



# H2-AMP: Advanced Materials for PEM Electrolyzers

Kathy Ayers  
Vice President of R&D  
Nel Hydrogen



# 90+ years of experience in electrolyzer technology

- Strong field know-how & manufacturing capacity

- Alkaline electrolysis: established in 1927
  - >800 systems fielded
  - 2 production sites in Norway
  - Herøya plant capacity scalable to 2 GW/year
- PEM electrolysis: established in 1996
  - >2700 systems fielded
  - Production in Wallingford, CT
  - Capacity scalable to ~150 MW/year with current plant footprint
- Hydrogen fueling: established in 2003
  - 50+ stations delivered
  - Production in Herning, Denmark
  - 300 station/year capacity

## Manufacturing Sites

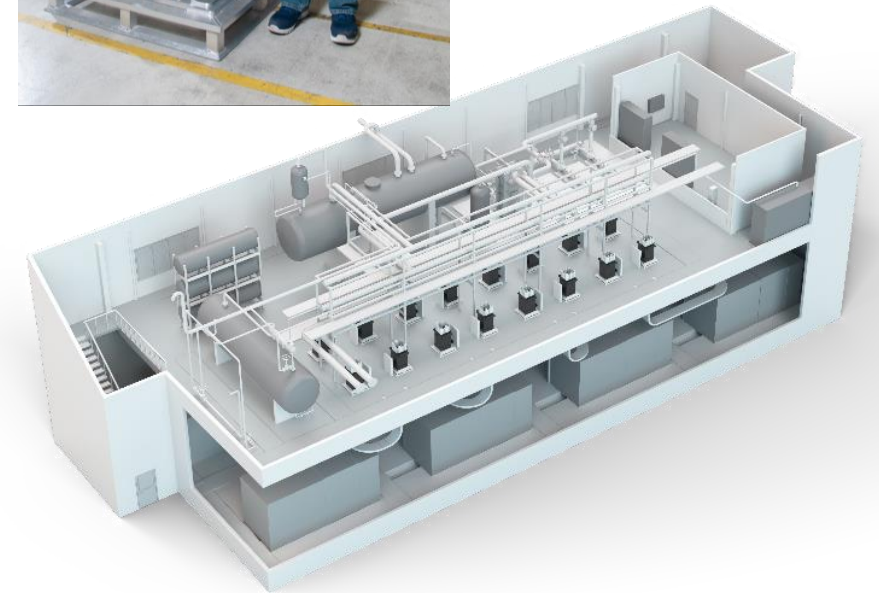




# Product scale – both at MW scale



Alkaline



PEM

# Scale up needs

- Catalyst thrifting important to mitigate volatility but not the lead issue today
- General scale up of component supply chain
  - Limited base of manufacturers
  - Raw material bottlenecks
- Advanced manufacturing development
  - Increased throughput
  - Decreased material usage
  - Quality control development
- Recycling – lifecycle becomes more critical as more waste is generated
  - Rare materials
  - Environmental hazards (e.g. PFAS)
  - Plastics – liners etc.

# Funding priorities – materials and manufacturing

- Many electrolyzer components are still adapted vs. designed to use
  - Membranes need better creep properties in fully hydrated cells at pressure
  - PTL/GDL materials optimized for liquid water/gas management
- Design for manufacturability
  - Matching of design feature functions and methods of fabrication
  - Additive vs. subtractive where possible
- Continuous flow
- Automation
  - Part handling/subassembly
  - Machine learning/quality control

# Accelerating materials development

- Partnerships need to start very early in the process
  - OEM involvement essential
- Define the right requirements up front
- Seeing is believing
  - Experience in our processes
  - Integration in our designs
- Realistic test bed for materials and components
  - Pressurized operation
  - Understanding of field conditions – including intermittent use

number one by nature