



**STORAG ETZEL**

Energy Storage Solutions

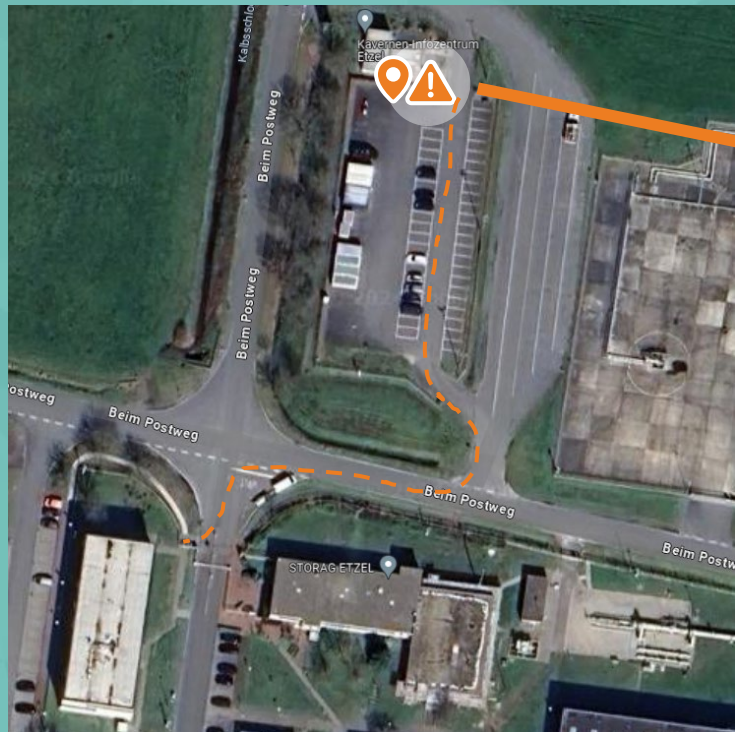
**VISIT STORAG ETZEL**

**SITE PRESENTATION / H2CAST ETZEL**

Etzel, August 2024

## SAFETY MOMENT

 Conference room



 Meeting Point in case of an emergency



# CONTENT

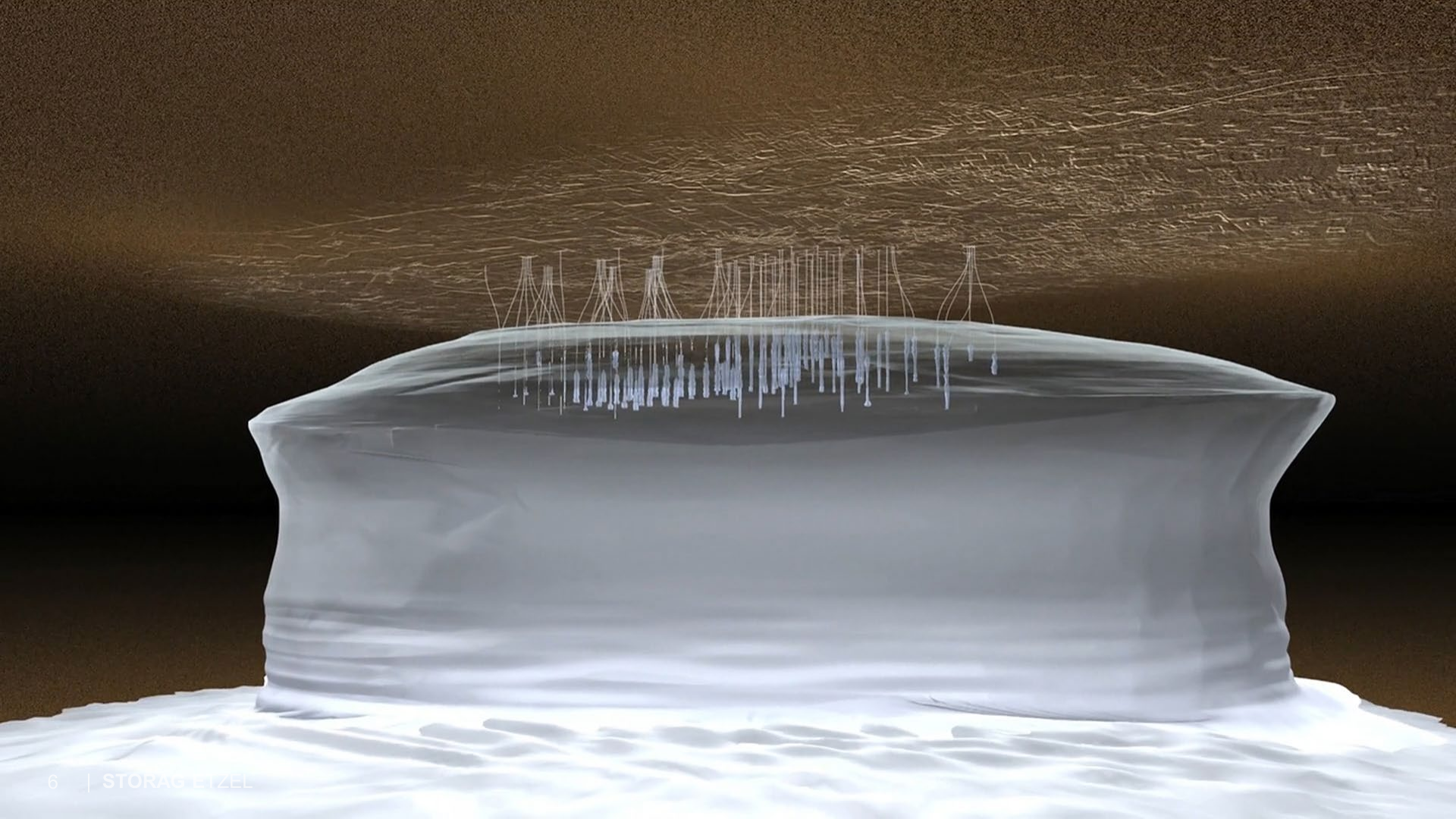
1. Introduction – Summary
2. Underground Storage, History of the Etzel Storage
3. Transition from Old Economy to New Economy – [H2CAST](#)
4. Energy Hub Port of Wilhelmshaven

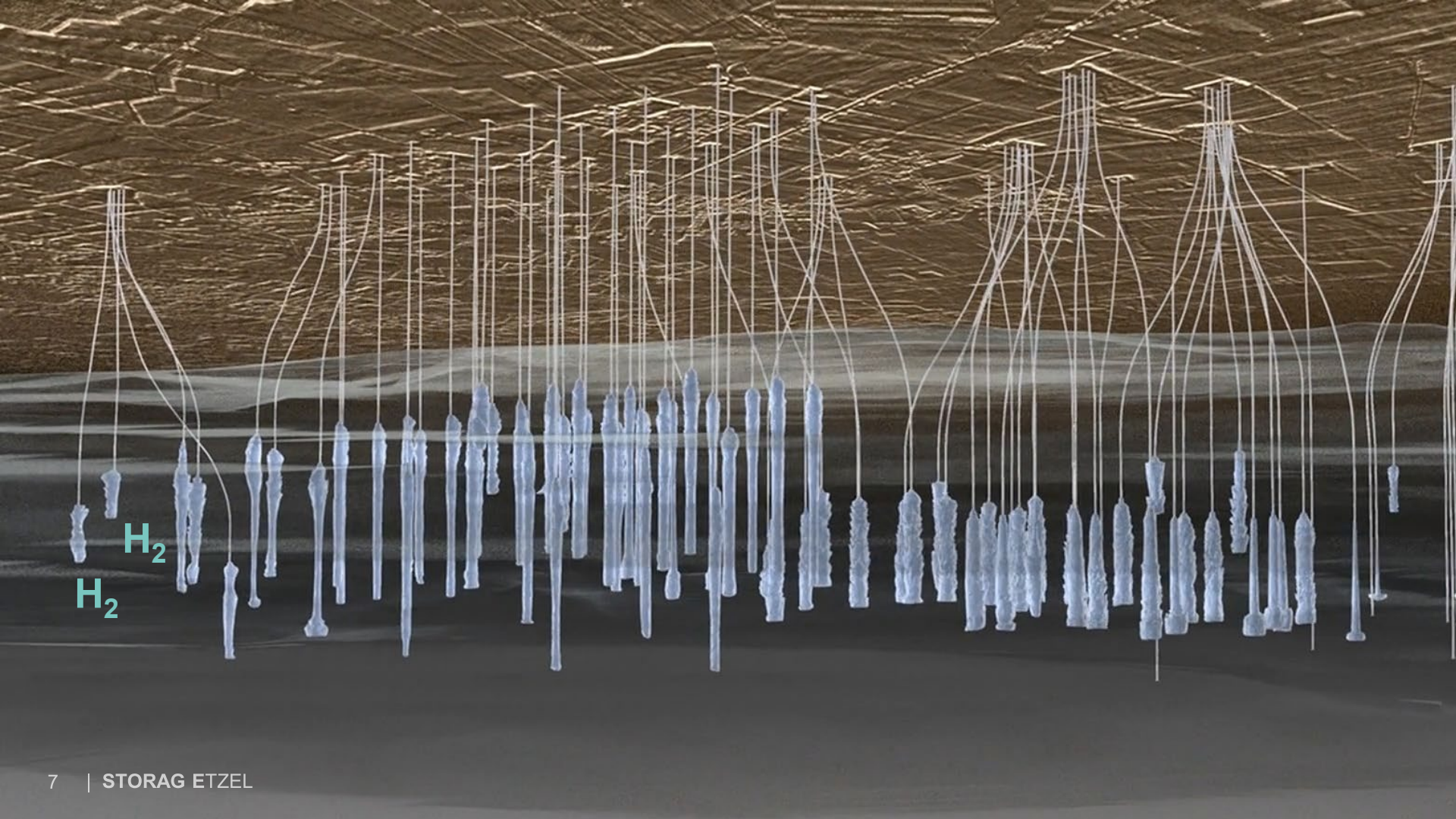


CAVERN STORAGE ETZEL (CLIP ON [STORAG-ETZEL.DE](https://storag-etzel.de))









$H_2$   
 $H_2$

## ABOUT STORAG ETZEL VOLUMINA, NUMBER OF CAVERNS

**3,9 bcm**

Working Gas Capacity (WGC)  
**51** Gas Caverns

~1/6 of the German gas  
reserves

**11 Mio. m<sup>3</sup>**

Oil Storage  
Capacity  
**24** Oil Caverns

Etzel is one of the largest  
oil storage facilities in the  
EU

**≈15 Mio. m<sup>3</sup>**

potential  
Storage Capacity  
(volumetric)  
**24** Caverns

Approved expansion  
potential



# ABOUT STORAG ETZEL CUSTOMERS

## Oil



ERDÖLBEVORRATUNGSVERBAND  
Körperschaft des öffentlichen Rechts

**ASEVA**

## Natural Gas



EnBW



OMV  
OMV

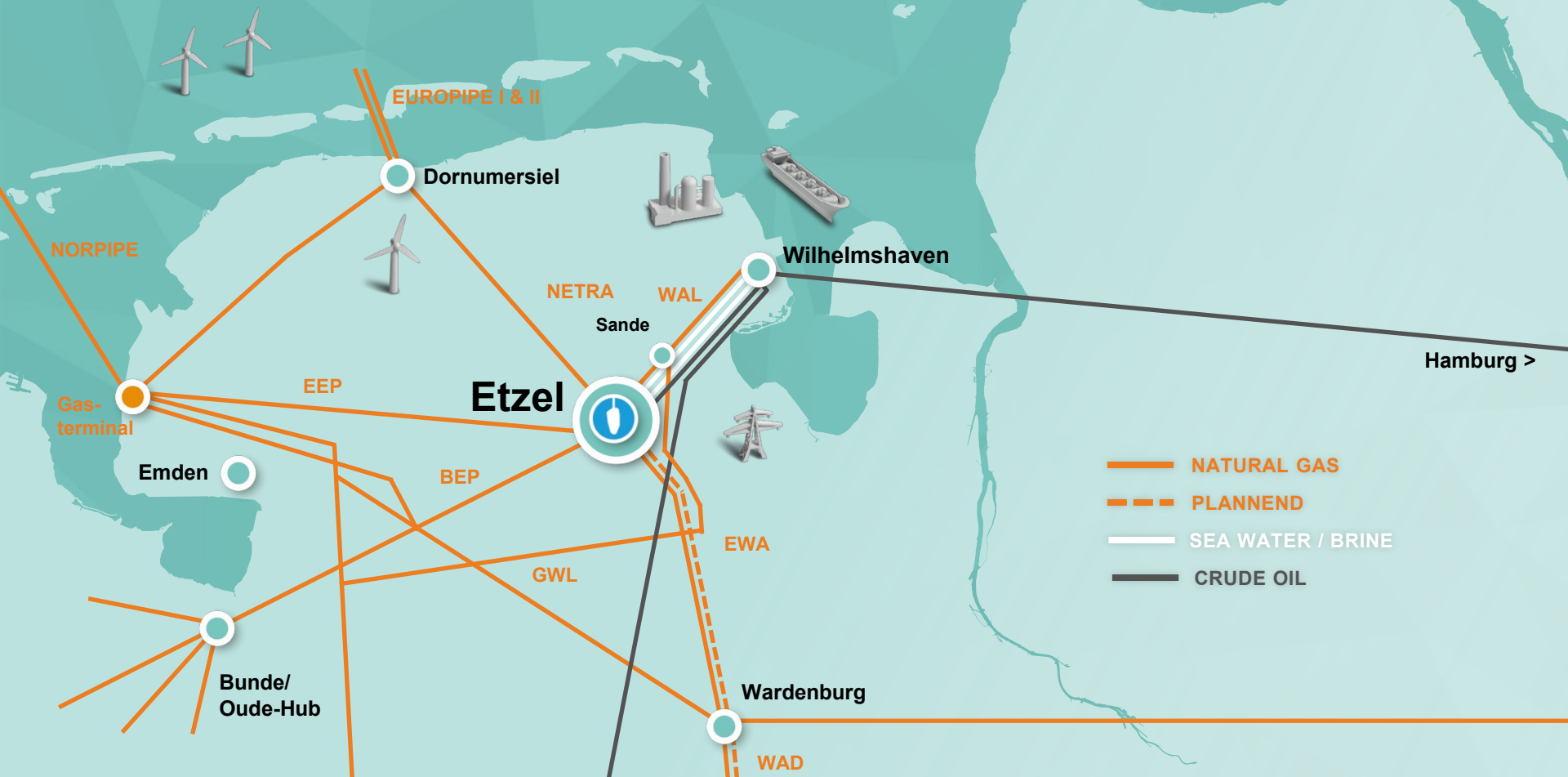
Ørsted



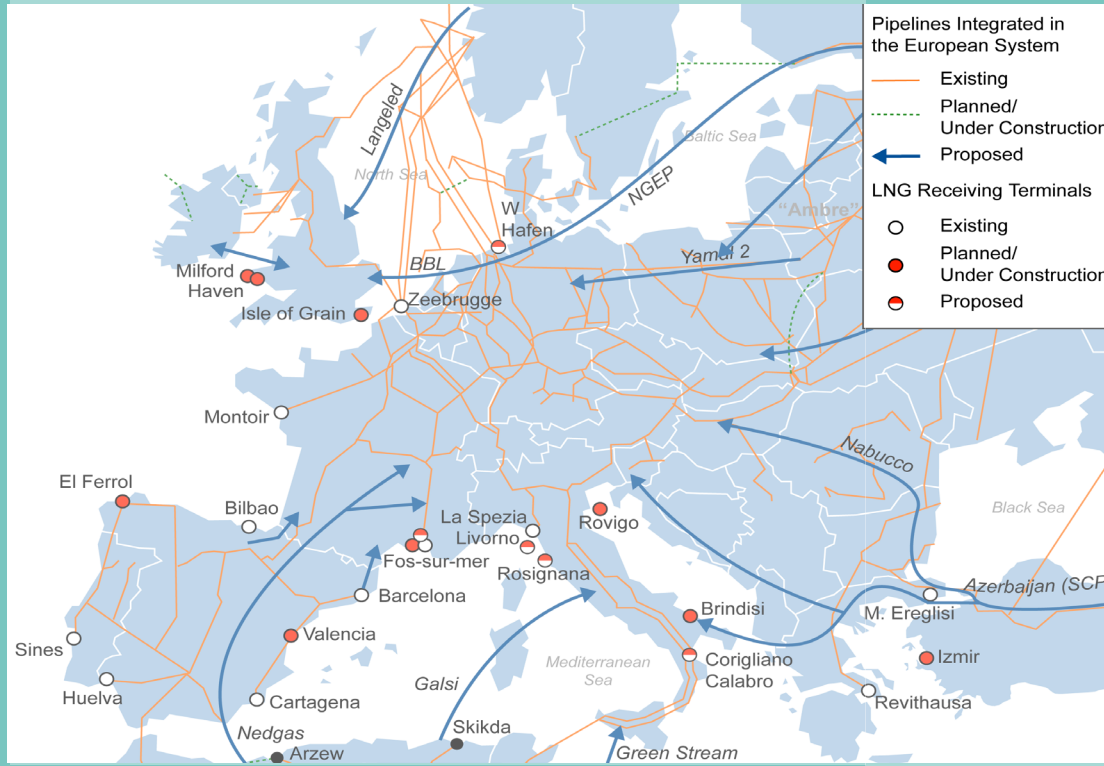
uni  
per

VNG  
Gasspeicher GmbH

# NATURAL GAS / OIL PIPELINES IN NORTHWEST GERMANY



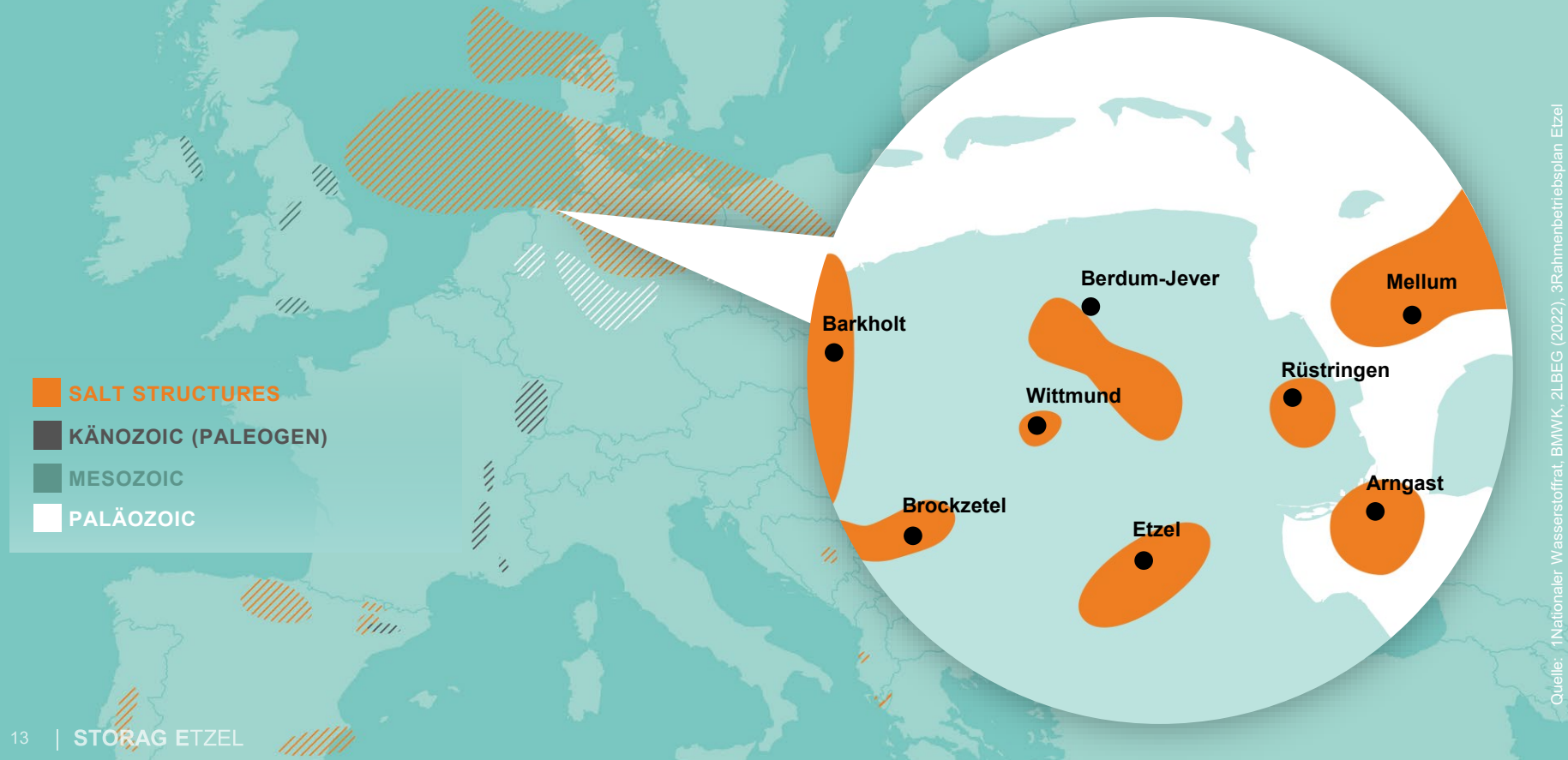
# LOCATION / DIRECT INTEGRATION INTO THE EUROPEAN GAS NETWORK







# SALT FORMATIONS IN EUROPE AND LOCAL IN LOWER SAXONY



# OIL STORAGE IN ETZEL



1974 – 1978	First 33 caverns constructed
1975	Start crude oil injection 600.000 t
1981	Storage of 8,5 mio. m <sup>3</sup> crude oil to build the German oil reserve
1986 – 1990	<b><u>Conversion</u></b> of 9 oil caverns for natural gas storage
1995 – 1998	Demand for further 7 oil cavern for European oil reserves
1998	31 oil caverns in operation
2003 – 2008	<b><u>Conversion</u></b> of another 10 oil caverns for natural gas
Since 2010	24 oil storage caverns in operation, 11 million m <sup>3</sup> total capacity



1990 – 2024:  
STORAGE  
CAVERNS FOR  
STRATEGIC OIL  
RESERVES/  
CRISIS  
PREVENTION

# GAS STORAGE IN ETZEL



1986	First contract for storage of natural gas
1986 – 1990	Conversion of 9 oil caverns for gas
1990	Commissioning of the first gas storage facility
2005 – 2009	Conversion of further 10 oil caverns for gas storage
2008 – 2014	Further expansion of the Northern cavern field by constructing 32 new caverns
2008 – 2012	Construction of three additional gas storage facilities of three consortiums
2012 – 2017	Gradual handover of the first new caverns to the tenants and first gas fill for commercial operation
Since 2017	<b>51 gas storage caverns in operation, 3.9 billion m<sup>3</sup> total capacity</b>



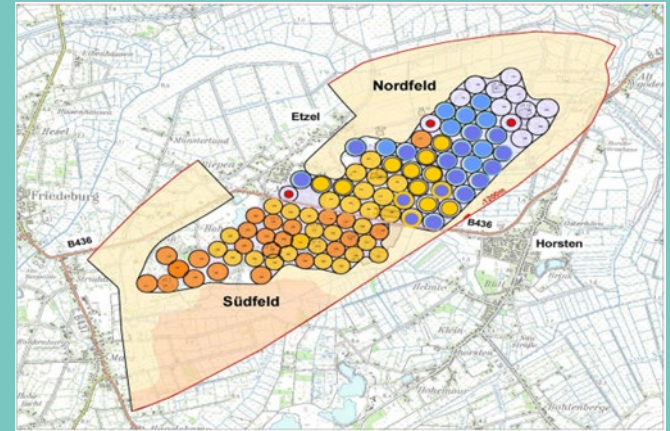
1990 – 2024:  
GAS STORAGE  
CAVERNS FOR  
SEASONAL GAS  
STORAGE

# FUTURE POTENTIAL



- The approved expansion horizon at Etzel currently comprises 99 caverns in total.
- i.e. further 24 Potential Caverns for future use
  - 2 caverns in use for transformation into H2 storage as part of the H2CAST-Project
  - 9 caverns already in leaching process, that could be ready for first gas fill in approximately 3 years time assuming demand; equivalent to 0.5 billion m<sup>3</sup> working gas capacity
  - 13 more to be developed on short notice in approximately 6 to 8 years assuming additional demand for storage; equivalent to 1.3 billion m<sup>3</sup> working gas capacity

ETZEL  
UNDERGROUND  
STORAGE  
DEVELOPMENT



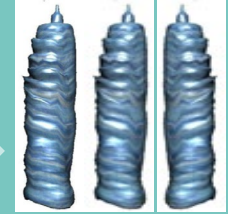


# TRANSITION IN THE FUTURE NECESSARY FUTURE STORAGE CONCEPTS

2023

LNG (FRSU) plus connection from WHV to Etzel

Import has a very high priority now to reduce dependency from Russian gas imports



2027

Ready for Hydrogen Storage

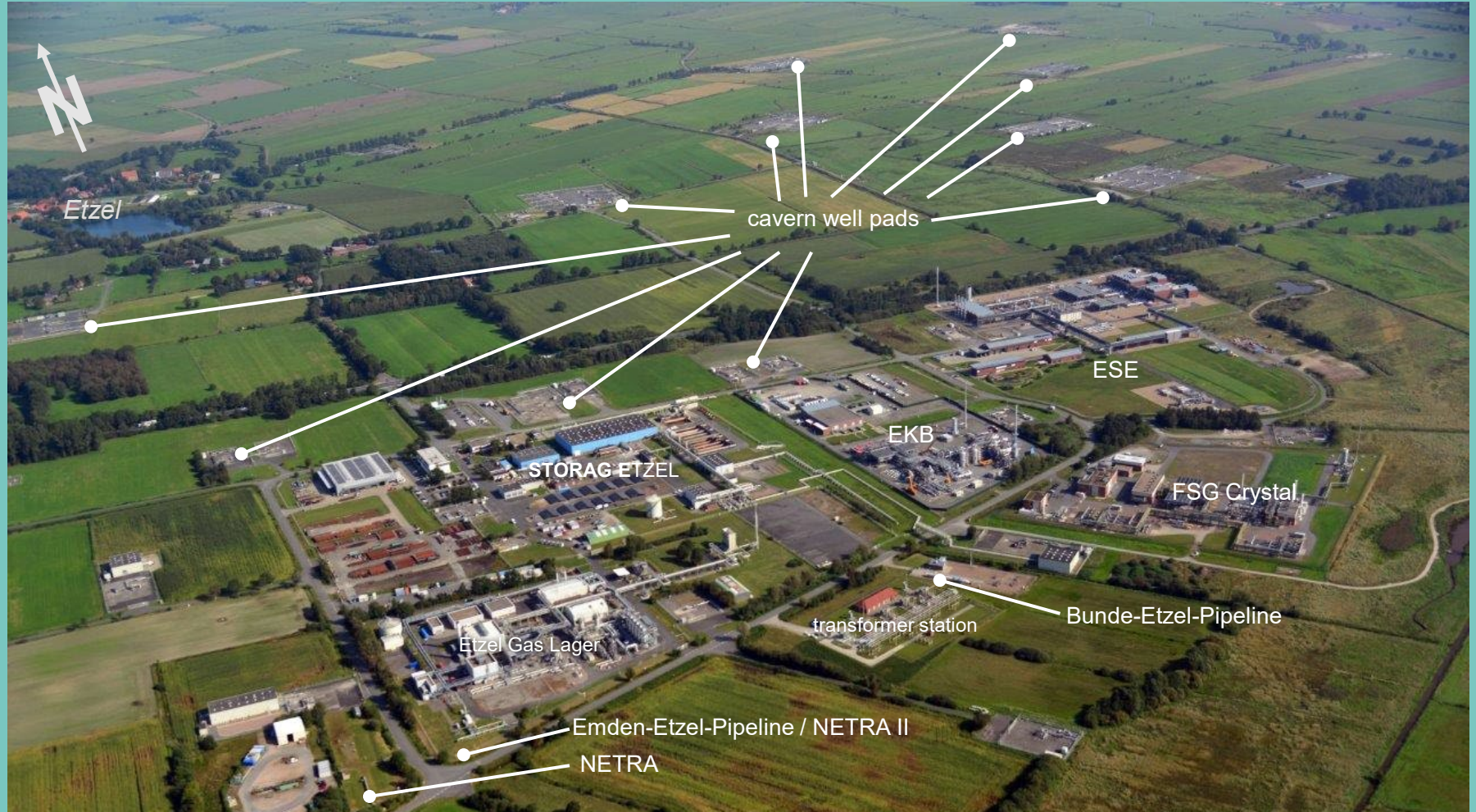


- Onshore, offshore production and import via tank ship
- Will be necessary to reduce hydrocarbon fuels
- Will certainly follow directly after establishing LNG
- Demand for high-flexible hydrogen buffering / storage



NEAR FUTURE:  
SYNTHETIZED  
NATURAL GAS  
PRODUCED  
FROM H<sub>2</sub> AND  
CO<sub>2</sub>

# CAVERN STORAGE ETZEL – AERIAL VIEW 2024



# CONTENT

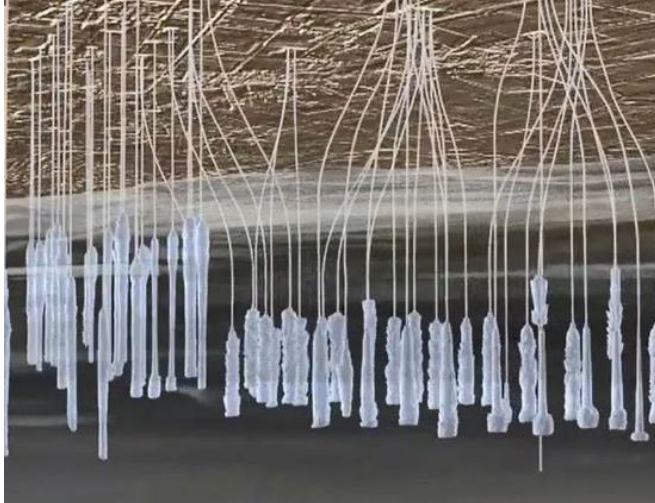
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# H<sub>2</sub>CAST Etzel – Joint Project & Partner

## › Subsurface



## › Above ground test-plant



**STORAG ETZEL**  
Energy Storage Solutions

**gasunhe**  
crossing borders in energy

**HARTMANN**  
VALVES & WELLHEADS

**DLR**  
Deutsches Zentrum  
für Luft- und Raumfahrt

**DEEP.KBB**

**TU Clausthal**

**SOCON**



Niedersächsisches Ministerium  
für Umwelt, Energie und Klimaschutz

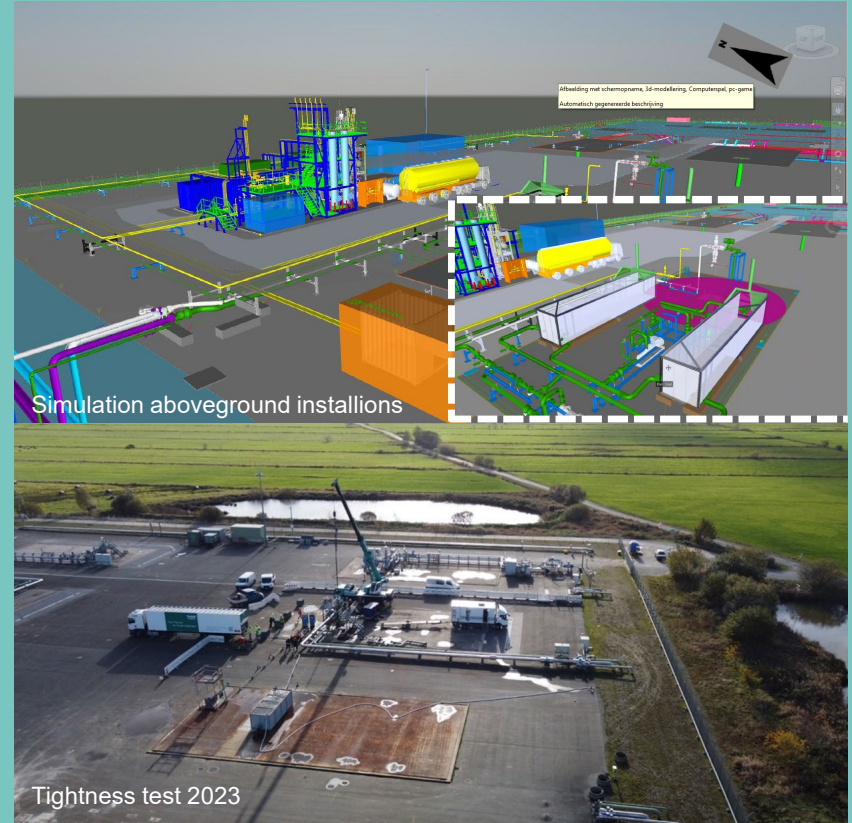


Federal Ministry  
for Economic Affairs  
and Climate Action



# TRANSITION OF CAVERNS FOR GREEN ENERGY CARRIERS

- 2 dedicated **caverns for research on H2 storage**
- Research project started in 2022
- In 2023 two caverns have been equipped with a subsurface completion suitable for H2
- **H2-Ready in 2024**
- Testing & Research in 2024 – 2026
- **H2-Prove end 2026**
- **Ready for commercial operation in 2027**



# H2CAST ETZEL OVERVIEW

Transformation

Scalability

Acceptance

Hydrogen

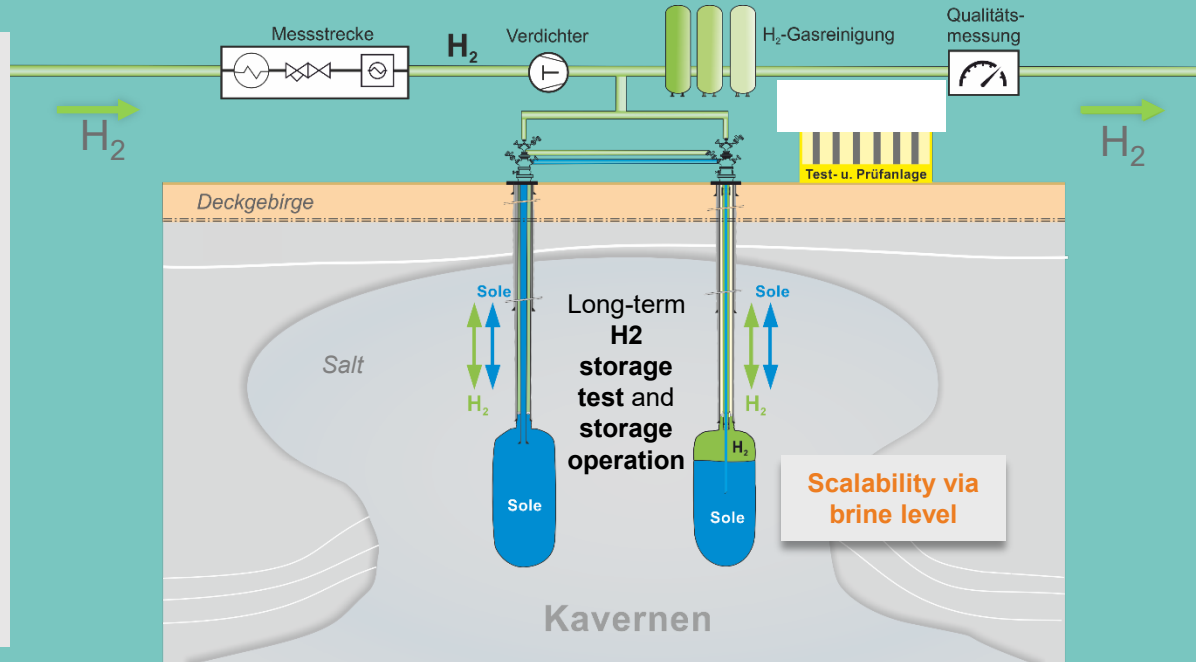
Produktion  
in the region



Import



AGF & Caverns



Grid



SNG

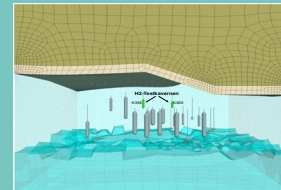
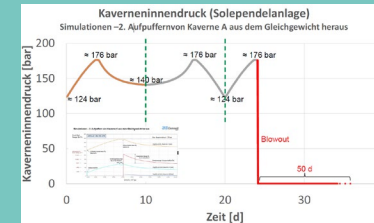
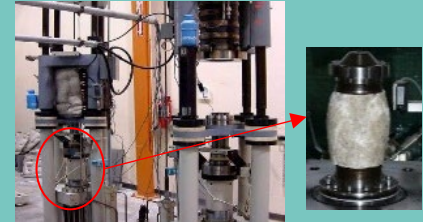


Wasserstoff

Transnational & Regional

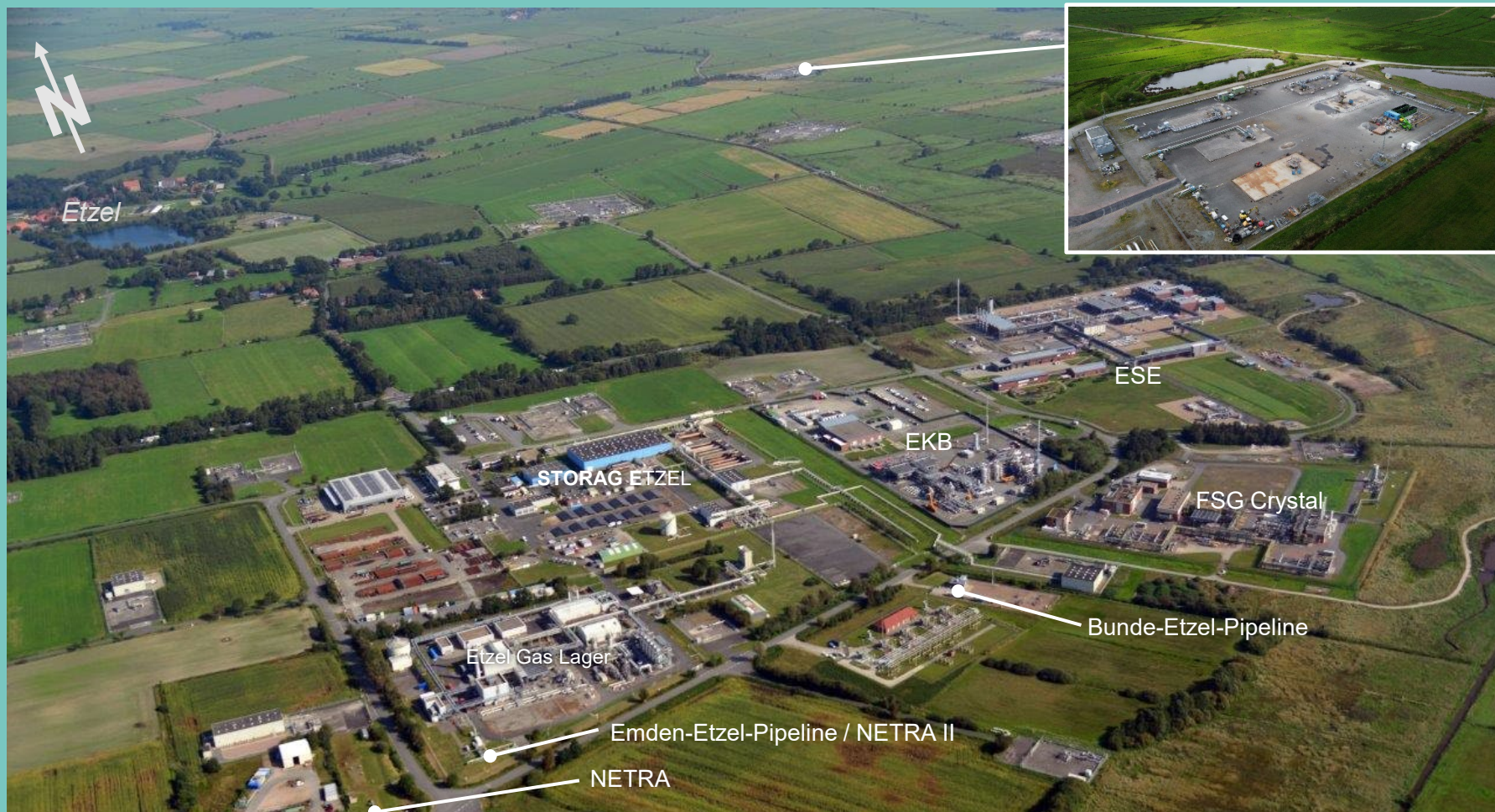
# H2CAST ETZEL SCOPE

- Evidence of **tightness** (salt rock & completion)
- Proof of **material** (fit for purpose)
- **H2 purification**: 1<sup>ST</sup> de-hydration, removal of HC), 2<sup>nd</sup> process & energy consumption AGF
- Volatile multi-cyclical hydrogen **operation** in interaction with other caverns
- Guideline for **approval(s)** in particular Mining Law & Major Accidents Act
- Influence on **H2 Quality**, i.e. H2S, HC, LC
- **Plant maintenance** under high pressure H2 condition & proof of well-integrity
- **Market** availability (Components & Services)
- **System** Integration gas / electricity grid
- **Economics** for transition & operation (CAPEX / OPEX)





## H<sub>2</sub>CAST ETZEL – HYDROGEN CLUSTER PAD „VERTEILER 16“







# A WORLD IN CHANGE. A REGION IN MOVE.

## MITGLIEDSUNTERNEHMEN ENERGY HUB



## ASSOZIIERTE MITGLIEDER ENERGY HUB



WIRTSCHAFT  
WILHELMS  
HAVEN



Land  
Niedersachsen



Stadt  
Wilhelmshaven



Landkreis  
Friesland



Landkreis  
Wittmund



Landkreis  
Wesermarsch

PORT OF  
WILHELMS  
HAVEN  
ENERGY  
HUB

# THE STORY OF THE REGION

## Overseas



Electrolysis



Production  
Electrolysis  
PV & Wind



Conversion  
into hydrogen  
derivates



$\text{NH}_3$   
ammonia

$\text{CH}_4$   
(synthetic)  
methane

$\text{CH}_3\text{OH}$   
methanol

PORT OF  
WILHELMS  
HAVEN  
ENERGY  
HUB

## Wilhelmshaven

Industrial location  
of energy-  
intensive  
companies



Use  
of hydrogen



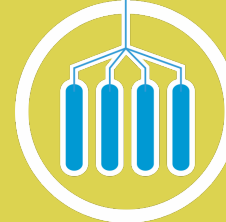
CO2 Export



Conversion  
back to  
hydrogen  
(green / blue)



Transport  
hydrogen  
backbone



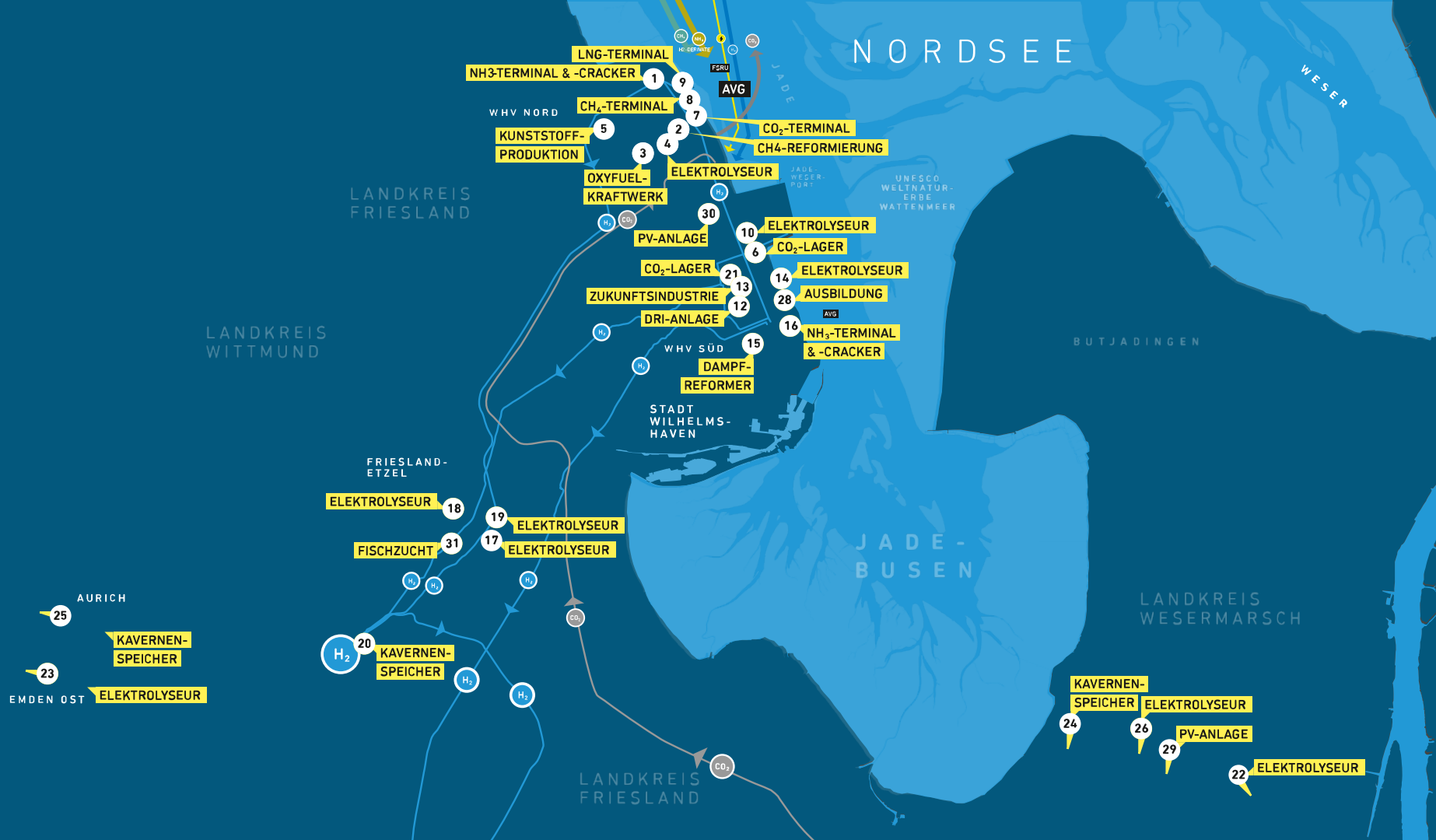
Storage in salt  
cavern

## Germany



More  
than 50 %  
possible

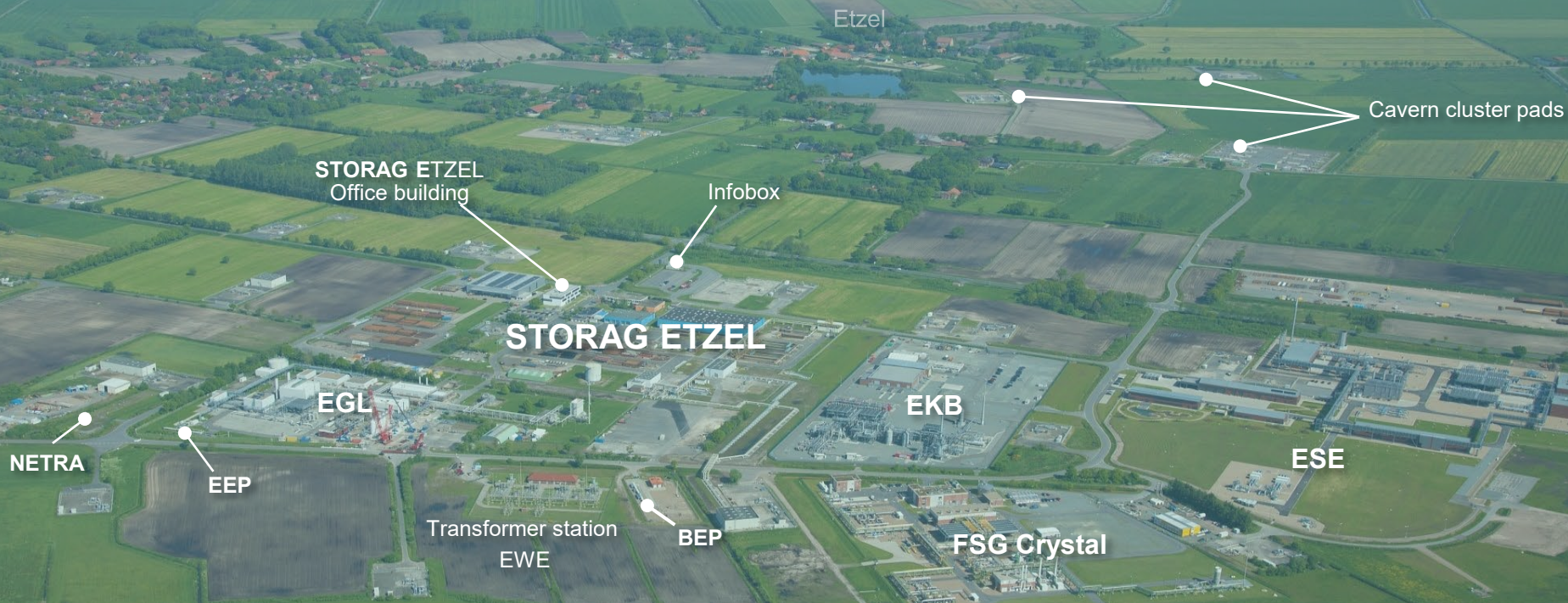








# TOUR CAVERN STORAGE ETZEL





**STORAG ETZEL**

Energy Storage Solutions



**IT'S A LAW OF  
NATURE TO STORE  
EXISTENTIAL  
THINGS SAFELY  
UNDERGROUND.**

# Thank you for your attention !

[www.h2cast.com](http://www.h2cast.com)

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