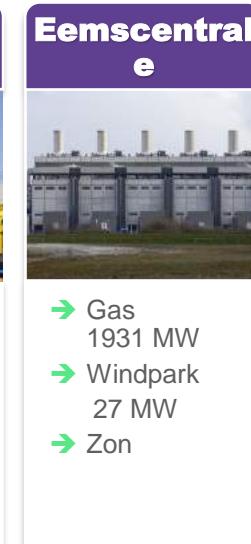
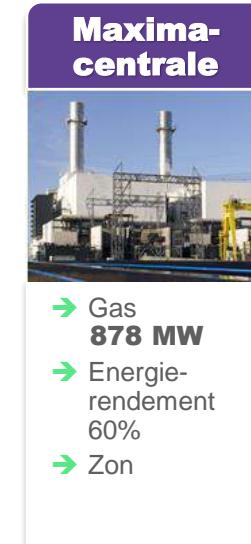


Hydrogreen

Net Zero mission.



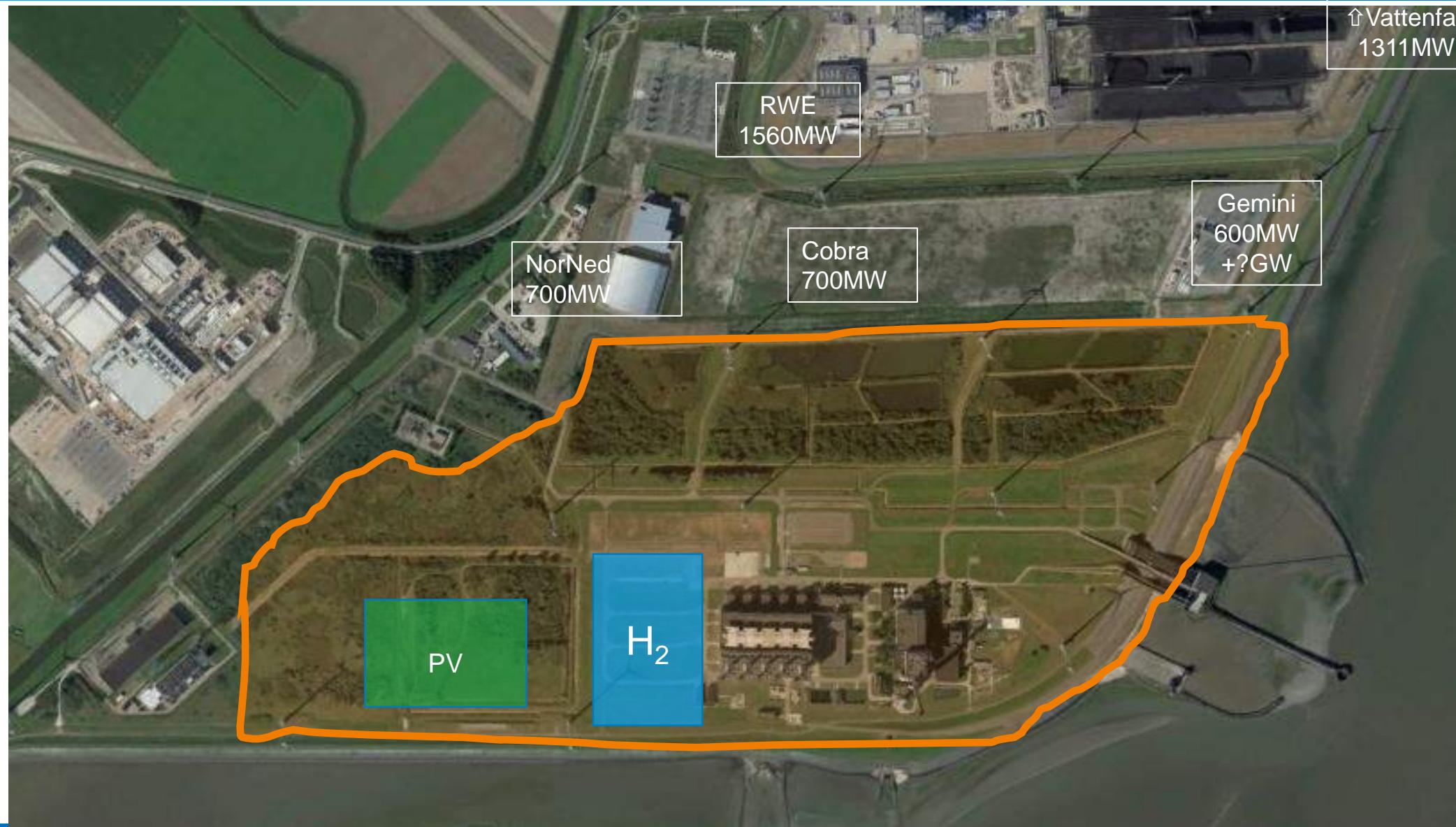
Engie Thermal generation in NL



In 2020 about 18% of Dutch Energy-supply

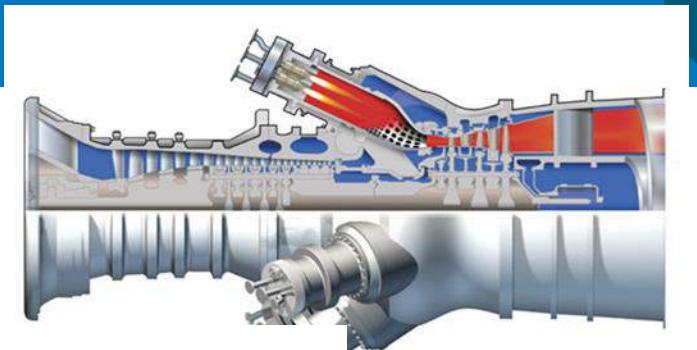


Eemshaven the center of En(er)gie



Eemscentrale the biggest powerstation in NL

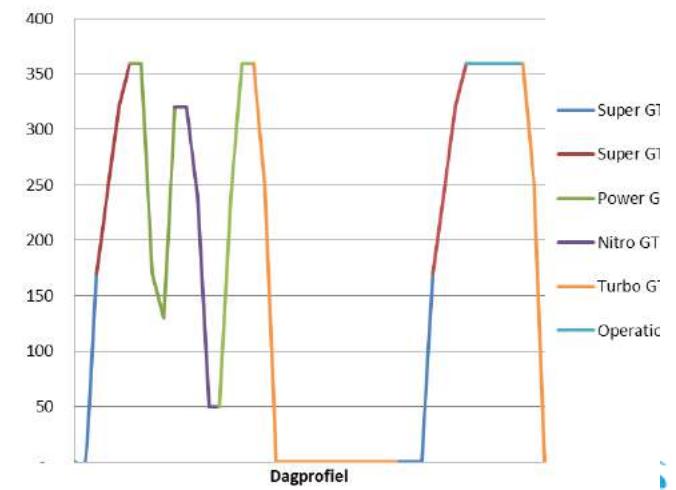
- Installed power of 1931 MW
- COD: 1996 CCGT GE-technology
- Can cover 10% of dutch energy demand
- Super flexibel



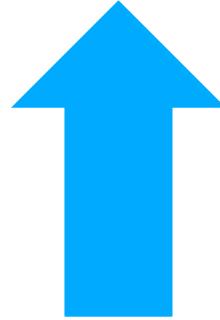
Increased Performance

- Reduction emissions ~30%
- Increased efficiency ~0,6%
- Increased gas flexibility
- Fast start

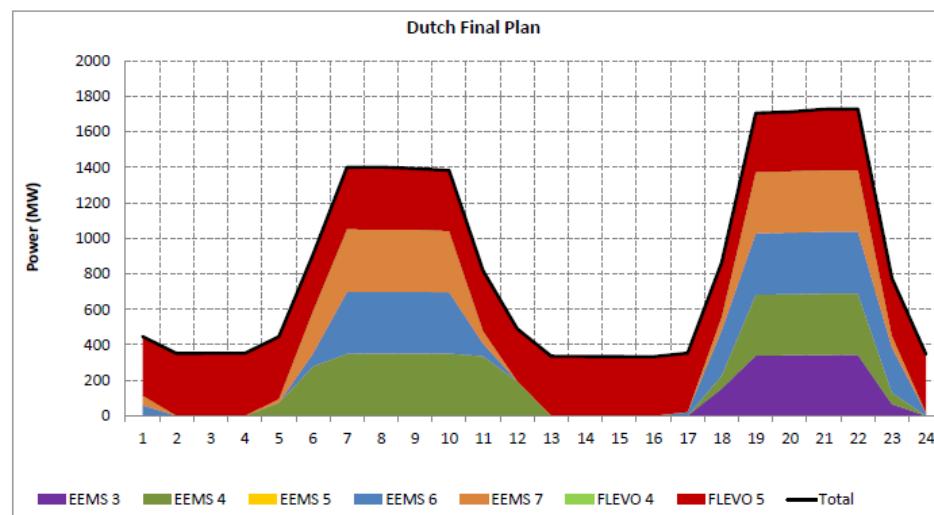
Voorbeeld operationeel profiel



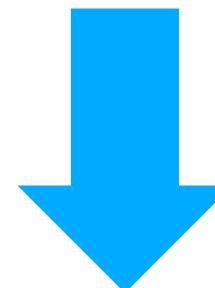
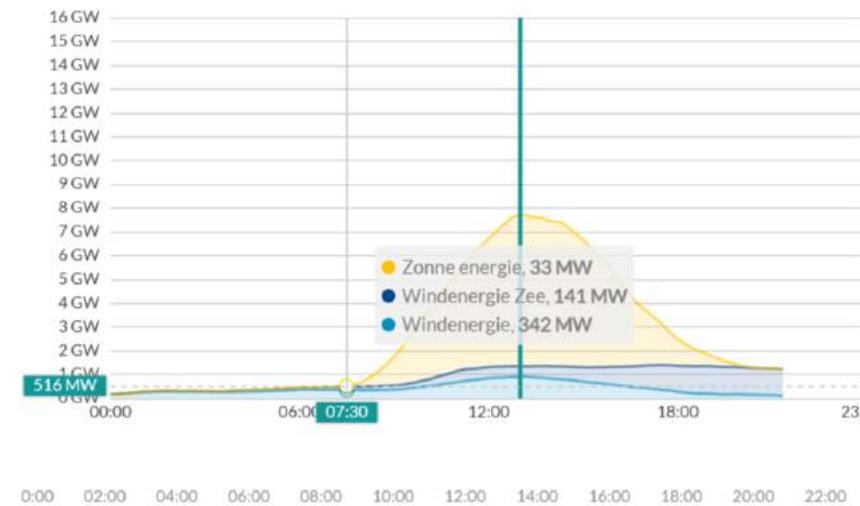
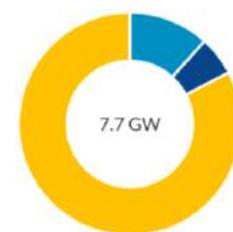
Changing running profile



- # starts
- Flexibility
- costs



dinsdag 14 september 2021



- CO2
- Operating hours
- revenues

It's all about the numbers.....production with 4 days storage



VS



1800MW

1300 x 60M (78Mrd)

The logo consists of the word "ENGIE" in a bold, white, sans-serif font. The letters are slightly slanted to the right. A thin, dark, curved swoosh or underline starts from the top left of the 'E' and sweeps down towards the bottom right, ending just before the 'e'. The entire logo is set against a dark, semi-transparent circular background.

ENGIE



Hydrogreen

Net Zero mission.



ENGIE has defined its ambition towards massive deployment of Renewable-based Hydrogen

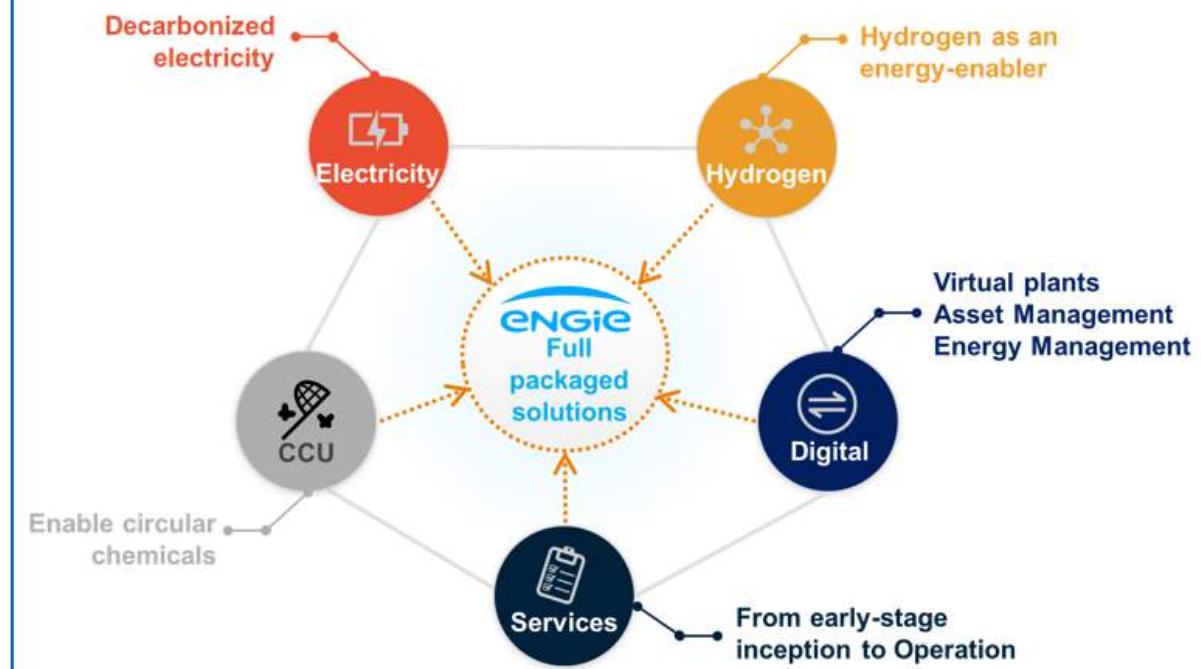
Engie vision and strategy drive ENGIE project development worldwide

Right place: renewable energy,
supportive policies

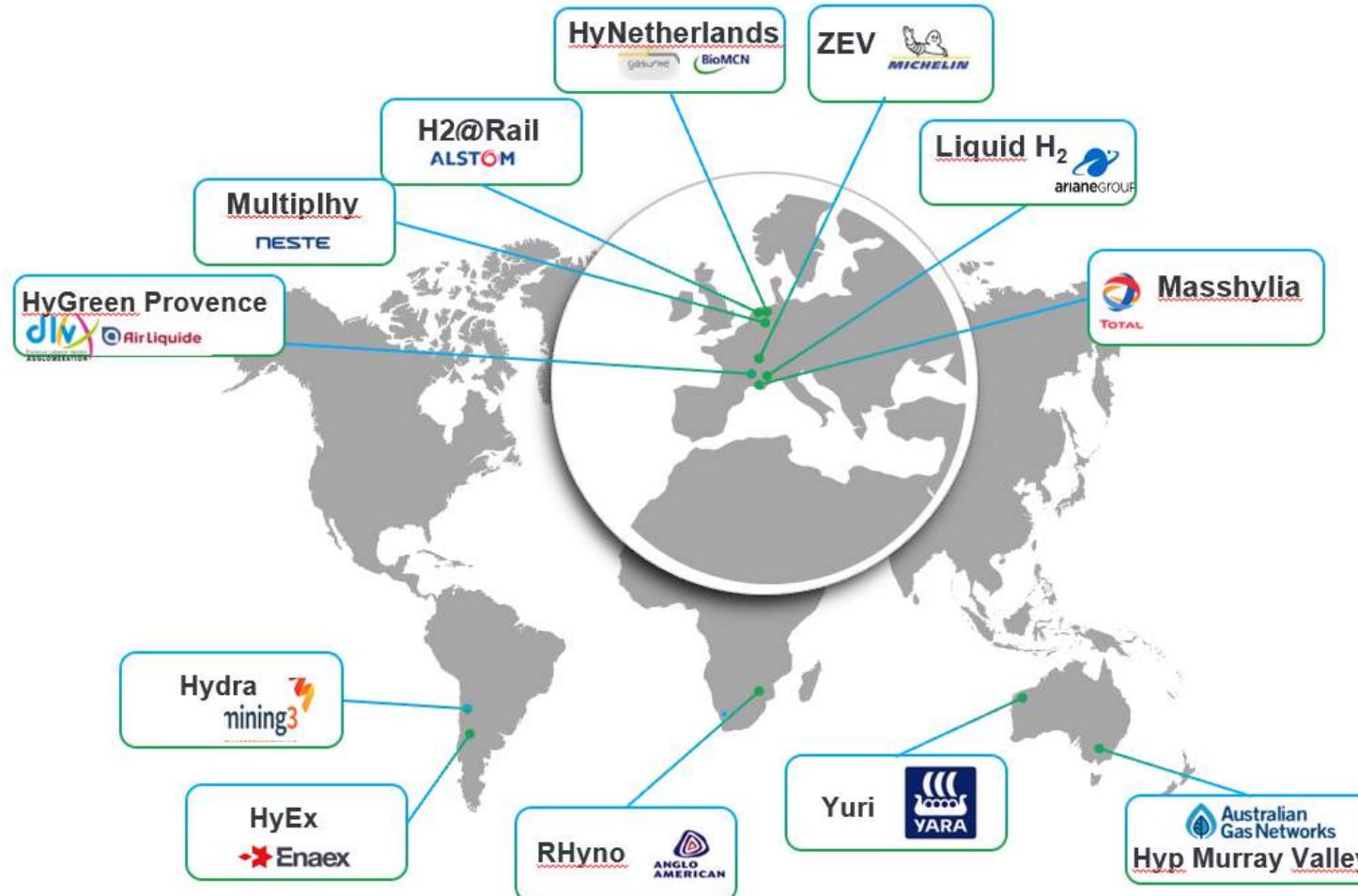


Right local and
overseas customer &
solution

ENGIE offer encompass all necessary competences to address



Our ambition to have 4GW ENGIE's industrial renewable hydrogen projects



Projects	Sectors
HyGreen Provence	Mobility and industry
Multiplhy	Bio refinery
H2@Rail	Trains
HyNetherlands	Chemical feedstock, industrial fuel and transport
ZEV	Mobility
Masshylia	Bio refinery
Liquid H₂	Maritime and more
Hyp Murray Valley	Network injection
Yuri	Green ammonia
RHyno	Mining
HyEx	Ammonia nitrate
Hydra	Mining

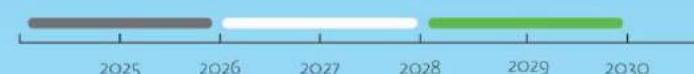


Gasunie hydrogen backbone

Local backbone branches
Regional backbone ribs
Country main backbone
NW Europe cross border networks

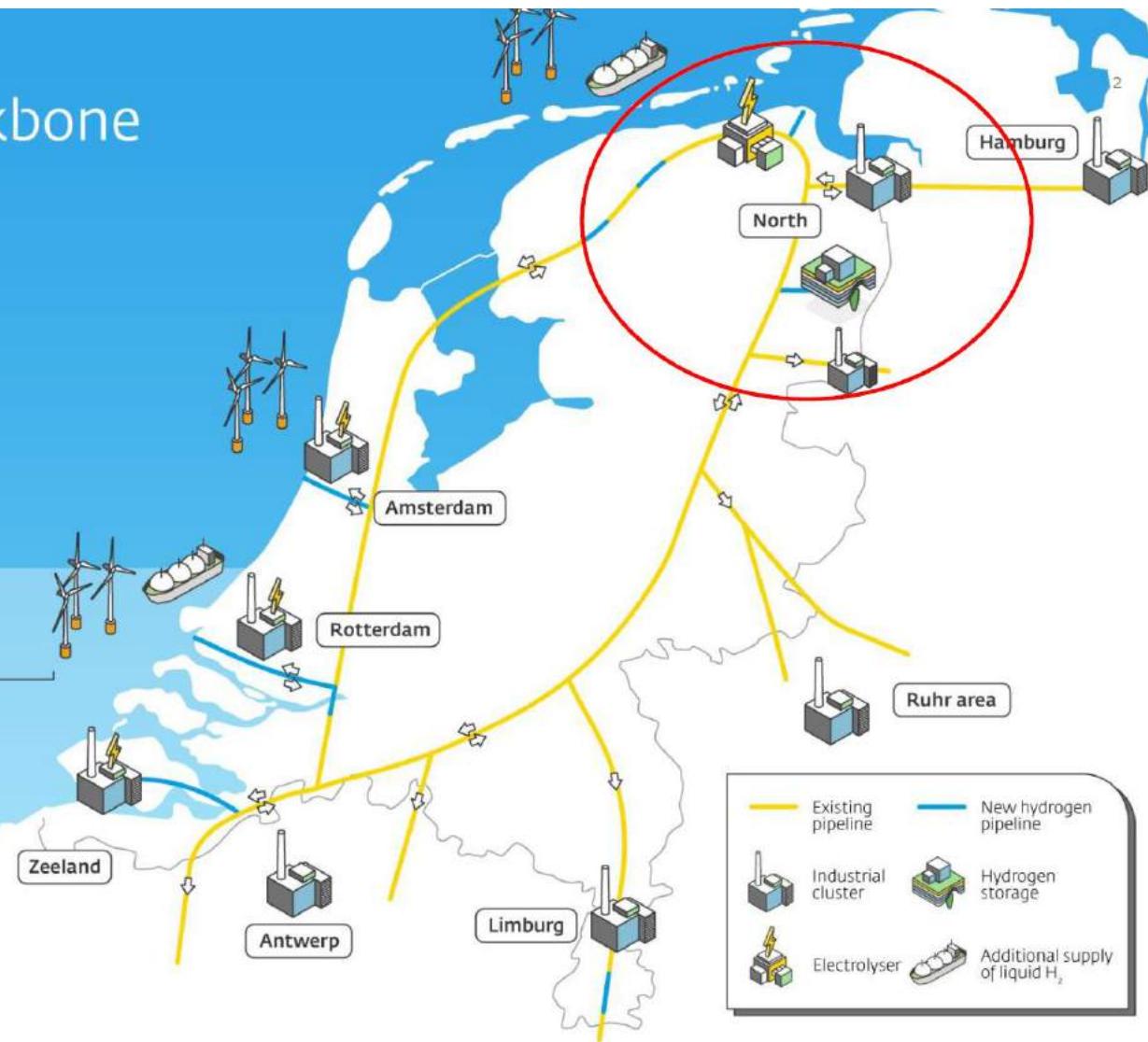
Re-use low cost / little impact
Storage balancing demand / supply
Large scale & 1400 km, ± 42"
capacity > CO₂ red. potential

Phases



- Development of regional backbones, including connections to Germany and the northern Netherlands
- Industrial clusters interconnected and connected to hydrogen storage facilities
- Backbone connected to European hydrogen backbone

gasunie
crossing borders in energy



Gasunie, September 2020

engie

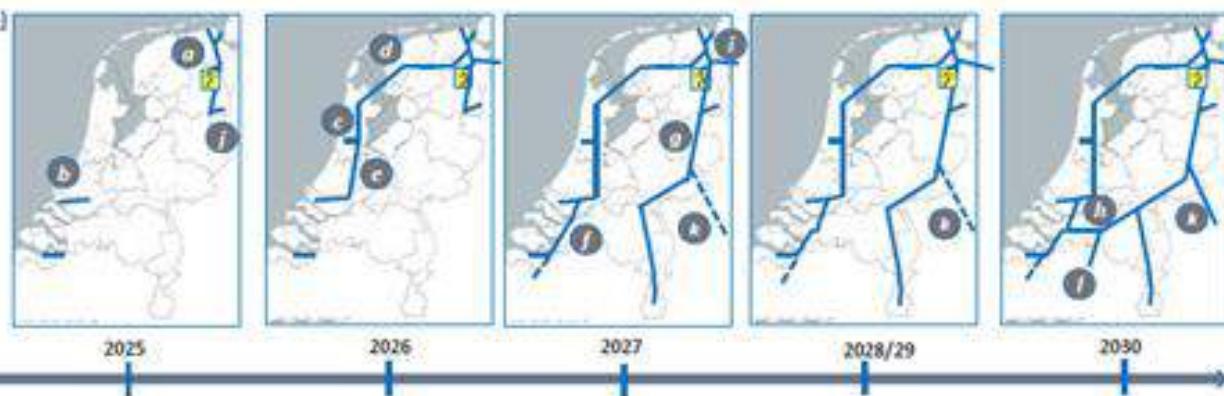
ANTICIPATED TIMELINE FOR THE BACKBONE OF GASUNIE HYWAY 27



H2 backbone – envisaged development - ambition

Possible phasing of the H2 network, actual steps depending on (market) opportunities

nr	Trajectory	Cap (+ GW, diam related)
a	RIB NO-NL	7,6
b	Rib Rotterdam	5,3
c	Rib Amsterdam	1,6
d	NO-NL – Uimond	4,5
e	Uimond – Rijnmond	4,7
f	Rijnmond – Zeeland	3,2
g	NO-NL – Limburg	7,6
h	Ravenstein – Ossendrecht	2,5
i	Export DE1	7,5
j	Export DE2	0,5
k	Export DE3	7,5
l	Export BE	7,5



Design characteristics

- build-up largely from existing natural gas pipelines
- magnitude of investments 1,5 – 2,0 billion €
- initial government funding -> commercial contracts
- physical constraints & market requirements

around 10 – 15 GW excluding compression (-> 2035/40)
 25 -> 50 GW or more including compression (-> 2040)
 from zero to full load 2025 -> 2035/40
 tariffs should be "minor part of H₂ cost chain"
 design bandwidth of pipeline specifications

hynderlands

gigawatt scale green hydrogen value chain



value chain

- green electricity
- hydrogen production
- storage
- transport
- utilisation

connection with Belgium
and ports of Amsterdam,
Rotterdam and Antwerp

solar energy

wind energy

green electricity
from Scandinavia

the first step:
a 100 MW green
hydrogen plant on
ENGIE Eemshaven site

transport through Gasunie
H₂-backbone

hydrogen storage

utilisation
for mobility

utilisation
by industry

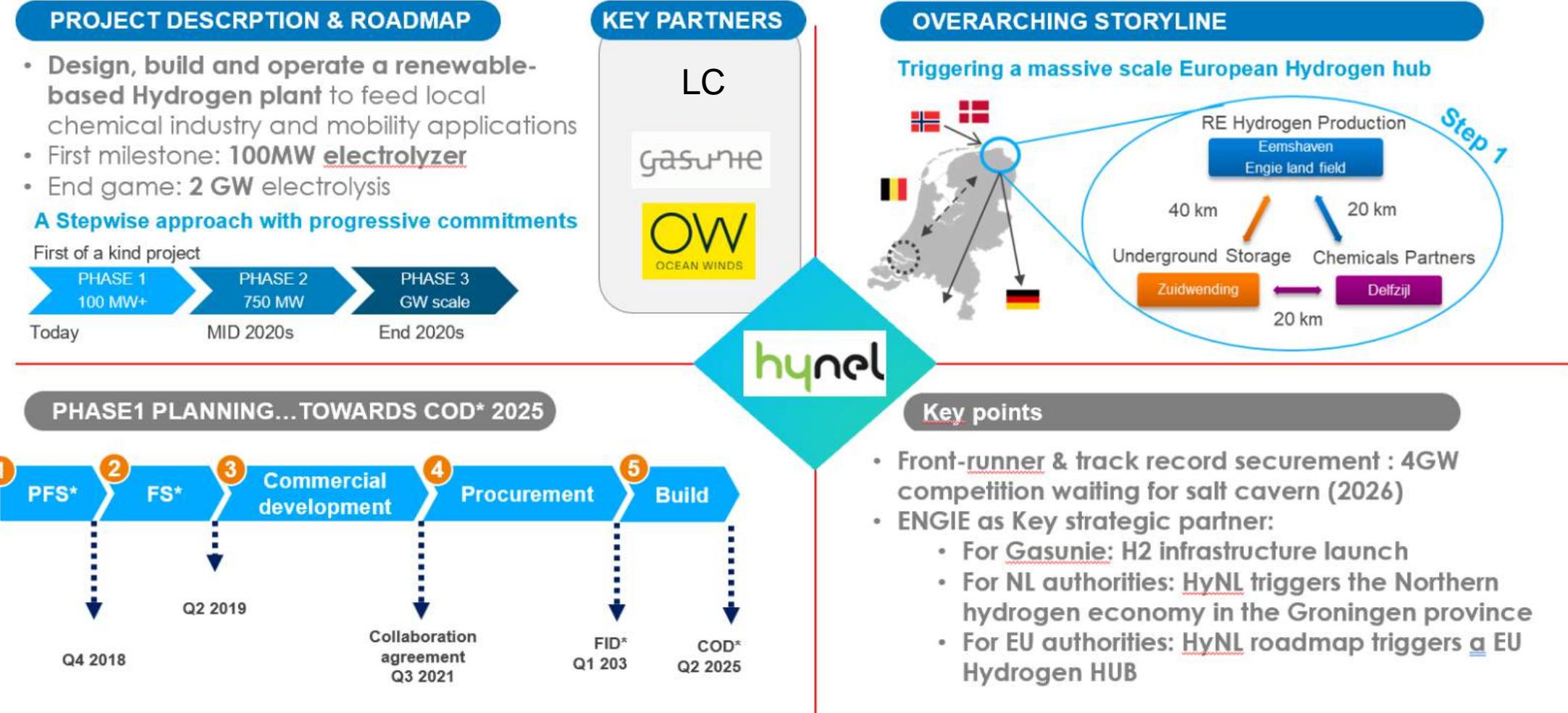
utilisation by
chemical industry in Northern Netherlands

connection with
Germany

ENGIE

HyNL scalable project

1 What is the HyNL project? A unique combination of long term roadmap, targeted Early '22 FID and strategic project for ENGIE



*PFS = Pre-Feasibility Study; FS = Feasibility Study; FID = Final Investment Decision

THyou2

