Driving the energy transition:
a view from future operator perspective

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HyCC

Enabling emission-free industries

Our Vision & Mission

To enable the full **decarbonization of industry** and the transition to a truly circular economy, by supplying safe, reliable and affordable **green hydrogen** supplies and circular **chemistry solutions**

HyCC

Joining forces to create a new leader in green hydrogen

NOBIAN

Leader in essential chemicals with 100+ years experience in electrolysis

MACQUARIE | Green Investment Group

Global investment group focused on accelerating the green transition

50%

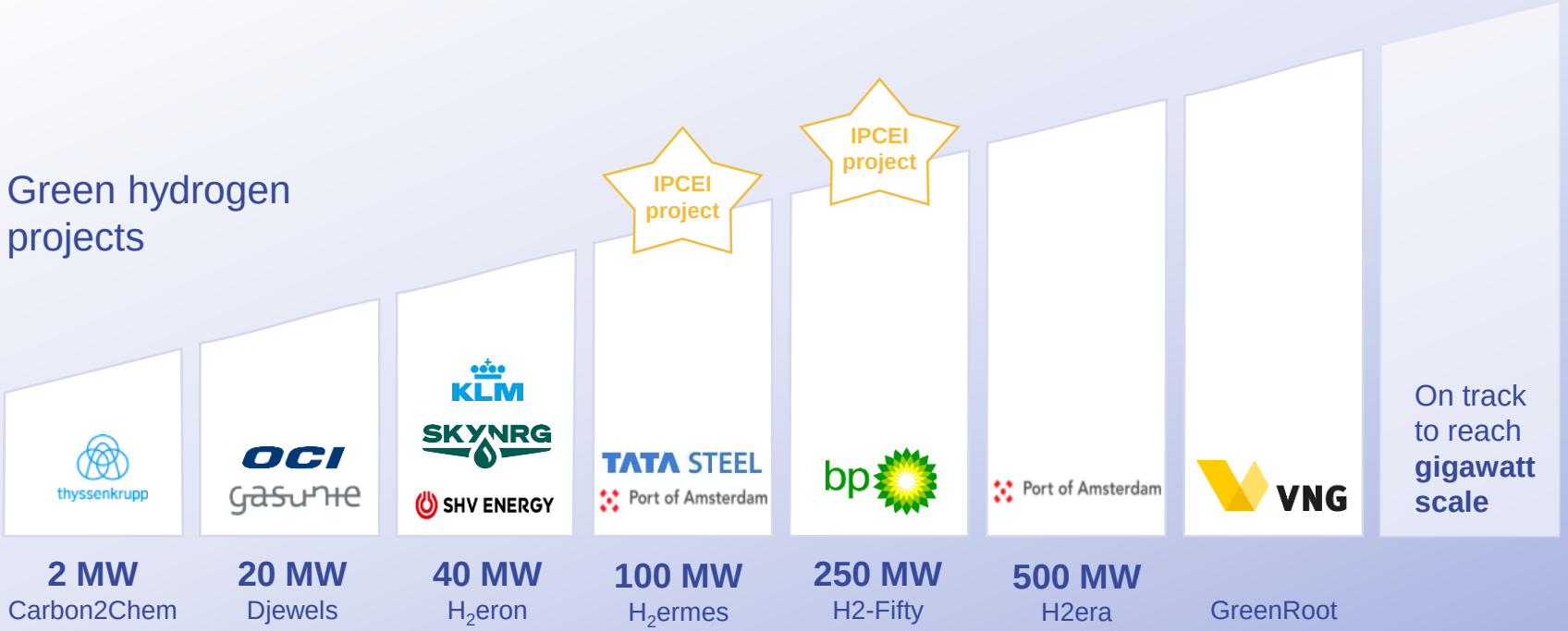
50%

HyCC

The Hydrogen Chemistry Company

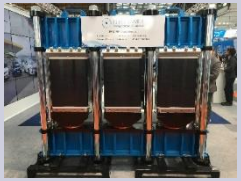
A leading provider of green hydrogen and circular chemistry solutions with over 1 gigawatt under development.

Strong pipeline built on robust customer engagement



Technology introduction

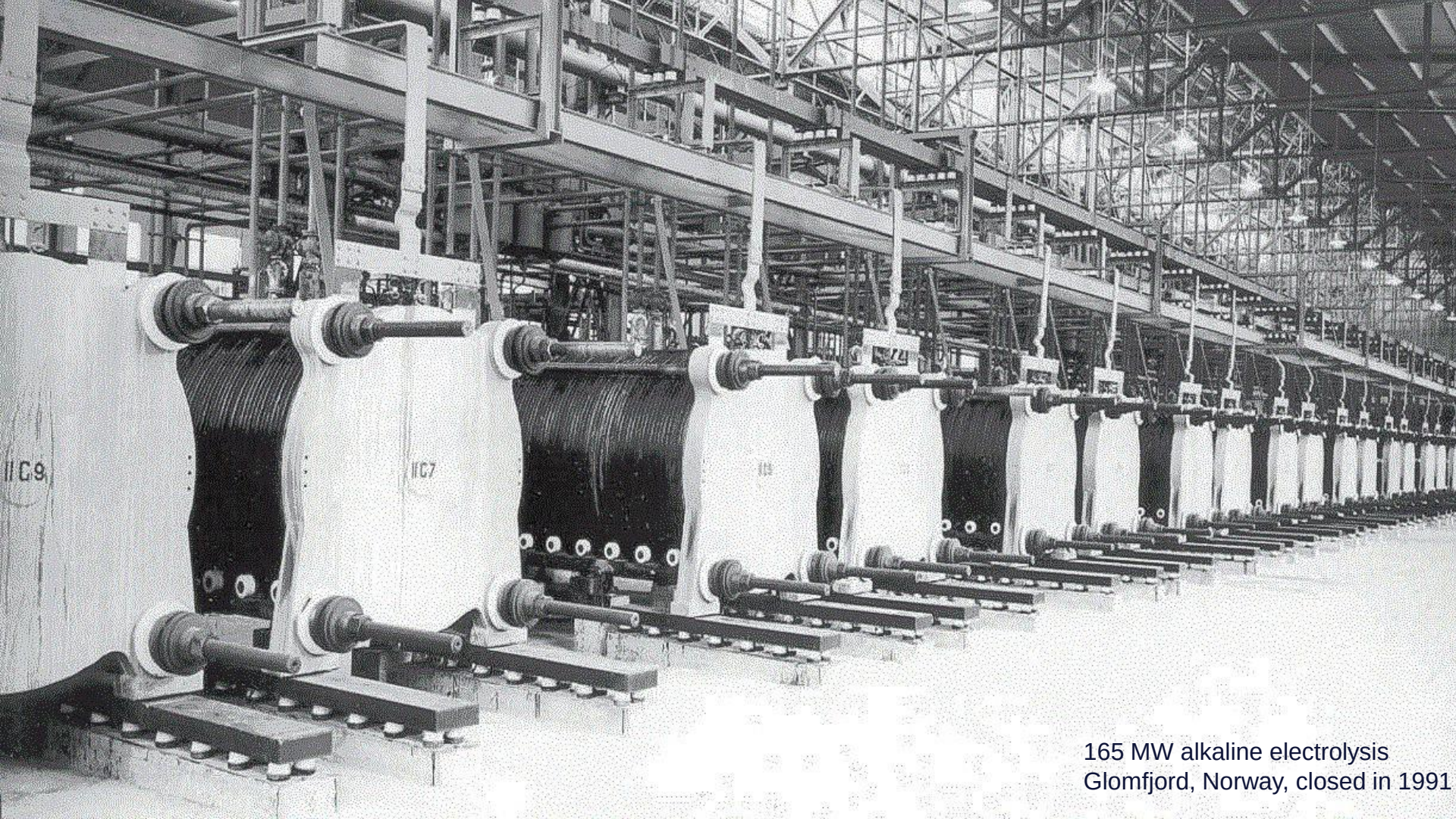
Key electrolysis technologies

	Alkaline	PEM	Solid oxide	AEM
				
Stack size (MW)	1 – 10	0.5 – 2.5	~0.01	0.0025
Largest operating plant (MW)	150 Ningxia (China)	20 Bécancour (Canada)	0.72 Salzgitter (Germany)	0.02 Rozenburg (Netherlands)
Key strengths	Not dependent on noble and rare earth metals	Compact and flexible	Efficient	Combines strengths of alkaline and PEM

“Ready” for large-scale (but not TRL 9)

Need for more development

Building hydrogen plants: how difficult can it be?



165 MW alkaline electrolysis
Glomfjord, Norway, closed in 1991

90 MW 30 bar alkaline electrolysis
Kwe Kwe, Zimbabwe, closed in 2015

Limited innovation in the past 90 years…

1931

Today

21st century challenges

- Safety
- Flexibility
- Electrolyte quality management

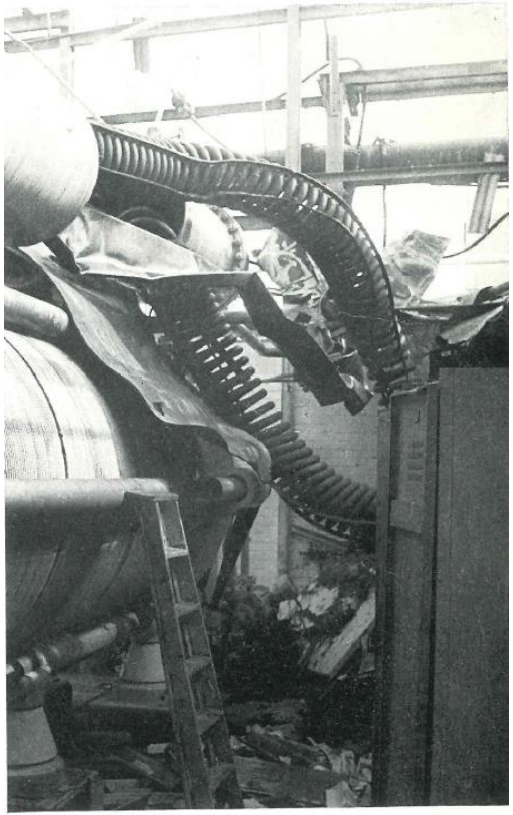
Safety

- Water electrolysis is a technology that has significant safety challenges, due to the simultaneous formation of hydrogen and oxygen
- Increased 21st century safety standards make that we cannot just rebuild the plants as we did in the 20th century
- We are working with suppliers and our peers to develop proper safety practices for water electrolysis: we do not compete on safety!

Institute for Sustainable Process Technology

Green Hydrogen Inherent Safety Practices on Industrial Scale

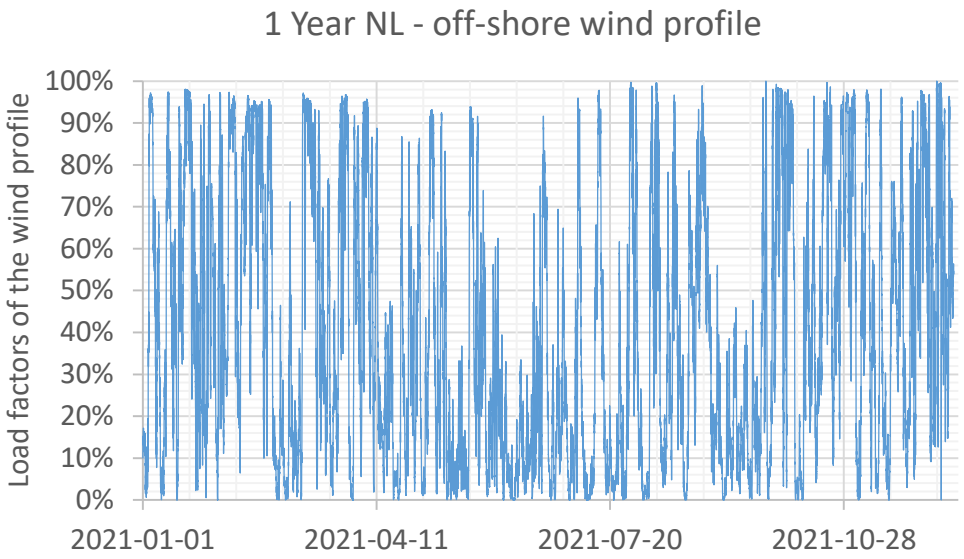
WVIP



Source: the explosion at Laporte Industries Ilford, 1975

Flexibility

- 20th century plants were based on constant hydropower, new electrolyzers need to breathe with wind and sun
- Ramp speed not a problem: <10%/min required
- Challenge is allowable minimum load and number of shutdowns (~1 time per day)



Source: PBL, Eindadvies basisbedragen SDE++ 2022

Eletrolyte quality management

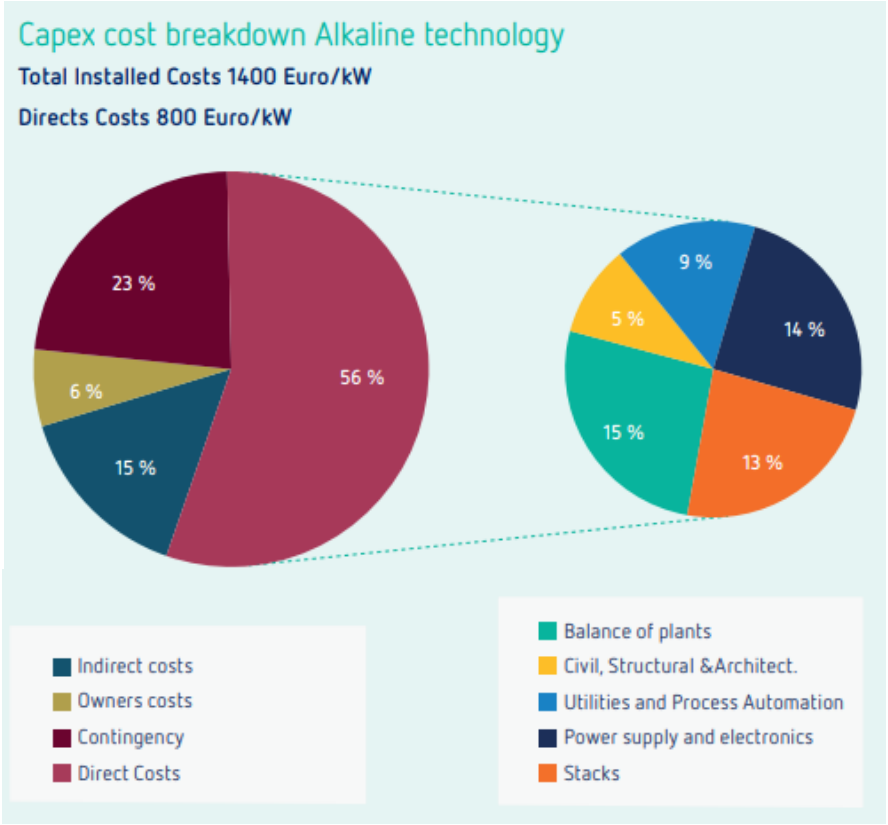
- Decades of research in the field of chlor-alkali have resulted in high performing cathodes that can also be used in alkaline water electrolysis
- Yet, these electrodes are vulnerable to electrolyte impurities, especially iron
- Electrolyte quality management limits material choice in balance of plant

Photo: 200 MW chlor-alkali facility of Nobian in Rotterdam

A non-technical challenge: unrealistic price expectations

- CAPEX values in public reports are often underestimated, since total project costs are not properly considered

- As a result, the current expectations for green hydrogen prices in public reports are too optimistic.

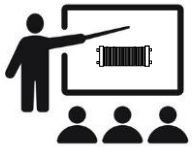


Source:

HyCC Operations & Asset Management

O&M strategic goals on green hydrogen

Growth

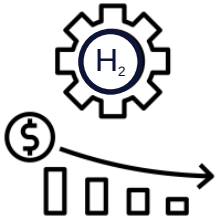


Be regarded as a O&M leader

Able to ensure that the best companies/contractors are selected

Set O&M standardization

Cost



Have top class LCOH understanding

Have top quartile O&M expertise

Accelerate implementation of new technologies

Reliability

Develop smart autonomous plants

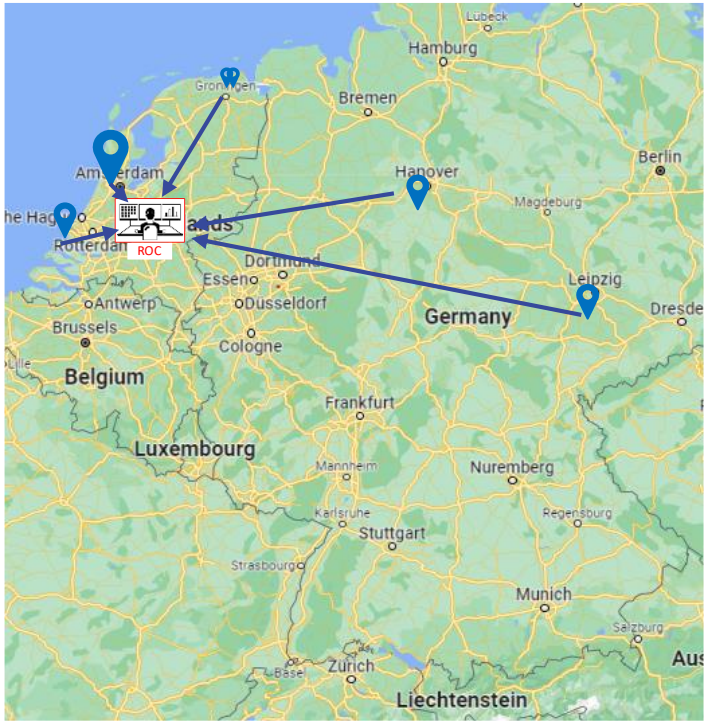
Be regarded as a leading company in safety

Be regarded as a reliable supplier of green hydrogen

HyCC, a new operator building on decades of experience

Building a chemical company from scratch enables us to make clear choices on what we focus on:

- Remote supervision of autonomous plants
- Highest safety, efficiency & reliability due to full data integration
- Strong partnerships on non-core activities
- Technology leader on operational electrolyzer knowledge



Intention of partnership Stork - HyCC

- First of its kind in our industry; Stork is an integral part of our way of working
- High benefits of involving maintenance in early stages of the projects
- Realizing autonomous operation with unmanned plants
- Scope of the intended partnership
  - Deliver the Blue print for Asset and maintenance management to be used for all plants
  - Maintenance representative in projects
  - Be the custodian of our assets
  - Be the local maintenance and operations support company

Thank you

HyCC