



University of Antwerp
| TPR | Department of Transport
and Regional Economics

Greening ports: challenges, opportunities and best practices

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- **Challenges and opportunities**
- **PIONEERS cases**
- **WPSP best practices**



Challenges and opportunities

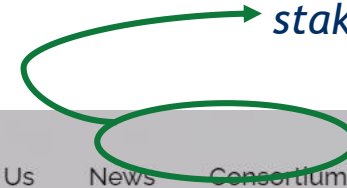
- **No 'one size fits all'**
- **Strong business case**
- **Partnerships**
- **Little known about failures**
- **Investment only when technology is ready**
- **All types of cargo / passengers**
- **Public or private or PPP**

Most common initiatives

- **Sustainability reports**
- **Facilitators**
- **Cold ironing**
- **Renewable energy**
- **Alternative fuels**
- **CCUS**
- **Local environment and sustainability**
- **Green port dues**
- **Digitasiation**

<https://pioneers-ports.eu/>

Receive updates on the project through our stakeholder community network!



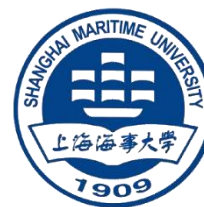
Portable
Innovation
Open
Network for
Efficiency and
Emissions
Reduction
Solutions

www.pioneers-ports.eu

 PIONEERS_EU

 PIONEERS

PIONEERS' 46 PARTNERS




Green port demo's Antwerp

Demonstrations in real port environments of solutions and innovations related to green energy production, distribution and supply


WP4 partners:




Identification and tackling non-technological barriers




Green Hydropower Platform for Port Infrastructure




Realisation of a hydrogen refuelling infrastructure



Corridor of modular docking stations for energy containers



Battery storage & smart mgmt of green energy in terminals

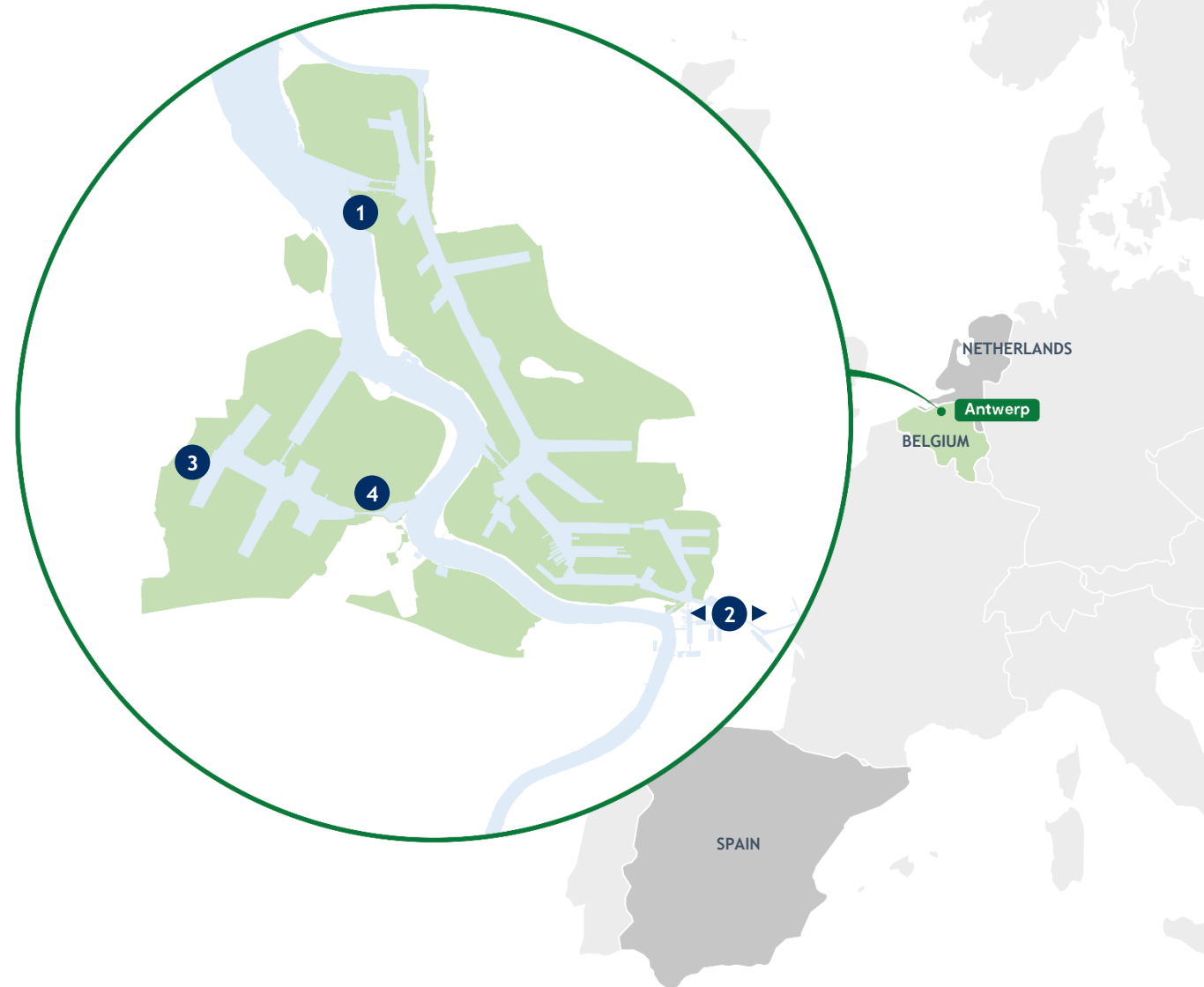


Integration with other innovations in the PIONEERS ports



Location of the WP4 demo's

- 1 Hydrogen refuelling infrastructure
- 2 Corridor of modular docking stations for energy containers
- 3 Battery storage and Smart Management of Green Energy in terminal operations
- 4 Hydropower Turbine

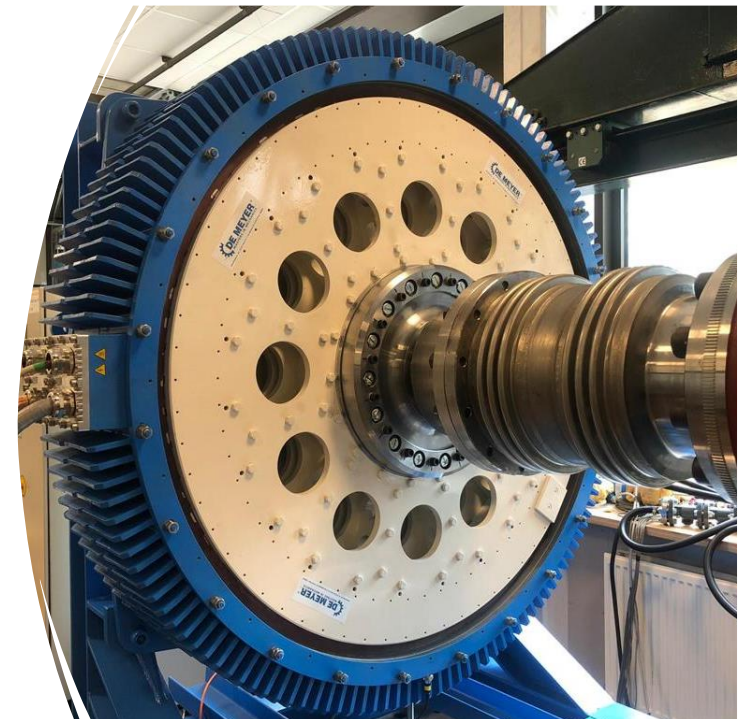
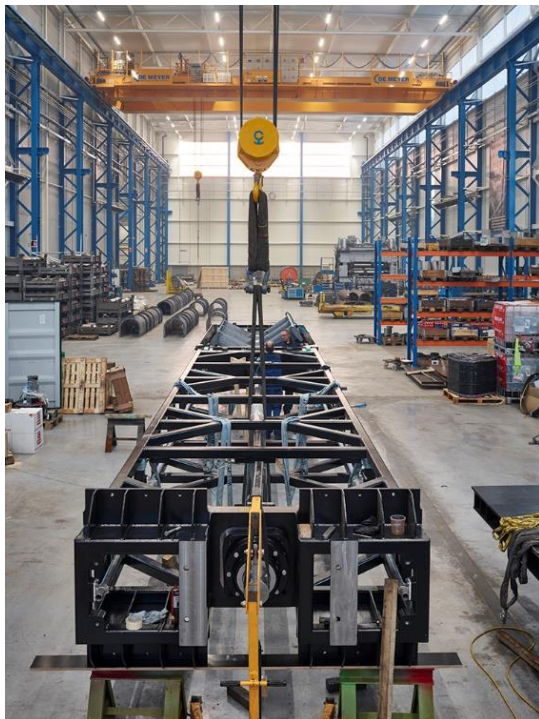


Integrated Green Hydropower Platform for Port Infrastructure - De Meyer



Lead partner: De Meyer NV - Masters in Mechanics

Objective is to develop and demonstrate an end-to-end solution to convert energy from water to electricity, specifically in port infrastructure



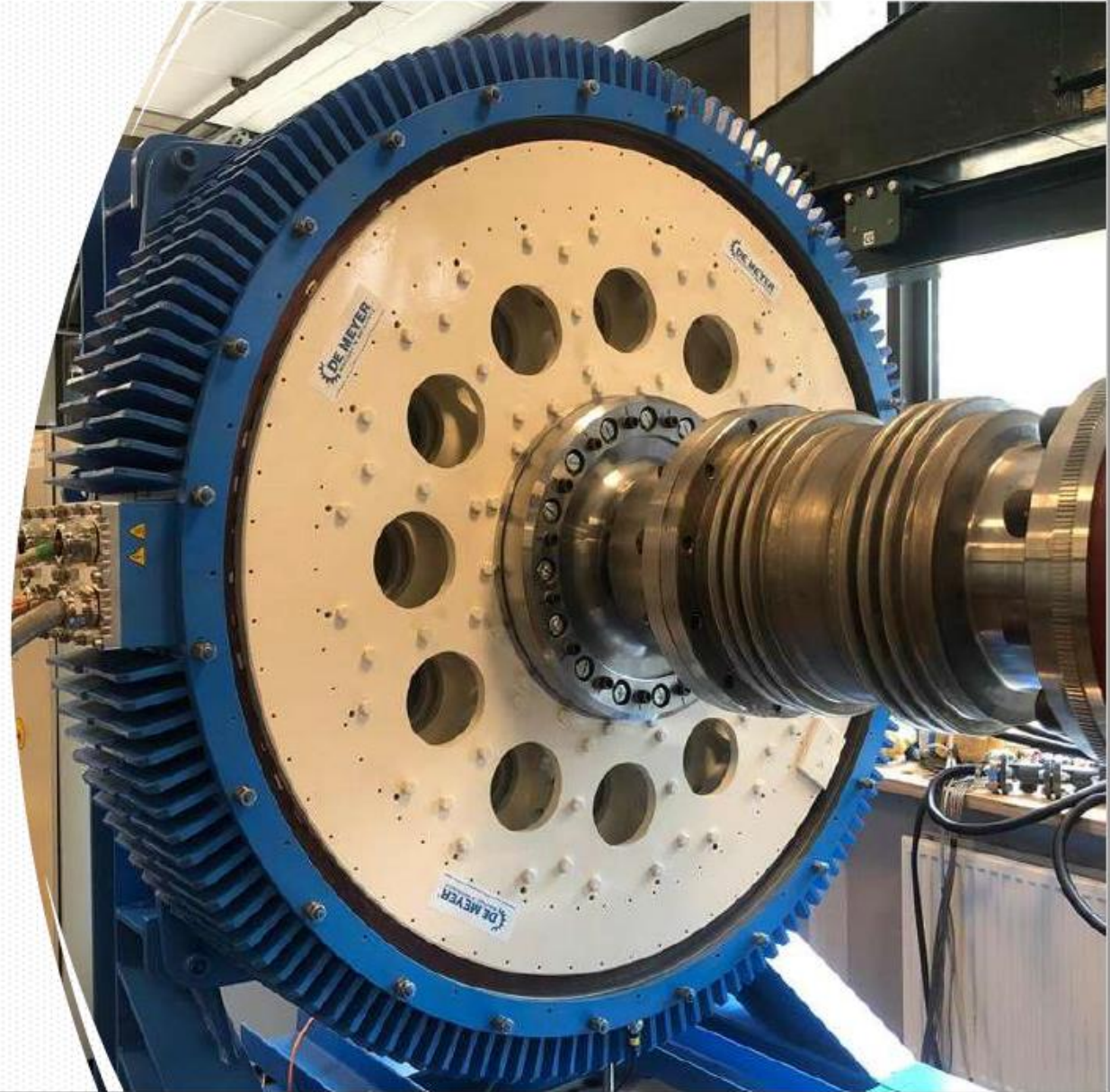


Integrated Green Hydropower Platform for Port Infrastructure

- Back in 2017, De Meyer NV deployed a successful Hydropower Turbine Prototype in the 'Kallo Lock' (PoA)
- Result: Proven energy potential of 150 kW from one 3-blade turbine installed in a bypass sewer of the Kallo Lock

Integrated Green Hydropower Platform for Port Infrastructure

In 2021, De Meyer NV
completed a modular, axial-
flux engine/generator to
complete the Hydropower
installation.
(PowerGen)



From Wind to Straddle - Air Liquide

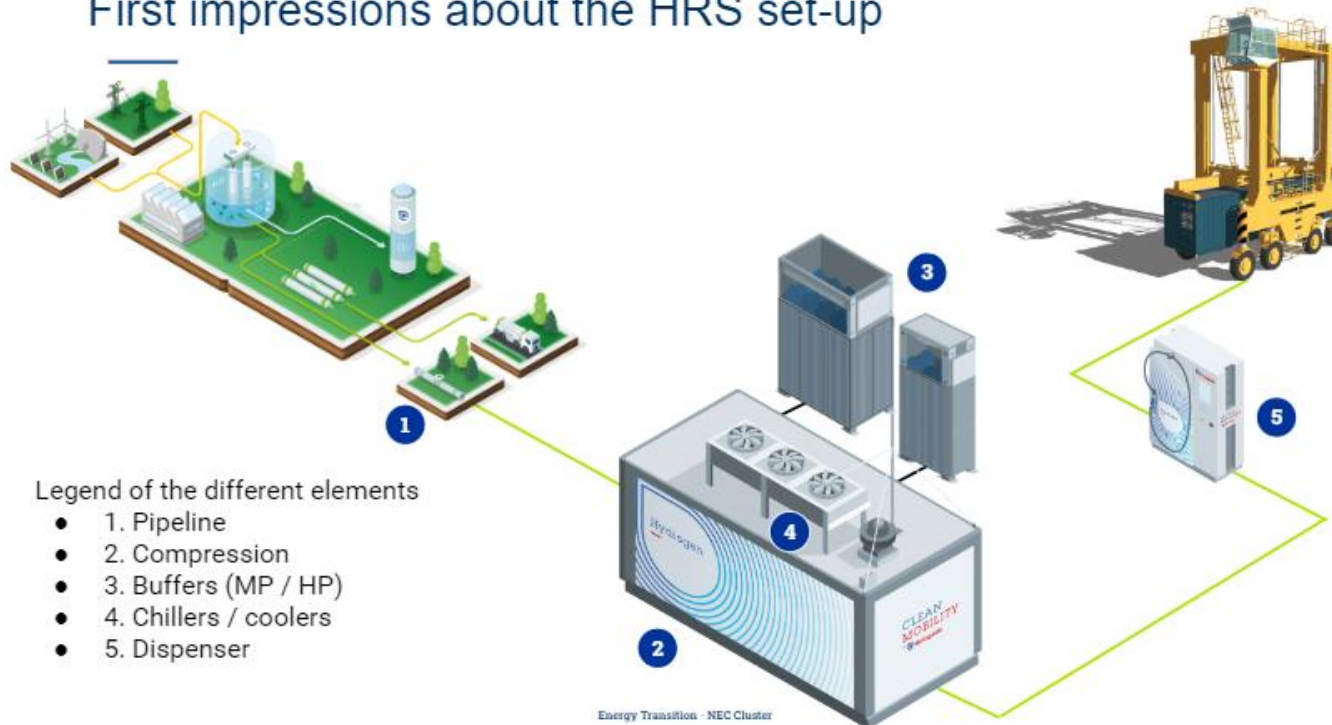


Air Liquide's +40 years' hydrogen expertise at the service of the PIONEERS project:



- Energy sourcing
- Core business: production & distribution of hydrogen
- Solution development → Providing the required refueling infrastructure in order to decarbonise PSA Antwerp's fleet of straddle carriers & support a relentless operation of the terminal (currently powered on diesel → equivalent consumption > 100kg H₂/day/straddle carrier)

First impressions about the HRS set-up



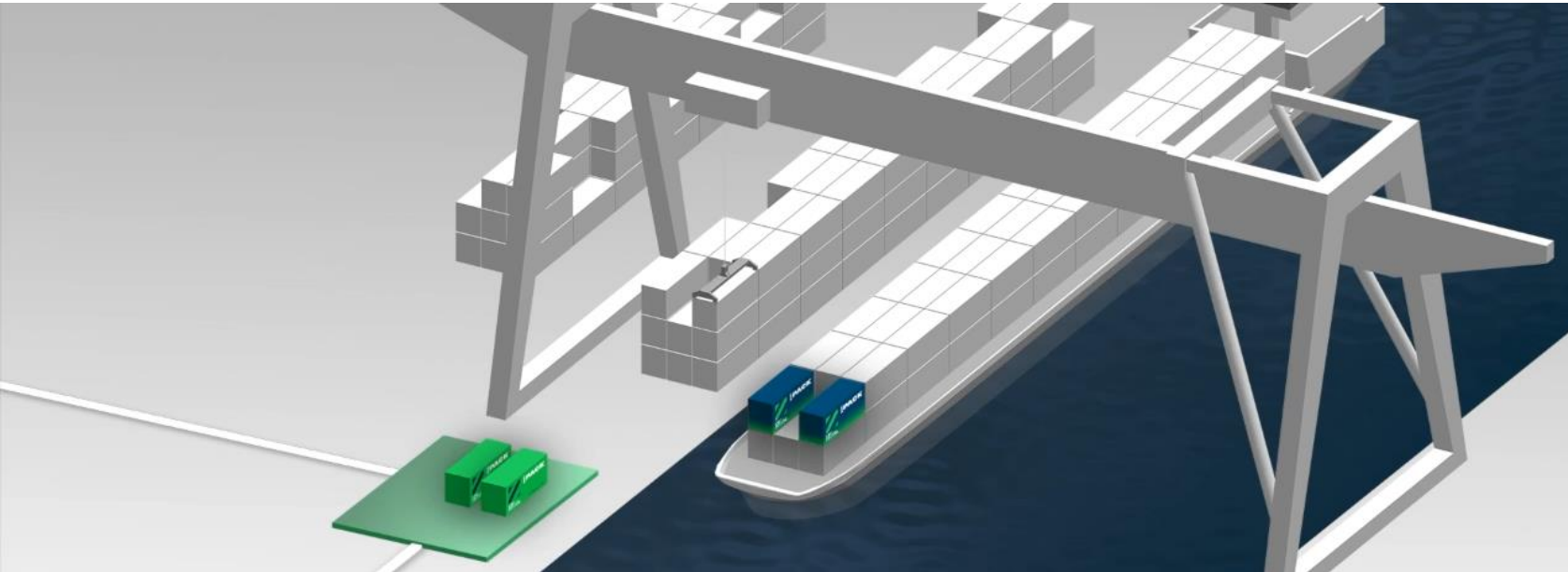


Engineering and demonstration of 350 bar, high speed hydrogen refuelling station for straddle carriers:

- Operations
- Refuelling process

→ (possible) links to Green Straddle Carriers (Task 5.4) and Modular Docking Stations for Energy Containers (Task 4.4.)

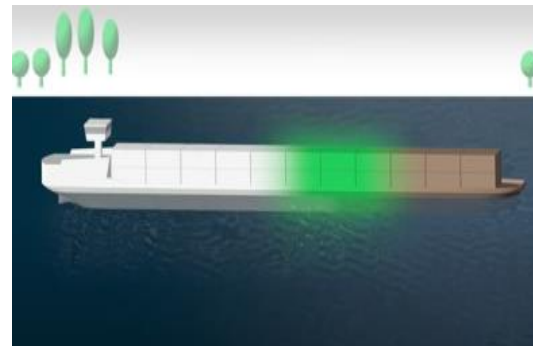
A corridor of modular docking stations for energy containers - Zero Emission Services



Exchangeable energy containers

Charging infrastructure & grid balancing

Pay per use business model



Electric propulsion of barges by means of battery containers

- Modular Energy Concept:
 - Barge with electric propulsion
 - 20' battery container
 - Docking station
 - Important side conditions:
 - Standardization and open access
 - Green electricity
- **Emission-free inland waterway transport**



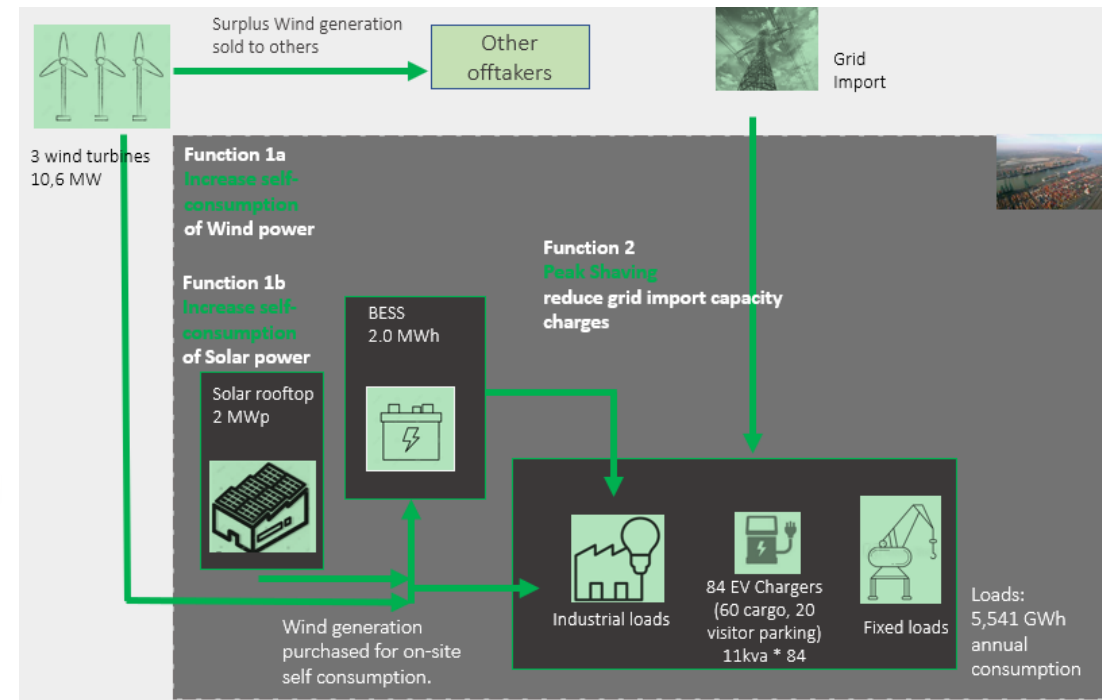
Developing a network of docking stations

- PIONEERS: focus on the corridor Willebroek - Antwerp - Venlo ★
- Connection to other potential locations in Belgium: Ghent, Zeebruges, Genk, Liège, etc. ★
- Connection to the future network in the Netherlands: Moerdijk, Bergen-Op-Zoom, etc. ●



PIONEERS

Battery storage and smart management of green energy in terminals - Antwerp Euroterminal

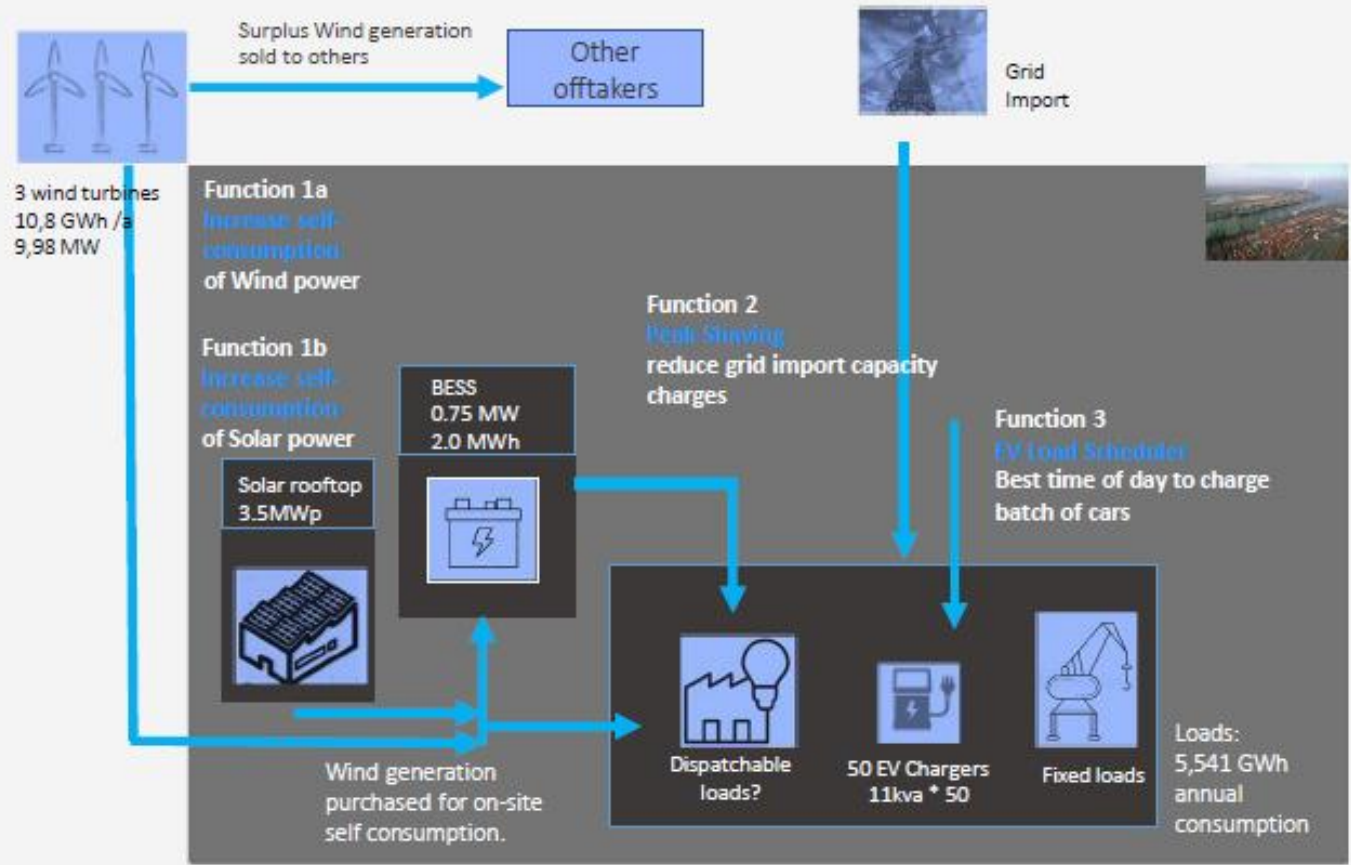


Energy transition on AET

- 3 new windmills on quay 10 M W
- 3,8' solar park on top of new multilevel storage building
- QPDI for electric cars
- Charging poles for electric vehicles
 - cargo as well as own cars
- Cold ironing
- Battery Energy Storage System and intelligent Energy management system (PIONEERS Project)



Energy Management Architecture



Multi-Function Energy Optimization

- Renewables self-consumption
- Peak Capacity charges reduction
- Load Scheduler
- Energy Storage Dispatch

Load and Production Forecast

- Wind power forecast
- Industrial Load forecast
- BESS dispatcher
- EV charge scheduler

Value Creation

- ✓ Economic Performance:
 - Increase use of lower-cost Wind power
 - Reduce grid import capacity charges
 - EV charging scheduler based on forecast
- ✓ Sustainability:
 - Maximize Wind self-consumption
 - Zero carbon objective



Battery Energy Storage System and intelligent Energy management system

- Multiple uses for the same battery
 - Storage of own solar energy
 - Storage of wind energy
 - Peak shaving
 - Charging of electric vehicles
 - Stabilisation of own grid
 - Stabilisation of external Grid
- Smart software to optimize battery usage for the above mentioned cases.
 - Which kind of battery do we need?
 - What is the optimal capacity of the battery?
 - When should the battery be used and for what purposes?
- Does the puzzle fit? Can we validate a business case for a battery on terminal?
 - Which use of a battery has the best ROI?
 - Can we reach a better ROI if a battery is used for multiple purposes at once?



Port of Long Beach – C-PORT Zero Emissions Demonstration Project

UNITED STATES

2019

CLIMATE AND ENERGY

Port of Vancouver – International Collaboration on Vessel Emissions Reduction

CANADA

2017

CLIMATE AND ENERGY

COMMUNITY BUILDING

DIGITALIZATION

ENVIRONMENTAL CARE

Collaborative project – 2020 Northwest Ports Clean Air Strategy

CANADA

UNITED STATES

2021

CLIMATE AND ENERGY

COMMUNITY BUILDING

ENVIRONMENTAL CARE

Port of Guangzhou – Onshore Power Supply Project

CHINA

2017

CLIMATE AND ENERGY

ENVIRONMENTAL CARE

Gladstone Ports Corporation – Tidal Energy Demonstration

AUSTRALIA

2018

CLIMATE AND ENERGY

Thanks a lot for your attention!

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