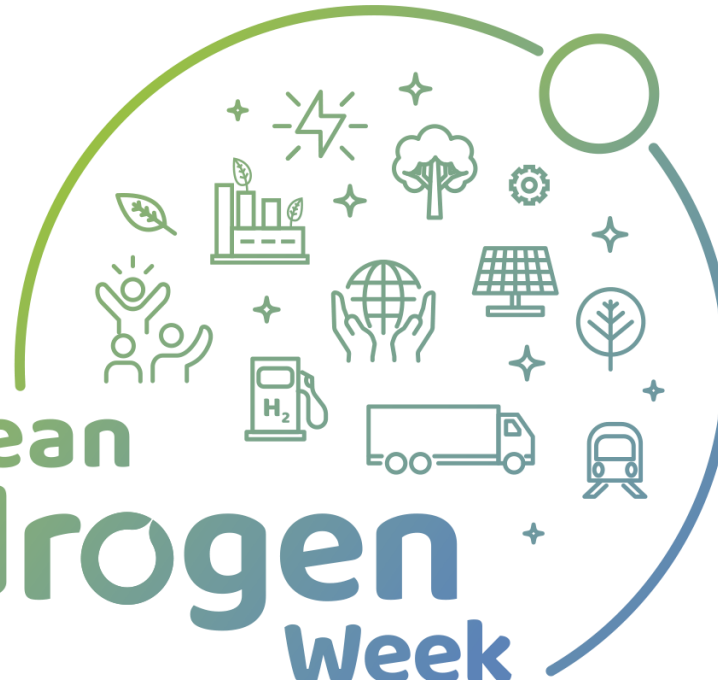


REFHYNE

- Clean Refinery  
Hydrogen for Europe



European  
**Hydrogen**  
Week



Anders Ødegård

SINTEF

[www.refhyne.eu](http://www.refhyne.eu)

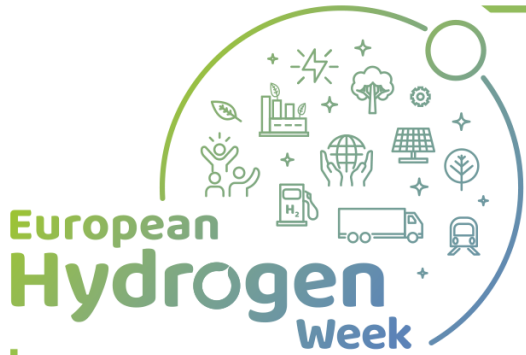
[ando@sintef.no](mailto:ando@sintef.no)



EUROPEAN PARTNERSHIP



#EUResearchDays  
#PRD2022  
#CleanHydrogen



# Project Overview

- Call year: 2017
- Call topic: Topic 2.5 - Demonstration of large electrolyzers for bulk renewable hydrogen production
- Project dates: 01/01/2018 - 30/06/2024
- % stage of implementation 01/10/2022: 60%
- Total project budget: 20 M€
- Clean Hydrogen Partnership max. contribution: 10 M€
- Other financial contribution: -
- Partners: Shell Deutschland, ITM Power Ltd, Element Energy, Sphera, SINTEF



EUROPEAN PARTNERSHIP



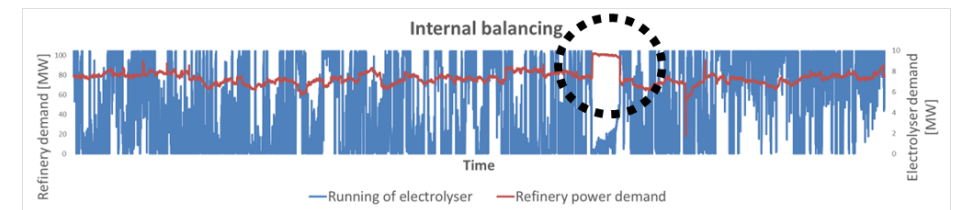
Co-funded by  
the European Union

# Project Summary

## Objective

- Deploy and operate a 10MW electrolyser in a Power to Refinery setting.
- Validate the business model for using green hydrogen as input to refineries, as well as providing primary and secondary grid balancing
- Provide input to the policy/regulatory changes needed to underpin the hydrogen market.

=> First of a kind full integration of a MW-sized PEM electrolyser in a refinery (industrial) process plant



# Project Progress - Installation & Operation

Oct 2021 - First hydrogen  
provided to the local  
hydrogen network

2019

Permit approval,  
ground-breaking



2020

Stack manufacturing,  
building construction



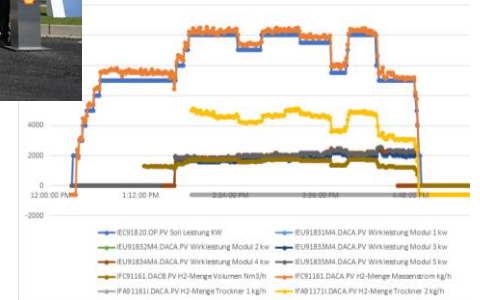
2021

Completion &  
inauguration



2022

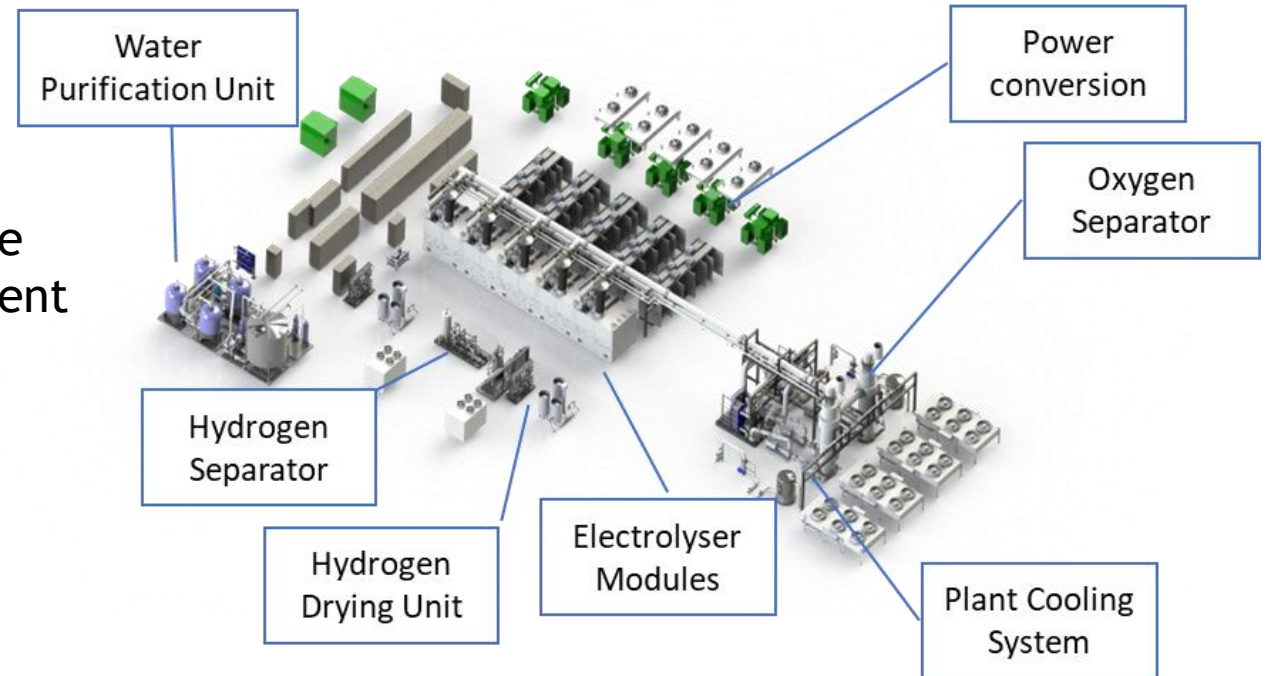
System testing  
& operation





# Risks and Challenges

- Lack of suitable BoP components
  - Most of the challenges experienced have been related to peripheral/BoP equipment
- Up-scaling of all system elements
- Overall costs
- Communication software integration
- COVID-19 restrictions
- High electricity prices



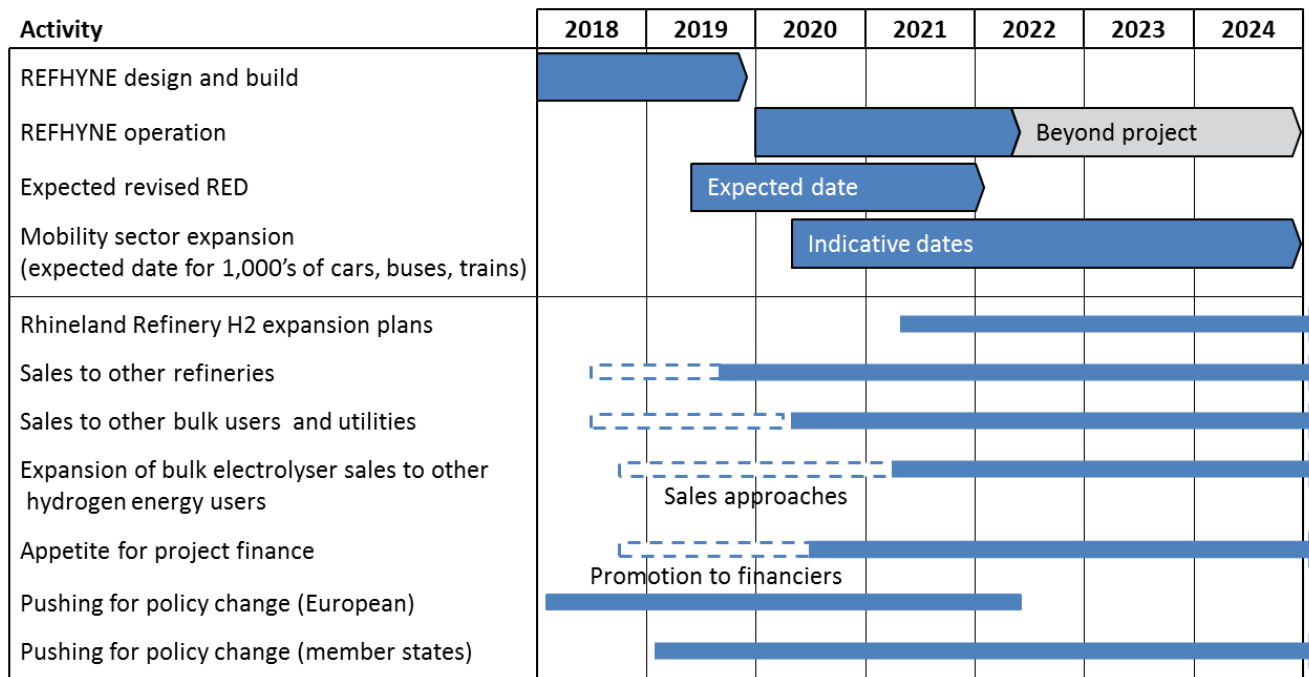
# Lessons Learned

- **Mature industry and (relatively) new technology**  
(e.g., industrial/site standards vs. no/few standards)
- **Bringing together SME and mature large industry**  
(e.g., work practice and culture)  
=> cooperation with experienced industry on handling huge/complex projects, process development/engineering and hydrogen safety aspects
- **Many actors involved**  
(e.g., engineering/design, suppliers, sub-contractors, ...)  
=> close cooperation, good and frequent communication
- **Additional to technical competence/resources:**  
Legal, permitting, industrial scale procurement, financing



# Exploitation Plan/Expected Impact

## Exploitation



## Impact

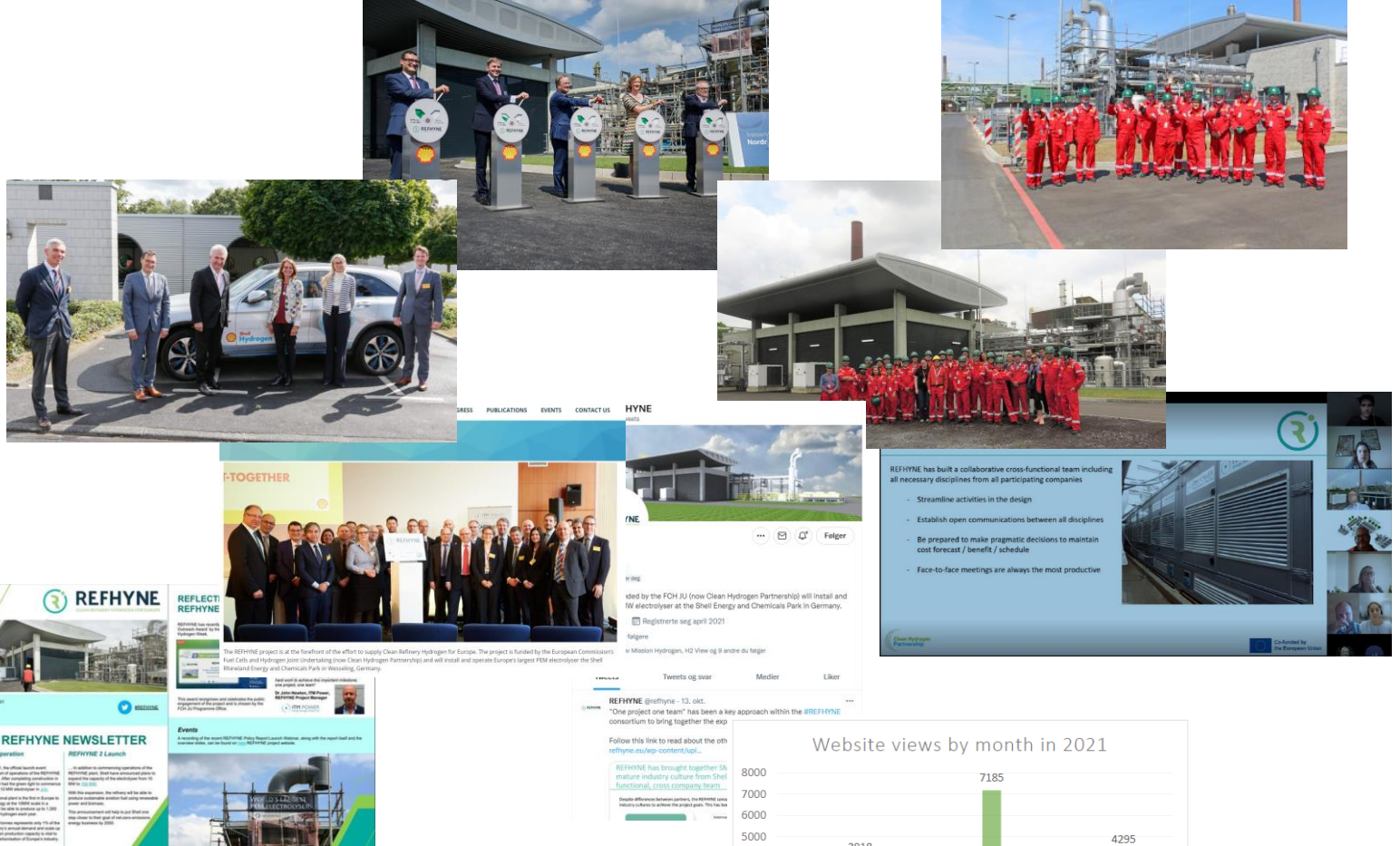
- Lessons learned for future project execution, design and manufacturing
- Starting a real market for hydrogen
- Input to development of policies and regulations
- Further large-scale electrolyser projects, e.g., REFHYNE 2 - 100 MW



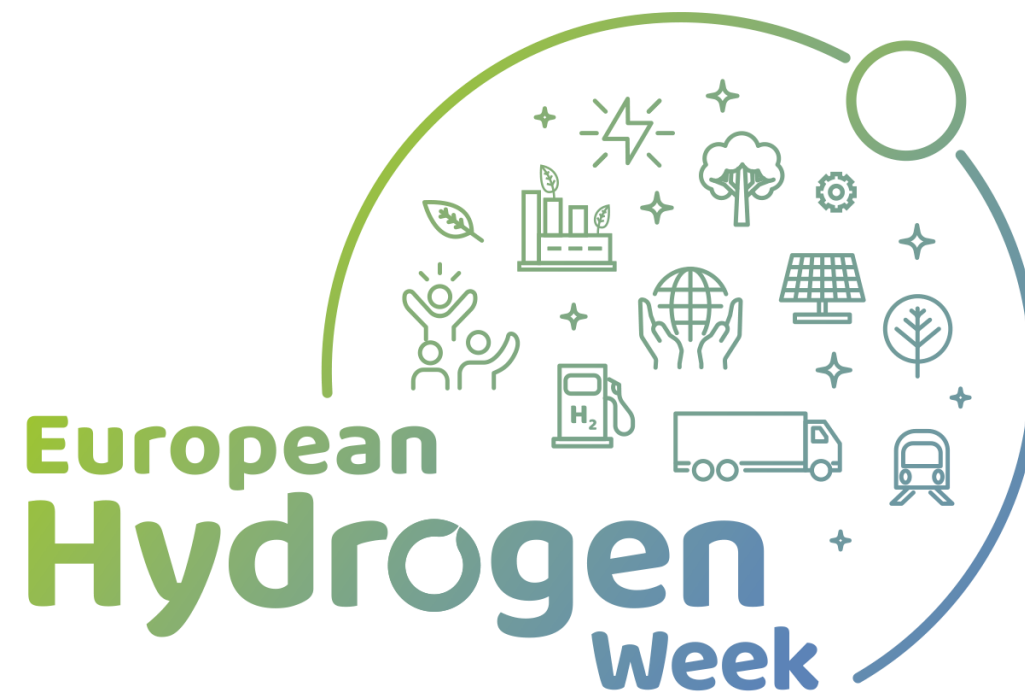


# Communications Activities

- Site visits at Refinery
- High level meetings
- Presentations at industry events and conferences
- Organised webinars
- Project newsletter
- Press releases
- Twitter account
- Project Website







EUROPEAN PARTNERSHIP



Co-funded by  
the European Union

#EUResearchDays  
#PRD2022  
#CleanHydrogen