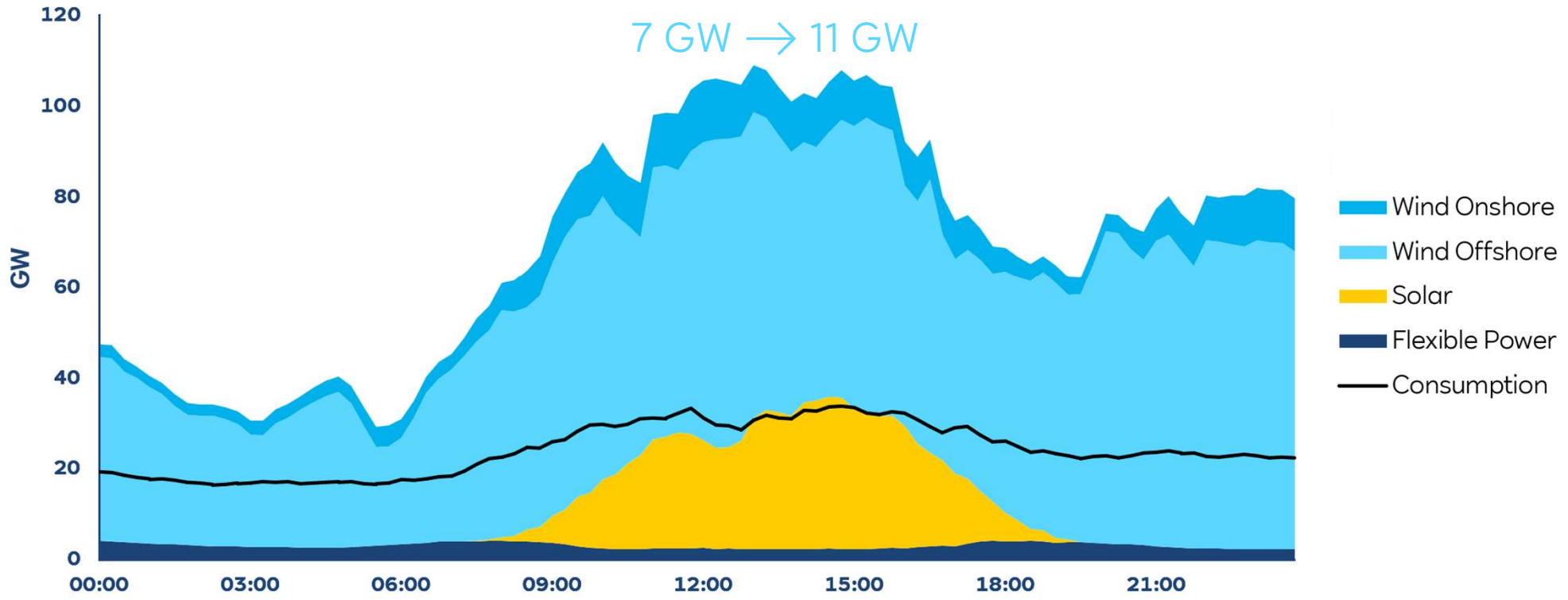


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

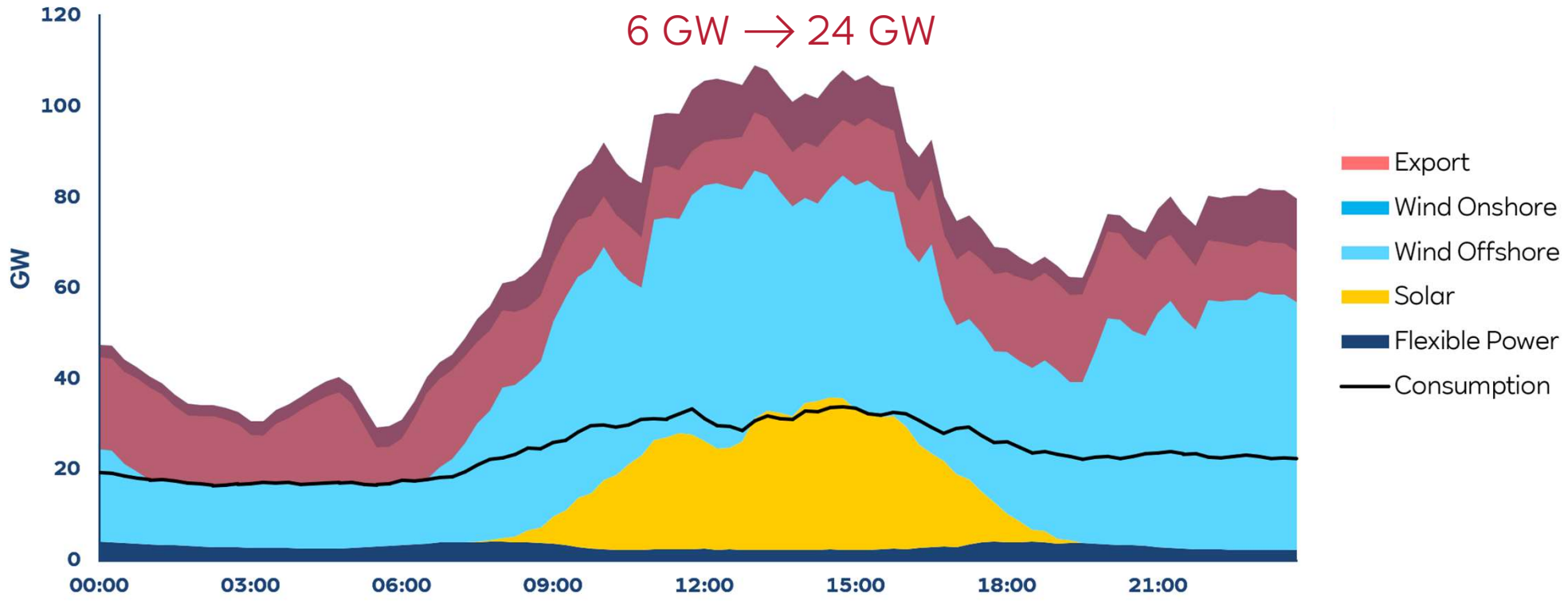


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

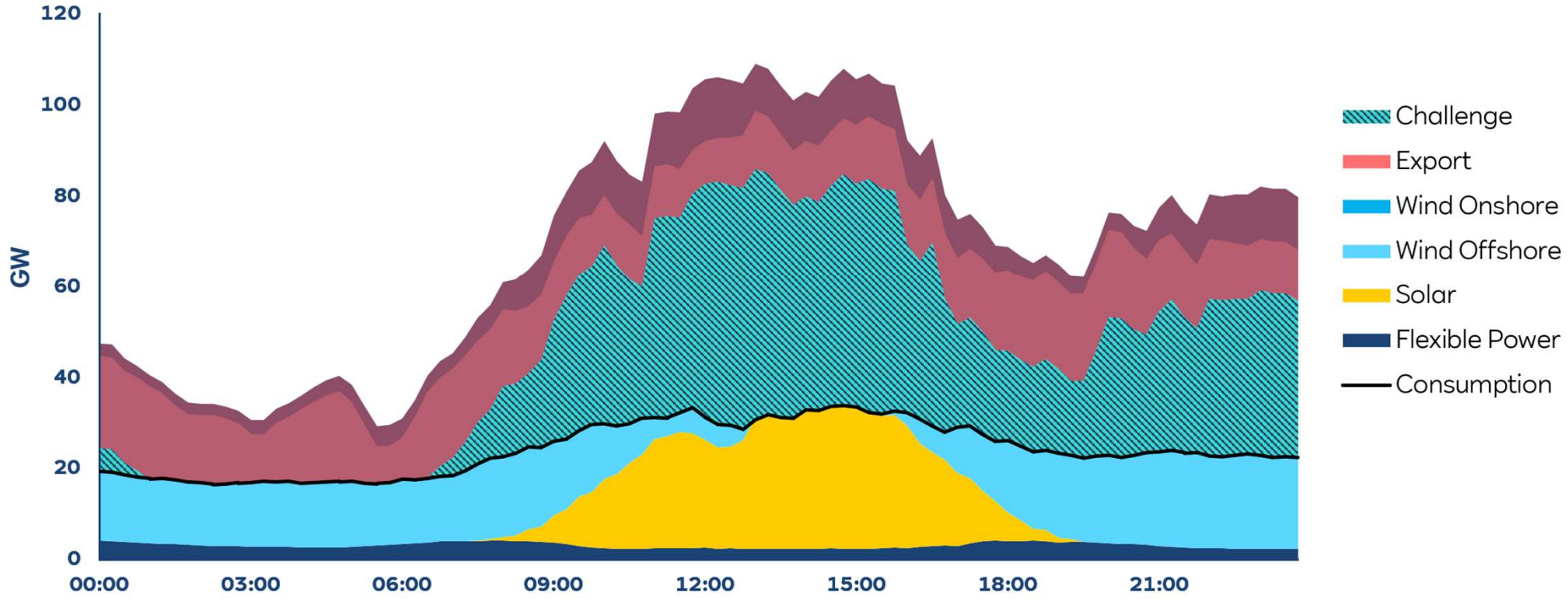


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

Electricity generation

NL, 2050

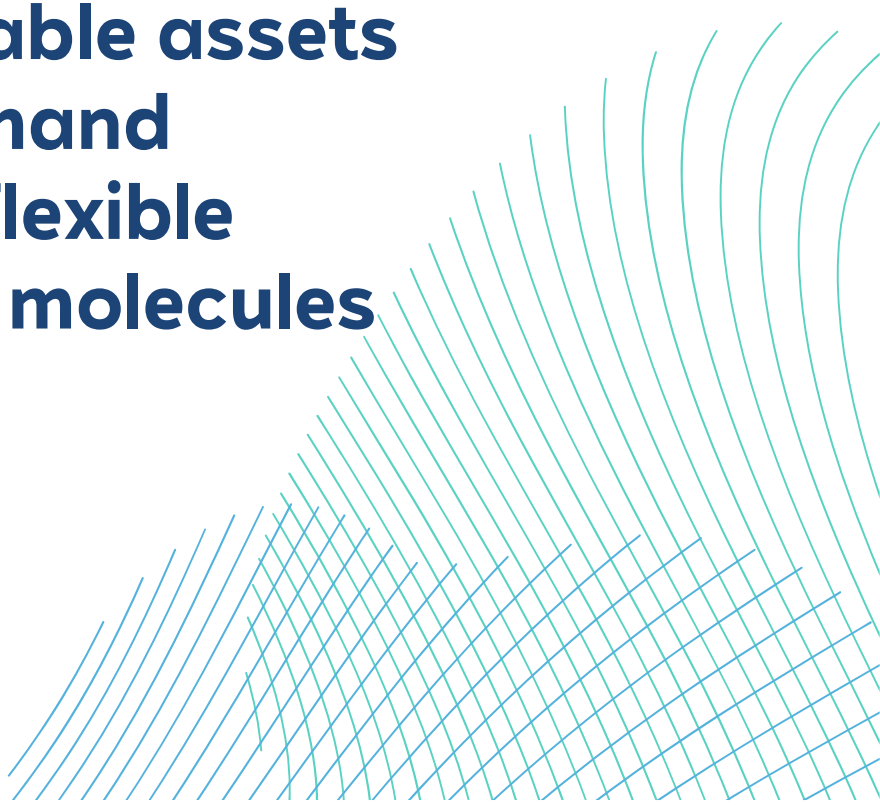


RWE

Bronnen: ENTSO-e. EnergieOpwek.nl, CE Delft, TenneT, CBS, TNO

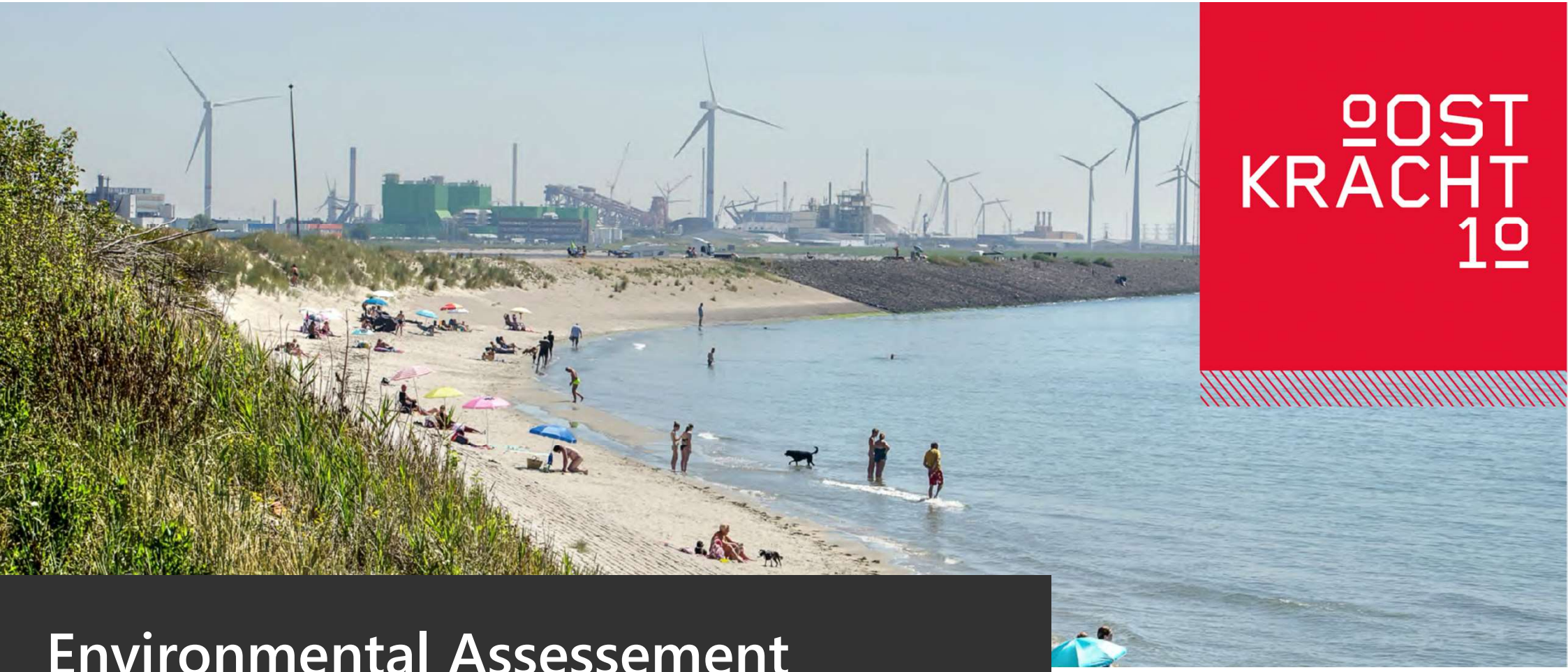
We need to

- **build renewable assets**
- **electrify demand**
- **use energy flexible**
- **make green molecules**




RWE
OranjeWind
Offshore Wind farm
Amsterdam
Air Liquide
200 MW
Maasvlakte
THE NETHERLANDS
Air Liquide
250 MW
Zeeland
refinery
Antwerp
Platform
BELGIUM


RWE



OOST KRACHT 1O

Environmental Assessement Hydrogen Carriers in Zeeland

H2Hub – 2 oktober 2025 – Dirk Jan de Boer

The construction of hydrogen and ammonia pipelines is essential for the hydrogen transition

Introduction

Strategic advisor safety and environment

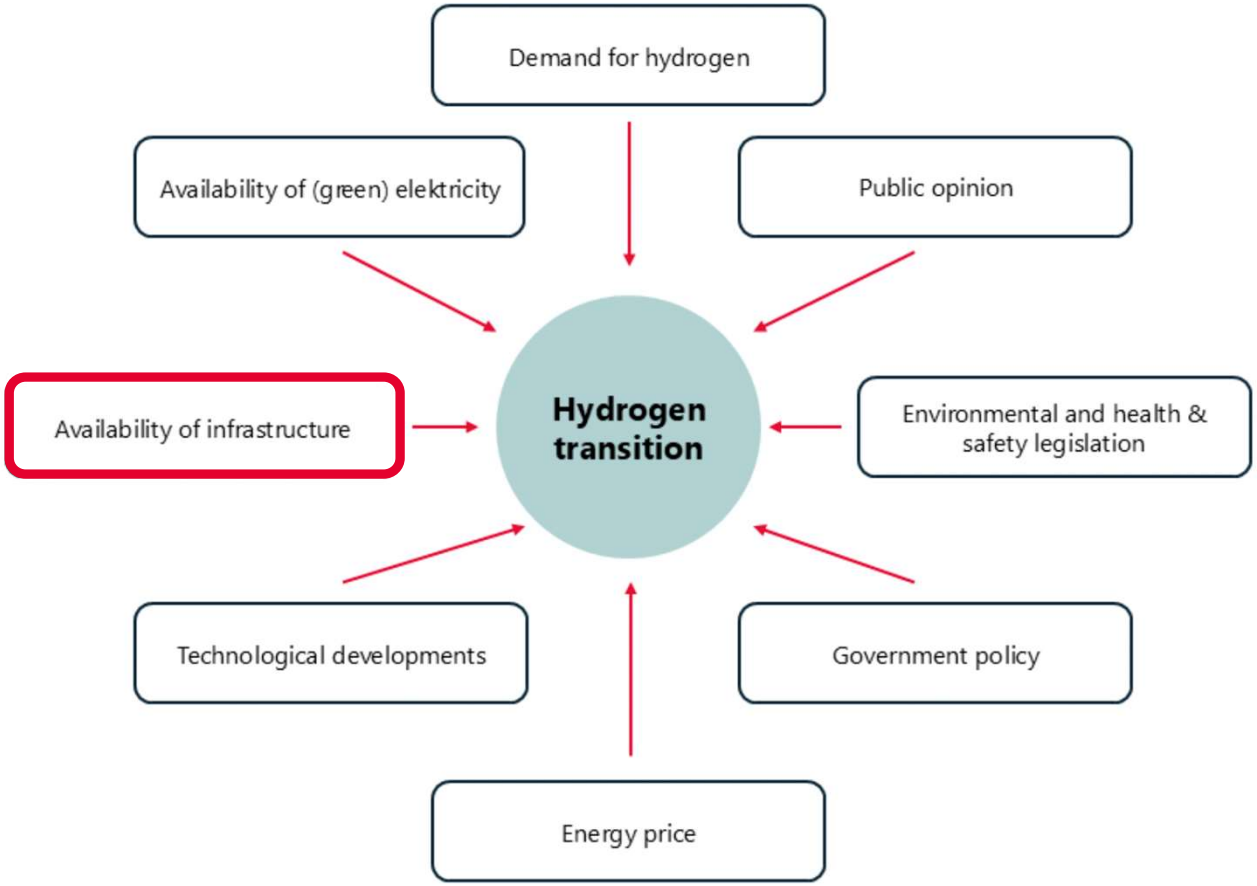
Oostkracht10

dirkjan@oostkracht10.nl

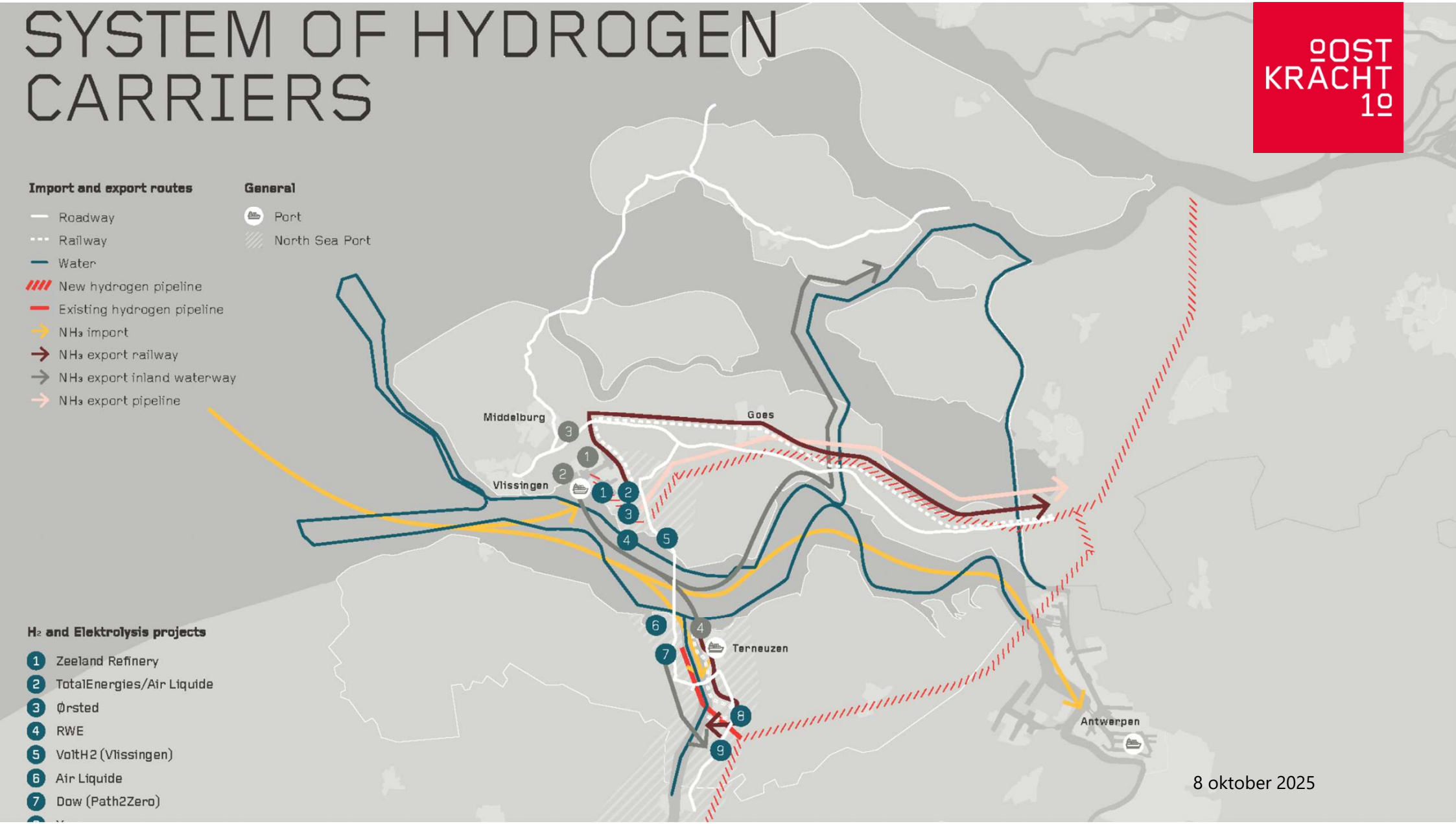
+31645069591

- Oost: [East], stands for down-to-earth thinking and an approachable way
- Kracht: [Power], Seemingly simple, clear, and pleasant to work with.
- 10: Symbolizes oachable way of working. the high quality you may expect.

Key factors hydrogen transition



SYSTEM OF HYDROGEN CARRIERS



8 oktober 2025

Hydrogen balance Zeeland

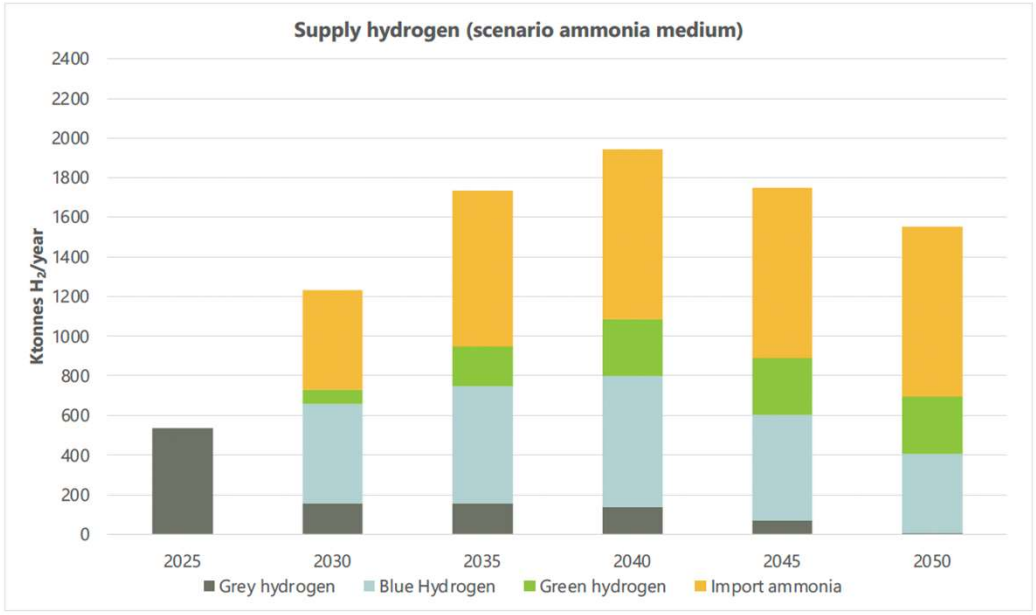


Figure 5 -Supply of hydrogen expressed in $H_{2,eq}$ (Smart Delta Resources, 2024)

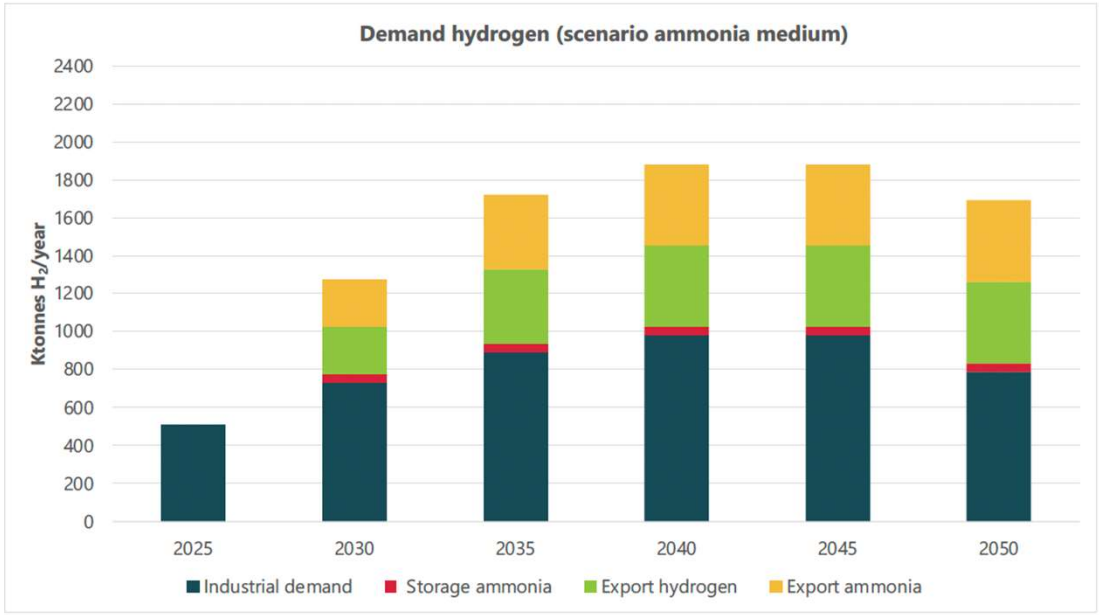
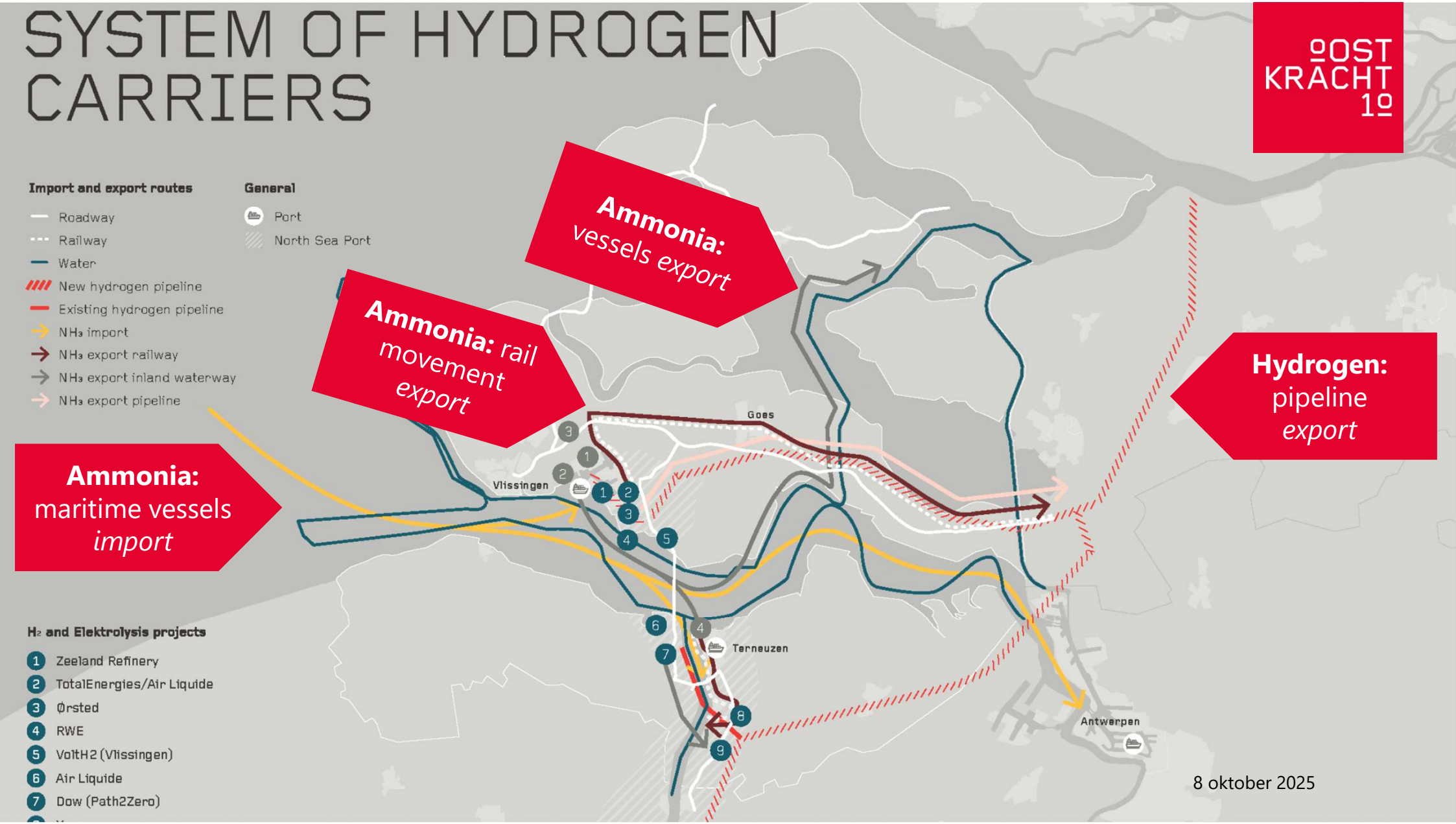


Figure 6 – Demand for hydrogen expressed in H_2,eq (Smart Delta Resources, 2024)

SYSTEM OF HYDROGEN CARRIERS



8 oktober 2025

Existing and new maritime traffic movements

Table 8 – Comparison of existing and new (import) maritime traffic movements in Zeeland

Mode of transport	Current	New (ammonia low / high)	Increase (ammonia low / high)
Maritime vessels movements	9,100	120 / 220 (2035)	0.01 / 0.02
		120 / 360 (2050)	0.01 / 0.04
Maritime Vessel Movement HS (in Dutch : GS)	1,485	120 / 220 (2035)	0.08 / 0.15
		120 / 360 (2050)	0.08 / 0.24
Maritime Vessel Movements (IMDG Class 2.3 - in Dutch GT3)	18	120 / 220 (2035)	6.7 / 12.2
		120 / 360 (2050)	6.7 / 20.0

Takeaway

Understanding the impact of the hydrogen transition on environment and safety starts with understanding the new necessary infrastructure.

Pipelines are a prerequisite for scaling up the transport and use of hydrogen and ammonia.

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info@oostkracht10.nl

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7411 TH Deventer

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3013 AK Rotterdam

Bedrijvenpark Twente 305
7602 KL Almelo

Dirk Jan de Boer

+31 6 35 06 95 91
dirkjan@oostkracht10.nl

Aad Bruggeman
Roger Energy

Building the h2-ecosystem

1. local
2. virtuel pipeline
3. via the backbone

Primary target market

Zero-E Civil and Hydraulic Engineering, Inland Navigation & Aviation

The primary objective is to reduce nitrogen deposition

Vehicles

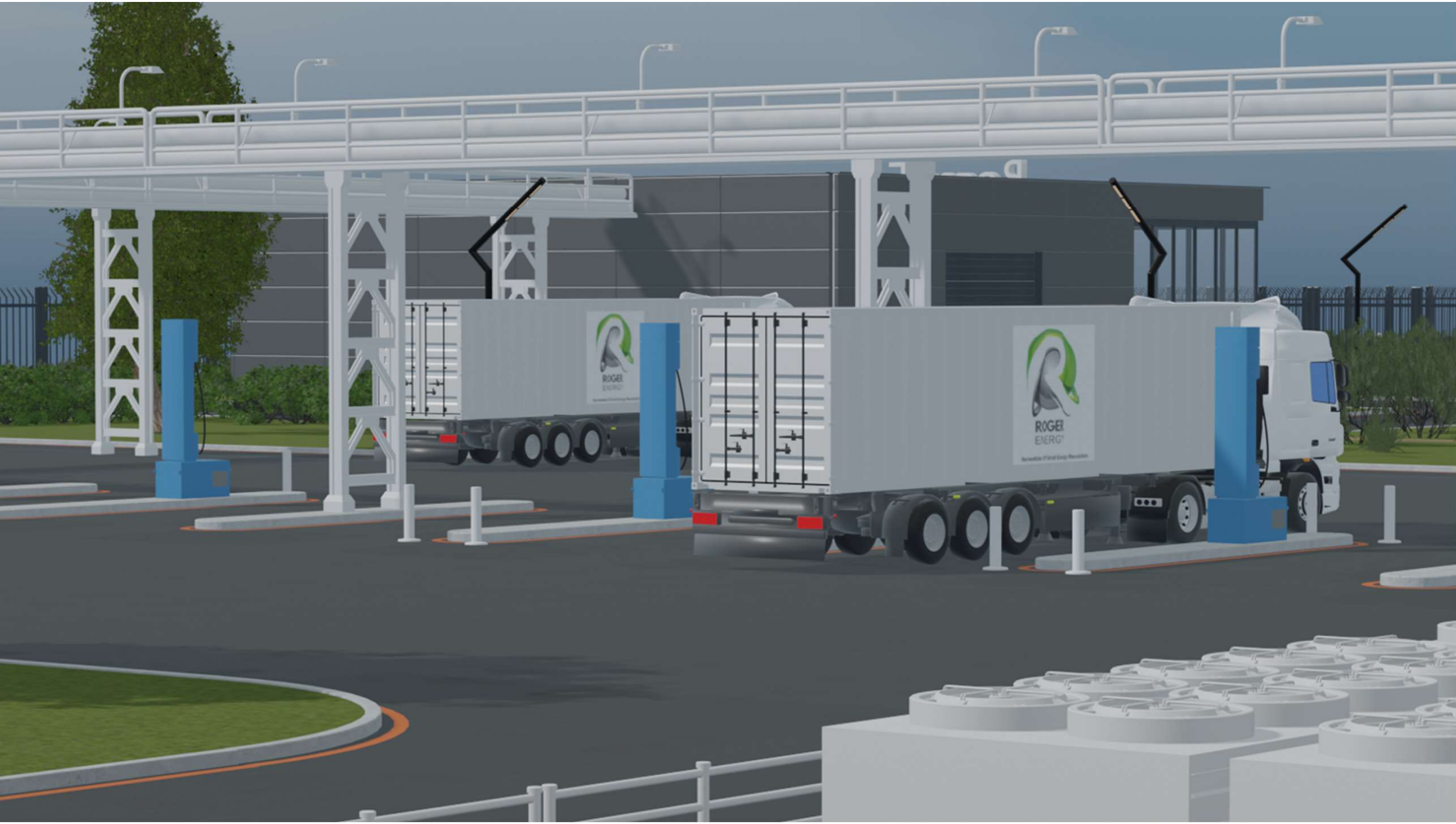
Vessels

Aviation and drones

Heavy machinery

”Temporary" provisions


Plot under development
field lab & Smallscale production unit
4 ha
road and water connection
off grid demand
roll-out to rural areas


ROGER
ENERG

H2-as-a-service

Electric power anywhere

Logistics weighs heavily on OPEX.

- The maximum load of hydrogen per truck is 1,000 kg.
- 20ft container max 470 Kg Hydrogen
- ADR Truck & trailer € 1,50 - 2,30 / km

Logistics energy hub

1. Logistics hub:
- Energy supply and demand
- Transport modalities by road and water
- Gas, liquids and electrons

2. Multifunctional:
Storage and transshipment
- Container stacking via cascade
- Bunkering for inland shipping
- Refuelling/loading heavy transport
Emergency power grid levels


Den Oever
Julianadorp
Callantsoog
Schagen
Schoorl
Heerhugowaard
Alkmaar
Hoorn
Velsen-Noord
Beverwijk-Oost
Wijkeroog
TMA Terminals B.V.
Haarlem
Amsterdam
Hoofddorp
Alphen aan den Rijn
Markermeer
Lelystad
Almere
Huizen
Nijkerk
Barneveld
Utrecht
Zeist
Lemmer
Wolvega
Steenwijk
Emmeloord
Urk
Nationaal Park
Kampen
Dronten
Biddinghuizen
Zwolle
Dalfsen
Nunspeet
Harderwijk
Ermelo
Epe
Raalte
Deventer
Apeldoorn
Zutphen
A6
A7
A22
A28
A1
A50
A30
Engie - Maxima-centrale
Profile Pouw Banden Utrecht
ROGER ENERGY
Google


Hoofdvaarwegennet
Hoofdtransportas (552 km)
Hoofdvaarweg (897 km)
Overige vaarweg (4 353 km)

Rijksdienst voor Ondernemend Nederland

Thank you for your attention!

Fenna van de Watering

Fenna.vandewatering@rvo.nl