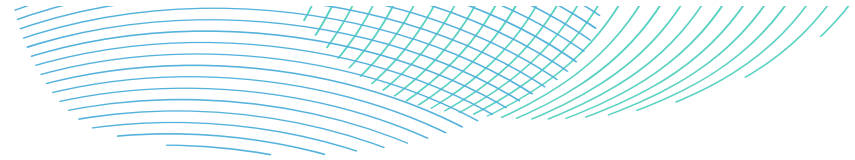


**RWE**

**RWE & The World Of Hydrogen  
December 2024**

A decorative graphic in the bottom right corner of the slide, consisting of a series of thin, light blue curved lines that form a grid-like pattern, curving towards the right and bottom edges.

# INTRODUCTORY VIDEO





# Energy Transition & Green Hydrogen Industry

- The industry is 'nascent' – we are **creating a new industry**, whilst this is **awe inspiring** it is also **challenging**.



# Global Market Situation – Hydrogen Council, 2024

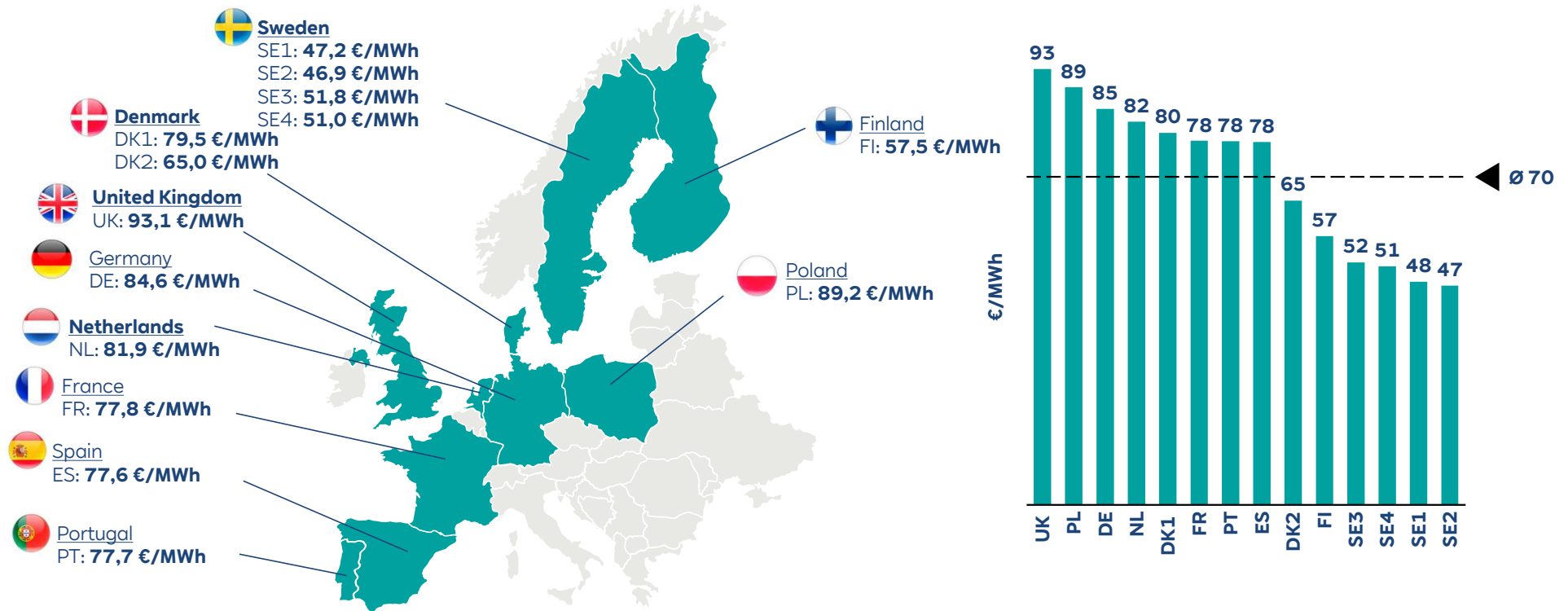
## PROGRESS

- **Clear & effective incentives** are making impact
  - US Tax Credits (Inflation Reduction Act)
- Demand side visibility drives offtake
  - CFD's for  power producers to H2 projects
- Industrial policy driving cost reductions through **deployment at scale**, 
- Project **maturity has grown 20 fold**
  - movement from project announcements to FEED studies being progressed

## HEADWINDS

- **Higher inflation** and **interest rates**
- Supply chain constraints
- **Increased cost of energy**
- **Regulatory framework uncertainty**
  - RED III implementation @ member state level
- Progress lags behind climate commitments
  - **8 fold increase** in progress **required**
- JOINT industry/government role required
  - Incentives & enabling frameworks are required and have a critical role in progress being achieved

# Expected European Base Power prices in the 2030s : Low power prices in the Nordics is a key differentiator



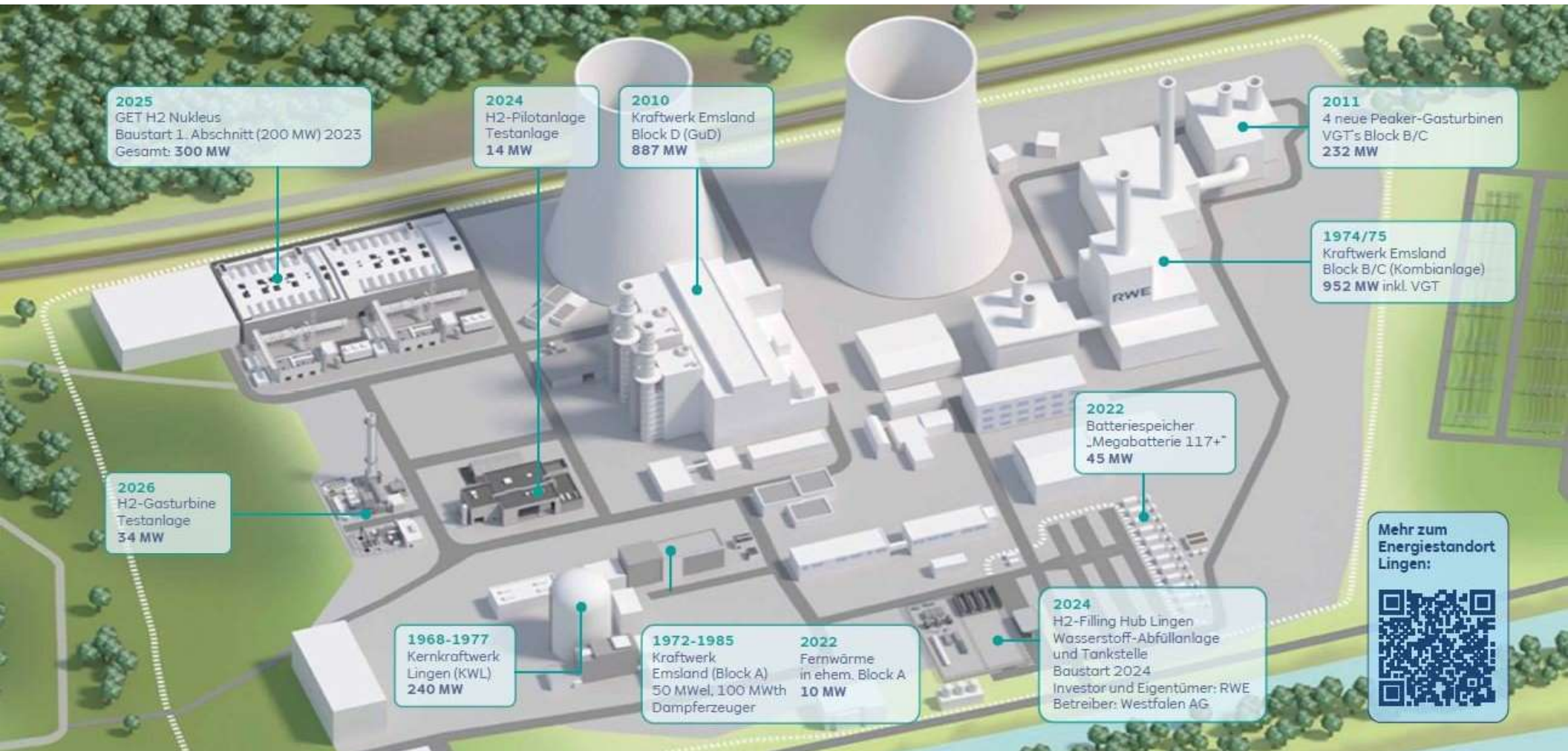
# Lingen Electrolyser Project

- **14MW** Pilot Plant & **300MW** Production Plant (in construction)
- 1<sup>st</sup> mover advantage, **experience** gained -
  - **Procurement** of electrolyzers
  - **Design & Engineering**
  - **Construction**
  - **Commissioning**
  - **Operation**
- All with different OEM's and technologies
- EU, German and State **funding** has supported this development





# Energy Hub Lingen





# Overview of DE hydrogen market



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- **Policy Framework**

- **Ambition – National Hydrogen Strategy 2020** 5GW of installed electrolyser capacity
- **Standards & Certification** – Focus on **green hydrogen** but relaxed requirements in ramp-up phase to include limited amounts of blue, turquoise and orange H2
- **Import Strategy** – requirement to meet demanding targets utilising green and low carbon hydrogen (and derivatives) with up to 70TWh a year being imported by 2030 (circa 50% of total H2 forecast demand)

- **Project Pipeline**

- **Gov target – 2023 Strategy update** stretches target to **10GW** of capacity
- **CFDs** – Climate Protection Contracts Oct '24 €2.8BN to be paid across 15 yr contracts to support corporate decarbonisation efforts – this may include hydrogen utilisation projects. A 2<sup>nd</sup> round is now ongoing

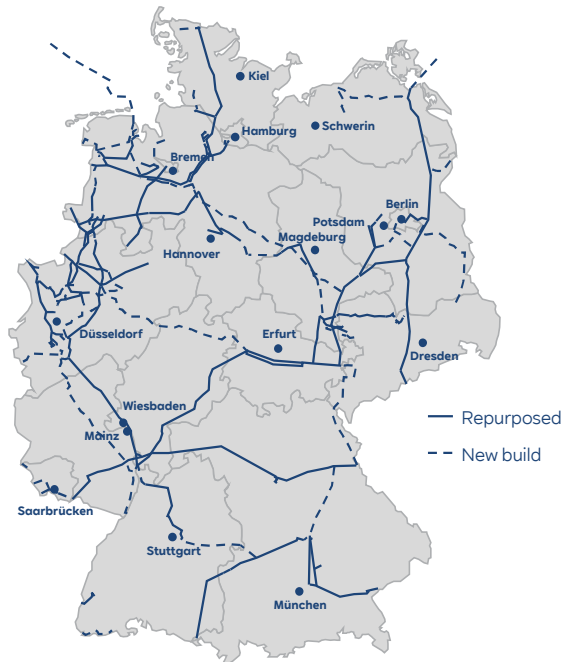
- **Key Challenges**

- **Chicken & egg:** production **costs** are substantially **higher than** consumers are currently **willing to pay**
  1. **Producers:** face regulatory **uncertainties**, an **uncertain** development of demand and a lack of transport and storage infrastructure (today)
  2. **Consumers:** **uncertainty** about the future availability of affordable renewable or low carbon hydrogen and the necessary infrastructure

# German Hydrogen Core Network (“Kernnetz”) acc. to approval on 22.10.2024



## Hydrogen Core Network<sup>1</sup> in 2032

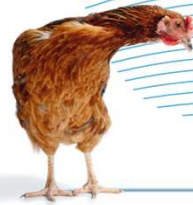


## Key Facts

- The **Hydrogen Core Network** connects the most important industrial centers, storage and production sites in all federal states, as well as border crossing points to neighboring countries for imports.
- Key Facts **Hydrogen Core Network**:
  - 9,040 km in length
  - Ca. 60 % repurposed pipelines
  - € 18.9 bn investment costs
  - Entry capacity around 101 GW, exit capacity around 87 GW
- Target year for completion is **2032** – however, for pipelines commissioned after 2027, this may be postponed to **2037** as part of the regular NDP<sup>2</sup> process.

<sup>1</sup> acc. Approval of BNetzA on 22.10.2024 | Please note that pipeline routes may not be displayed accurately | <sup>2</sup> Network Development Plan

# But it is all quite simple...



## Fields of action for the 2023 update of Germany's National Hydrogen Strategy

**Ensure sufficient hydrogen supply**

**Establish hydrogen infrastructure**

**Establish hydrogen applications in industry, transport, electricity, heating**

**Create good framework conditions**



**short-term**

**medium-term**

**long-term**

# Eemshydrogen Plant

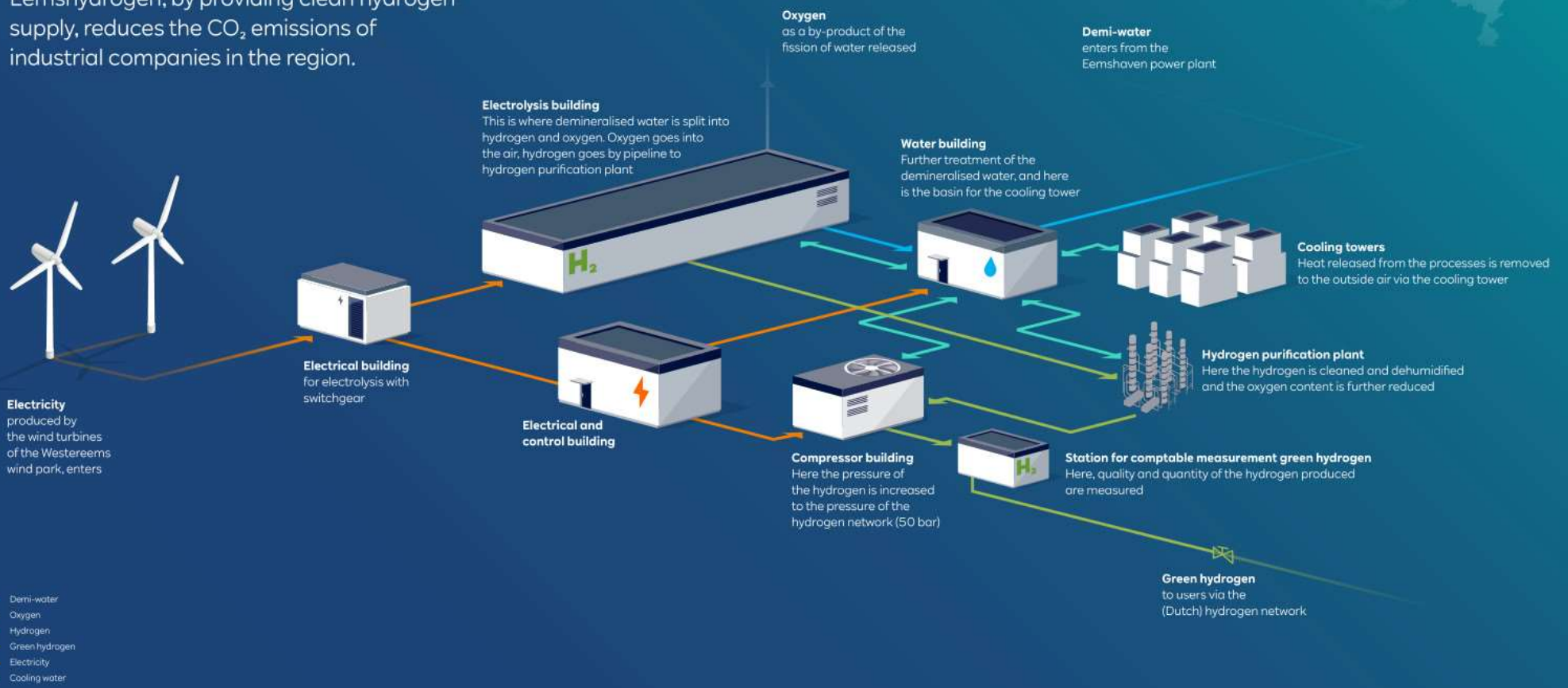
- 50MW electrolysis plant
- **Value chain** coverage, supplied by green electricity from adj. RWE Westereems wind park (recently repowered)
- The Netherlands Agency Enterprise (RVO) has granted RWE a funding commitment of **€124.9 million** for the Eemshydrogen project (**OWE funding** allocation)
- Connection to the NL hydrogen pipeline network
- RWE has launched an **offtake tender** for f/c delivery from 2027





## Eemshydrogen

Eemshydrogen, by providing clean hydrogen supply, reduces the CO<sub>2</sub> emissions of industrial companies in the region.



# Overview of NL hydrogen market



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- **Policy Framework**
  - **Ambition** – 2030 NL wants to achieve 3-4 Gigawatt of electrolysis capacity, together with the needed storage and infrastructure
  - **Funding mechanisms** – Main funding scheme is the OWE (Upscaling hydrogen production)
    - 2024 budget of €1bn - €3bn has been bid! **There are producers out there...**
  - Dutch Government is in early stages of researching a **funding scheme for offtakers**
    - to further decrease the gap between production/sales prices and the willingness to pay
- **Project Pipeline**
  - **Gov target 2032 Governmental targets stretch to 8GW**
- **Key Challenges**
  - **Upscaling the hydrogen economy has several challenges**
    1. the **high LCOH** contrasts with **low willingness to pay**
    2. pipeline infrastructure **delays**
    - 3. slow pace** in implementing regulations (RED III and refining route) are most crucial
    4. GRID: emergency measures aimed at relieving pressure on the **overfull power grid**

# Sweden vs the Rest of the World

- *in summary*

