



# REDII Ports

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# Partnership

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KORSØR HAVN



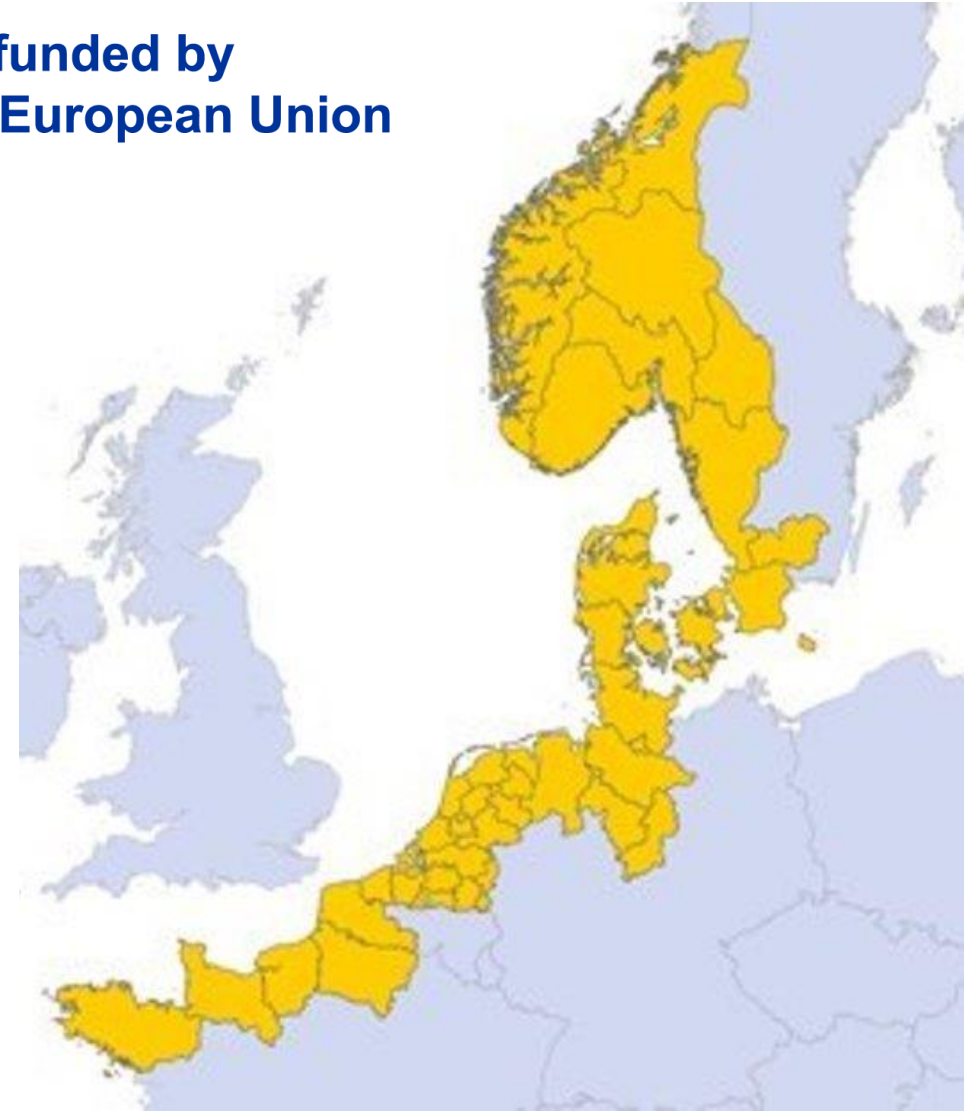
NICE



BRETAGNE  
DÉVELOPPEMENT  
INNOVATION



Niedersachsen  
Ports



# REDII Ports in a Nutshell

To better exploit local resources for a technically feasible and economically affordable generation, storage and consumption of cleaner energy like:

- Biodiesel
- Electricity (by tide, wave, solar and wind power)
- Hydrogen, Ammonia & Methanol

**REDII PORTS** will determine the conditions for blueprinting a medium-to-long term strategy that enables ports to become springboard for new green energy developments in the said fields.

*Renewable Energy Development and Intelligent Implementation in Ports*



[www.interregnorthsea.eu/redii-ports](http://www.interregnorthsea.eu/redii-ports)

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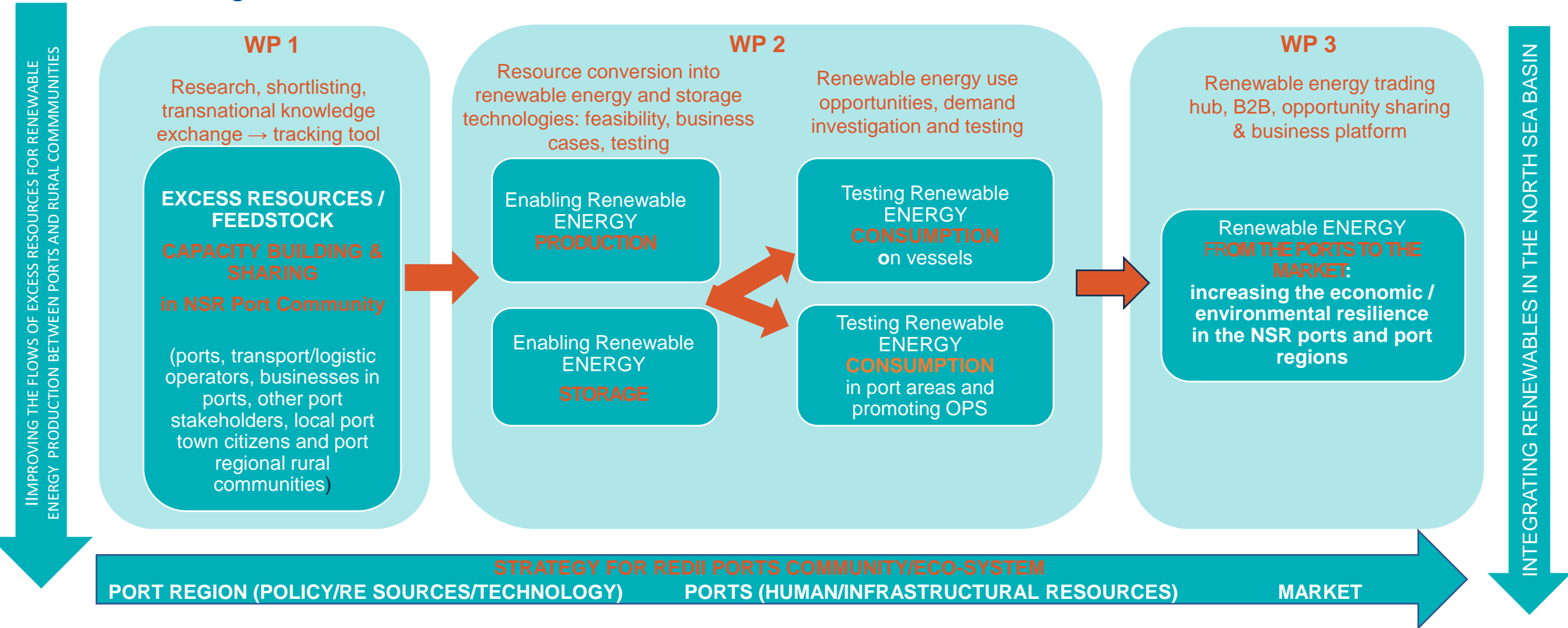


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# Overview on Solutions (all WPs)

WP	PILOT	INVOLVED PARTIES AND FOCUS	
1	Excess Materials Platform	NICE:	Resource platform
	Material Flow Analyses	VIVES/NICE:	Waste scan and methanol test
2	Bio Diesel/ Bio-Fuel	Disposal Collection Care:	Study on Gas-to-Liquide usability for Skagen
		Port of Zwolle:	HVO analyses
		Blue Power Synergy:	Hybrid bioethanol engine & solar sails prototype vessel
	Electricity	Korsør:	Battery/grid/port-integration
		Moss:	Battery & grid shore power integration
		Skagen:	Shore power system
		Blue Power Synergy:	Mobile renewable (solar-powered) energy storage
	Hydrogen Sailing	Port of Zwolle:	Vessel testing making use of H2 (jointly with Multicontainer Service)
		Brittany Region:	H2-study
		Brittany Region:	Ammonia / Methanol study
Ammonia / Methanol	Eigersund:	Biofuel study	
	Tide   Solar   Wave  Wind	Nports:	Testing small scale solutions on ports area
Renewable Energy Inland Transport	Trelleborg:	Study for a model for trucks	
3	Market Tool	Disposal Collection Care:	Extension of the tool
	Craft Port Eco-System Platform	BDI:	Port Eco-System tool (test field with Brest)

# Project Structure



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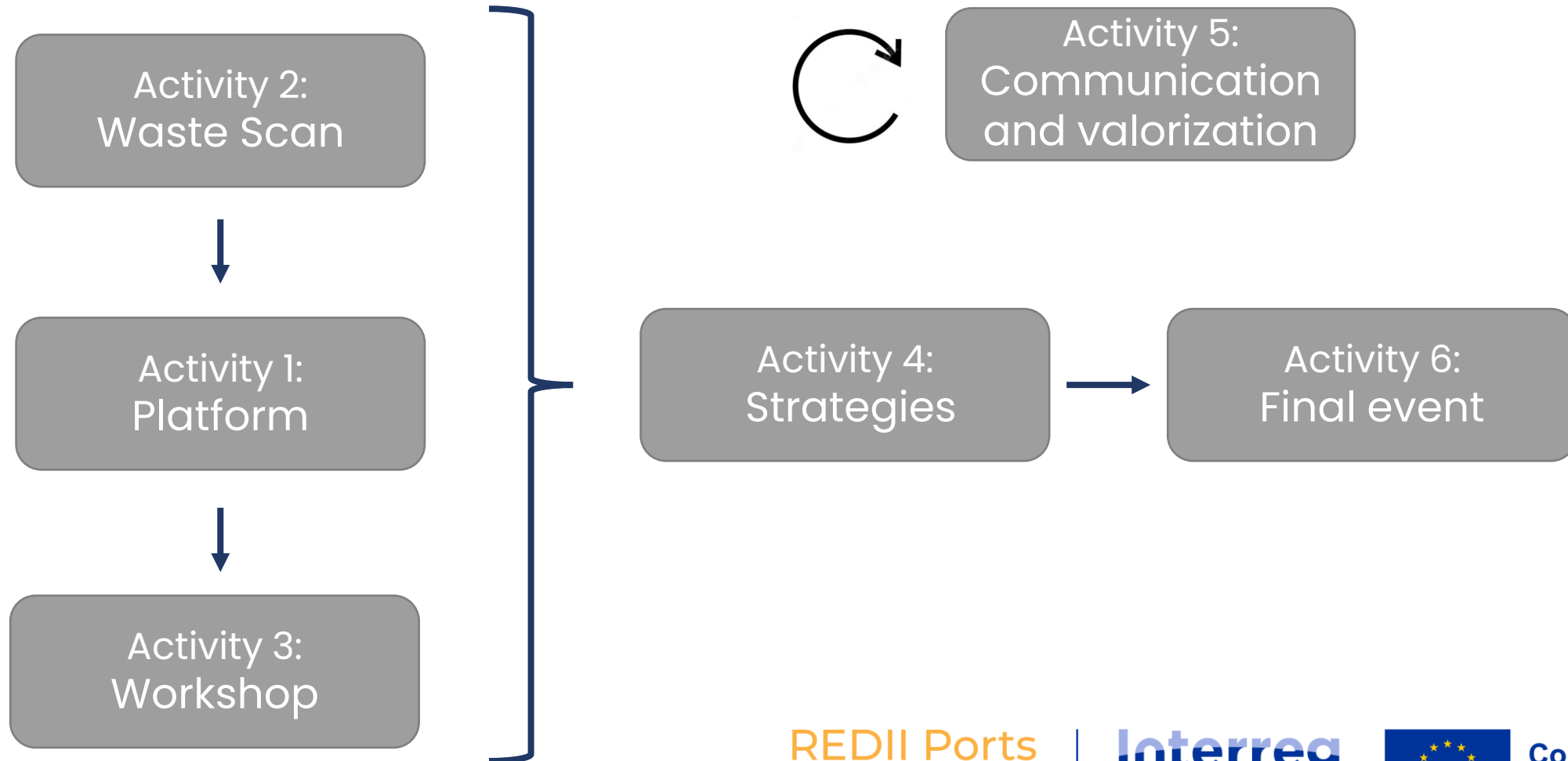
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# WP 1 in Short

## WORKFLOW



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# WP 1 in Short – Pilot Regions



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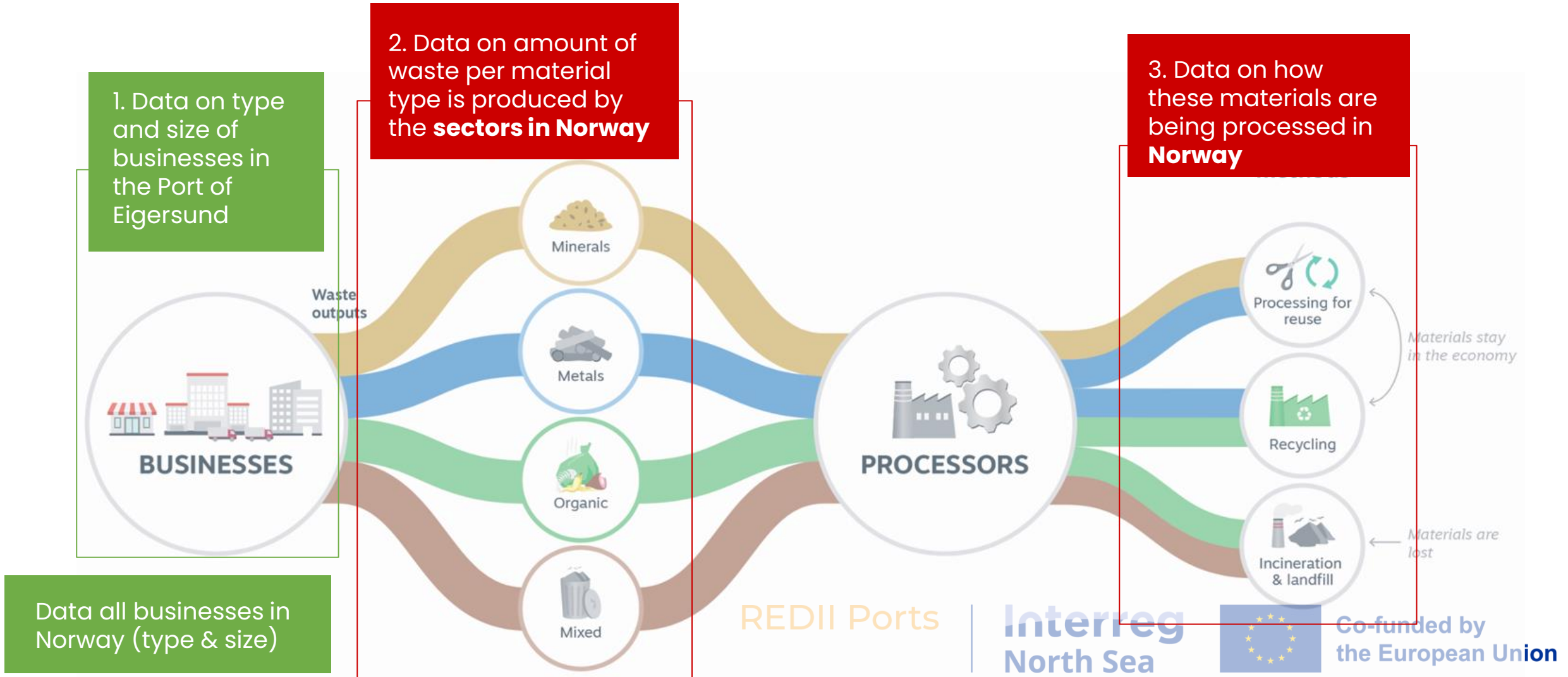
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# WP 1 in Short: (waste) material flow analyses





# WP 1 - Port of Egersund - Estimates based on National data

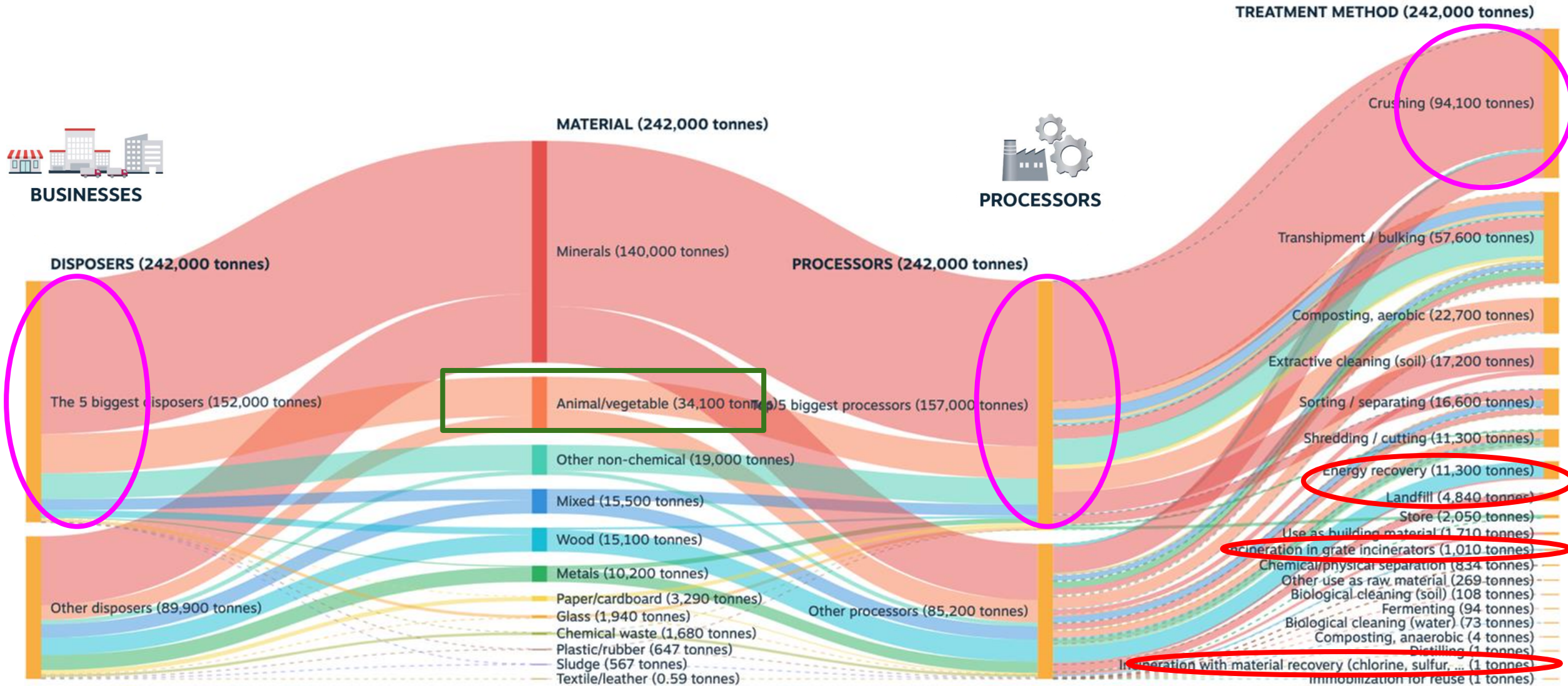


# Waste materials processed by Processing Company A

(based on data from 2022)



# WP 1 – Port of Zwolle





# Material Flow Analyses Report Ready!

## Data limitations

- Norway low data availability due to lack of centralized register
- Research steered by data available from waste registries
- No data on non-registered waste, by-products, etc.

## Ports have a key role to play in the transition

- Opportunities for renewable energy and closing material loops
- Economic and environmental potential (→ scalability to other ports)  
MFA is step one, next step is engaging stakeholders to set up networks for material exchange and high value cycling



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# WP 1 Green Resource Platform

Input from Nice missing & to be added

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# WP 2: PRODUCTION/MIX/STORAGE/CONSUMPTION OF REDII RENEWABLE ENERGY IN PORTS

WP	PILOT	INVOLVED PARTIES AND FOCUS	
2	Bio Diesel/ Bio-Fuel	Disposal Collection Care:	Study on Gas-to-Liquide usability for Skagen
		Port of Zwolle:	HVO analyses
		Blue Power Synergy:	Hybrid bioethanol engine & solar sails prototype vessel
	Electricity	Korsør:	Battery/grid/port-integration
		Moss:	Battery & grid shore power integration
		Skagen:	Shore power system
		Blue Power Synergy:	Mobile renewable (solar-powered) energy storage
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	Ammonia / Methanol	Brittany Region:	Ammonia / Methanol study
		Eigersund:	Biofuel study
	Tide   Solar   Wave  Wind	Nports:	Testing small scale solutions on ports area
Renewable Energy Inland Transport	Trelleborg:	Study for a model for trucks	

# Port of Skagen – Circular Fuels Study

## Study

- Fishing fleet depending on MGO
- Methanol, Bio-LNG, H<sub>2</sub>, Ammonia, need 2,5-7 times the volume of MGO.
- Local resource mapping
- Investigation on how to get green fuels with the same characteristics as MGO (BioGTL) → Feasibility study of production and storage
- Business case: Resource is necessary, investment costs, demand, operator/investor matchmaking etc.



*Supported by Disposal Collection Care*

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# Port of Zwolle – HVO analysis

## Headline

- Text input expected from Zwolle

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# Blue Power Synergy – Hybrid Bio-Ethanol Engine & Solar Sails Prototype Vessel

**Objective:** Explore sustainable sailing solutions and evaluate hybrid propulsion systems' reliability and feasibility.

## Involved Vessels

- One vessel powered by dual 520 kW engines.
- A sailboat equipped with hybrid propulsion technology, Designed as a commercial charter vessel.
- Both vessels will use bio-ethanol-powered engines, relevant to CCT and trawlers in the same power category.

**Testing Focus:** Comprehensive real-world testing of solar sail technology. It is crucial to assess the scalability of solar sails for commercial coasters and ocean-crossing vessels.



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# Port of Korsør – Battery / grid / port-integration

## Current electrification process

- Korsør Port has already established shore power facilities and collaborates with other ports such as the Port of Moss. Calculations have also been made for the use of solar panels and the implementation of battery systems.
- Tested battery technologies: Lithium-ion batteries (final choice), flow batteries, and sodium-sulfur batteries

## Next Step

- Obtaining approval from local authorities to build the battery system, identifying potential users of the solar panel and battery system, and developing a comprehensive investment plan.

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# Port of Moss – Battery & grid shore power integration

## Stationary batteries in the Port of Moss – Decision Report Finalised!

Used to identify the opportunities that arise in the development and implementation of a battery system on the port of Moss.

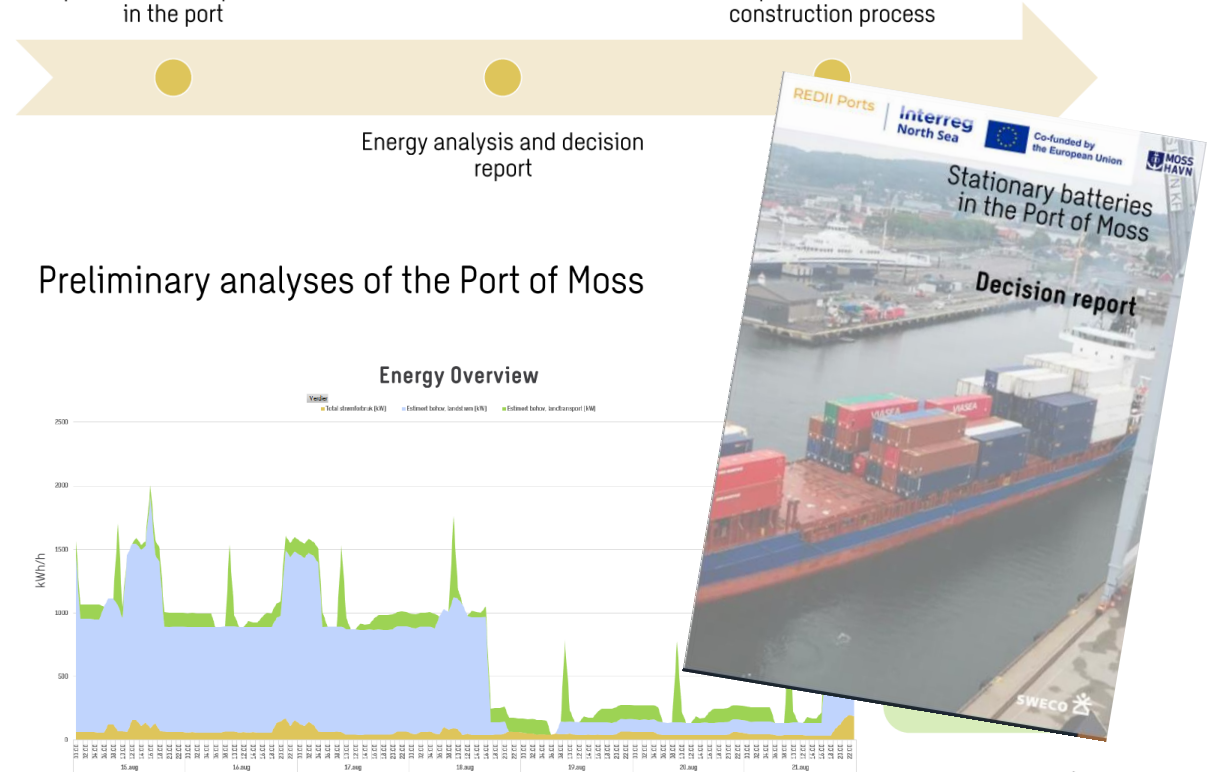
### Next steps:

Decision making on the procurement and implementation of the battery storage solution system

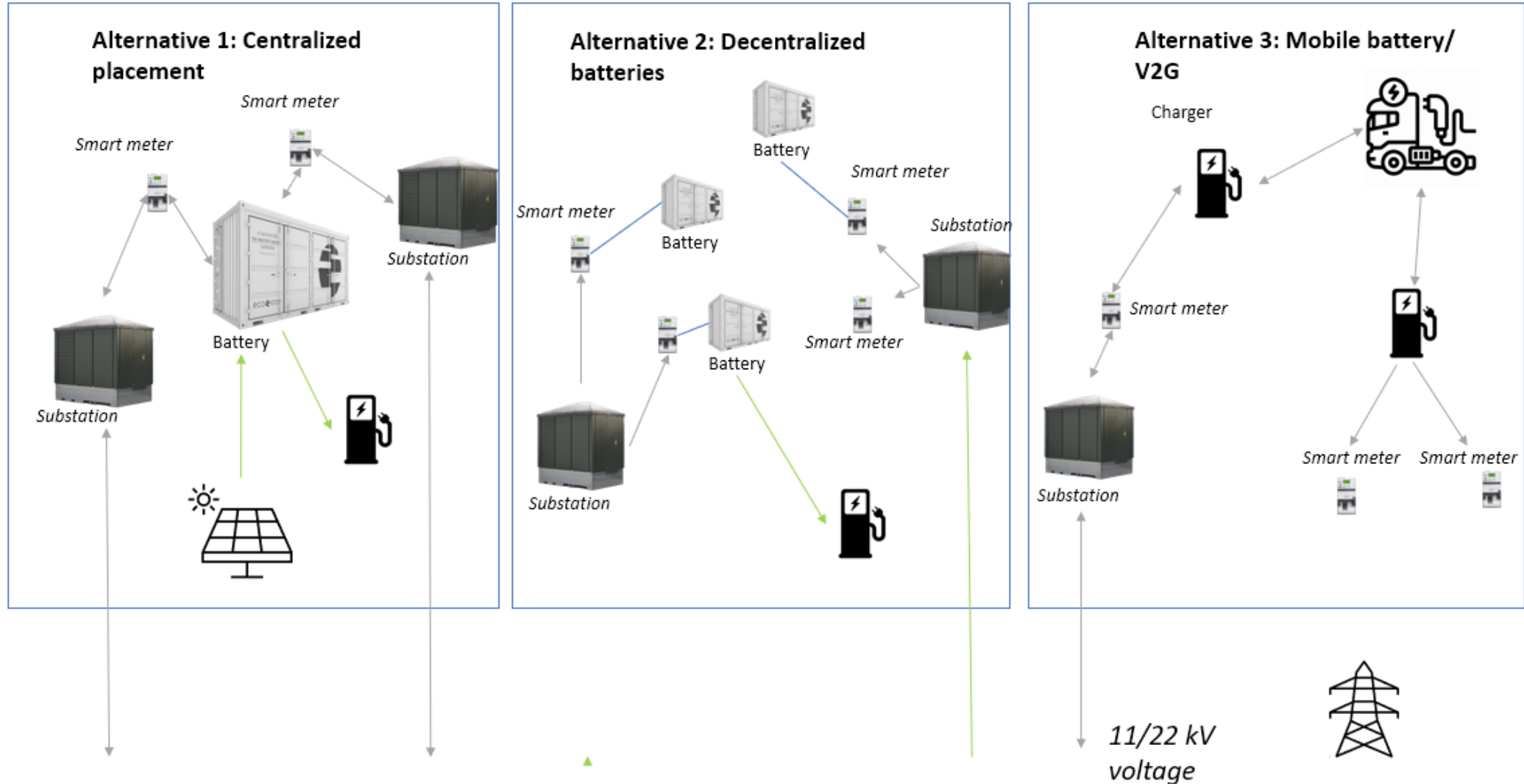
## Development Steps

Mapping and data acquisition of the operations in the port

Prepare requirements specification and construction process



# Port of Moss – Battery & grid shore power integration



# Port of Skagen – Shore Power System

## Annual Fuel Savings per Vessel:

A large pelagic vessel could save app. 172 tons of fuel annually by switching to shore power for unloading.

## CO2 Emissions Reduction per Vessel:

1 kg of fuel contain approx. 3.1 kg of CO2 emissions and the annual CO2 savings for this vessel is approx. 533 tons.

## Total CO2 Savings for the Fleet:

The DK fleet consists of 11 vessels organized under DPPO, with each vessel averaging similar savings, the total potential CO2 reduction would be 5,863 tons per year.



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# Port of Skagen – Shore Power System

## Pilot progress

- Interviews with end users
- Meetings with Shore Power system providers
- Preparation of technical specifications and request for proposal
- Contract with Shore Power System provider
- Total investment EUR 886.500,- incl Connection Points & Installation

## Next Steps

- OPS System delivery, Connection point delivery and installation in Q1 2025
- Commissioning and test Feb-Mar 2025
- Live test Q2 2025



# Blue Power Synergy – Mobile Renewable Energy Storage (Solar Powered System)

**Objective:** Mobile renewable energy storage.

**Solution:** Mobile battery bank in a 20-foot container, mounted on a trailer with a solar roof module. It aims to test the solution in real-life port environments.

→ **Current Norm** diesel generators **vs alternative** solar-powered solution.

## Benefits:

- Significantly reduces carbon emissions.
- Mobility allows deployment wherever and whenever needed.
- Provides a versatile and eco-friendly power source.



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# Blue Power Synergy – Mobile Renewable Energy Storage (Solar Powered System)

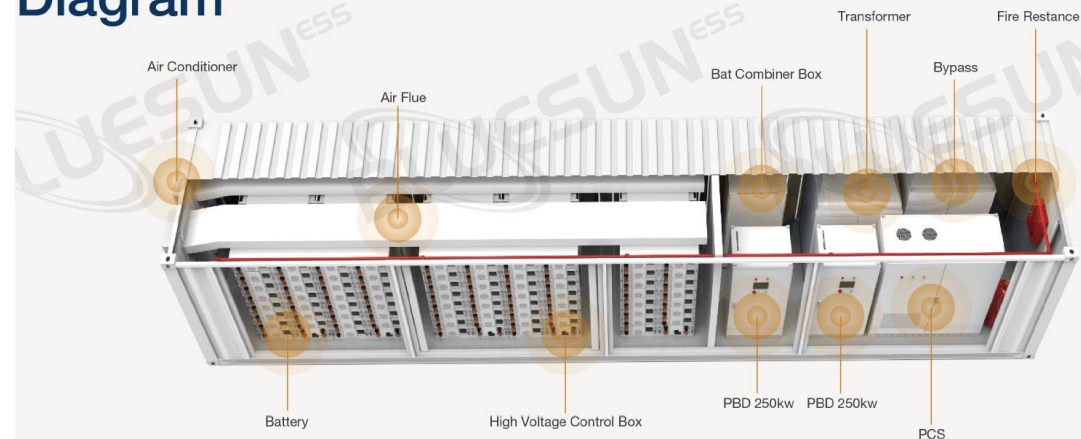
## Energy Storage

- Up to 5 Mwh in 1 container
- Possibility to customize
- >200Mwh setups possible

## Usage

- Peak shifting
- Frequency regulation
- PV+ESS
- Self-Use

## System Block Diagram



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# Port of Zwolle – H2 Vessel testing

## Headline

- Text input expected from Zwolle

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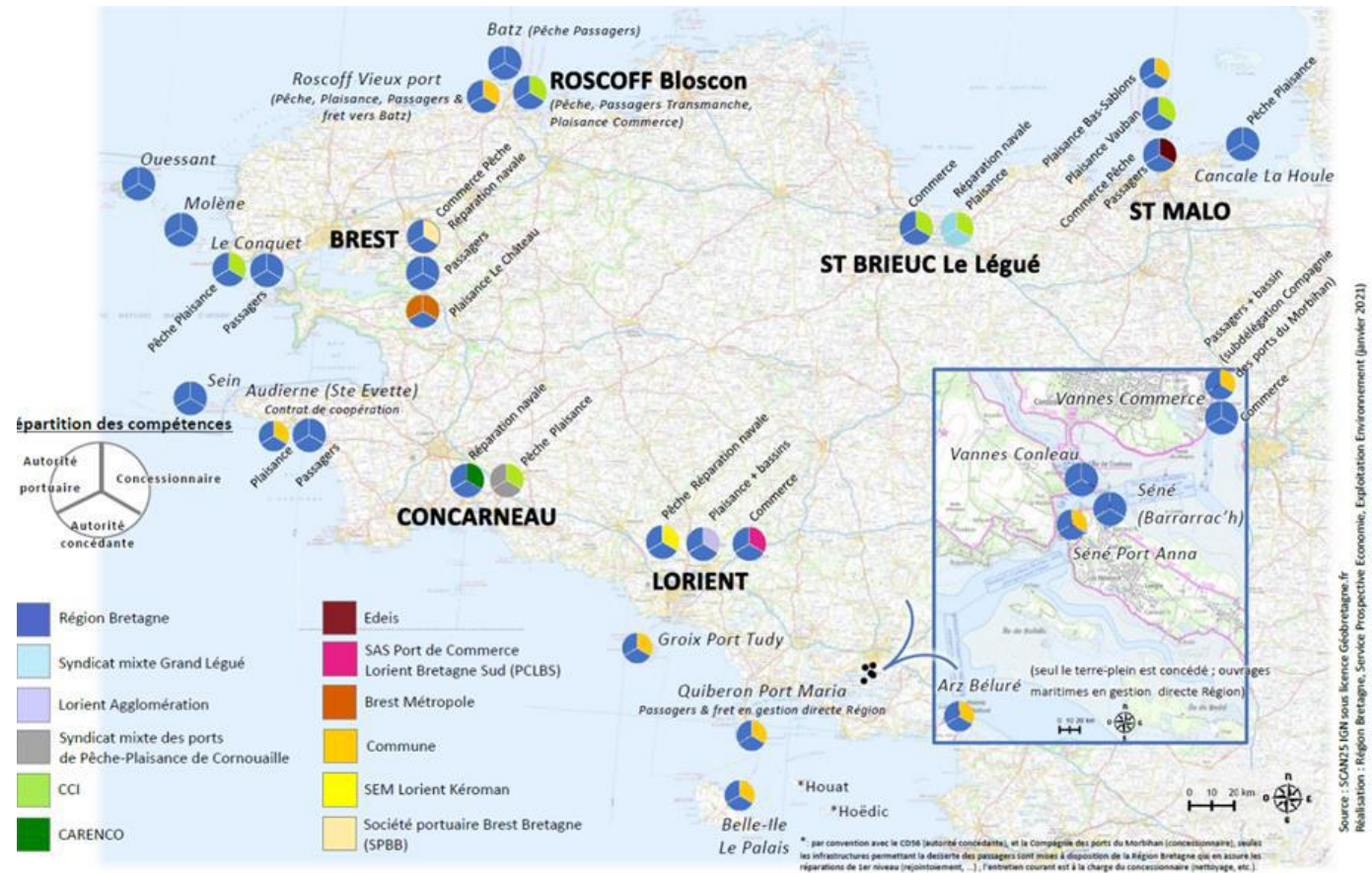


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# Région Bretagne - Hydrogen & Ammonia Study

Study on energy needs within a larger stakeholder group and potential use cases in Région Bretagne:

- Local actors meeting in Brest the 07/11/2023
- Indepth interview with ~40 of them during November 2023 Understanding their energy needs
- Define the irfutur decarbonized energy need



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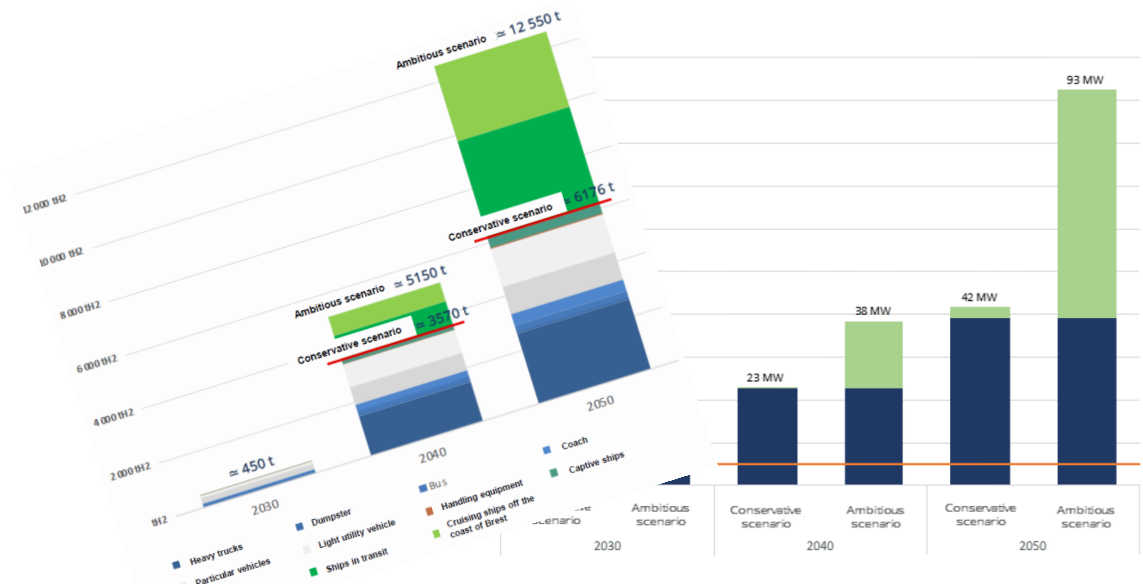


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# Région Bretagne - Hydrogen & Ammonia Study

Study on energy needs within a larger stakeholder group and potential use cases in Région Bretagne:

- Local actors meeting and interviews in Brest 2023 to understand their energy needs
- H2 Study Phase 2 finished 05/06/24
  - Production |
  - Supply Chain 2030 & 2050
- H2 Study Phase 3 started 07/2024
- NH3 Study Phase started 04/2024

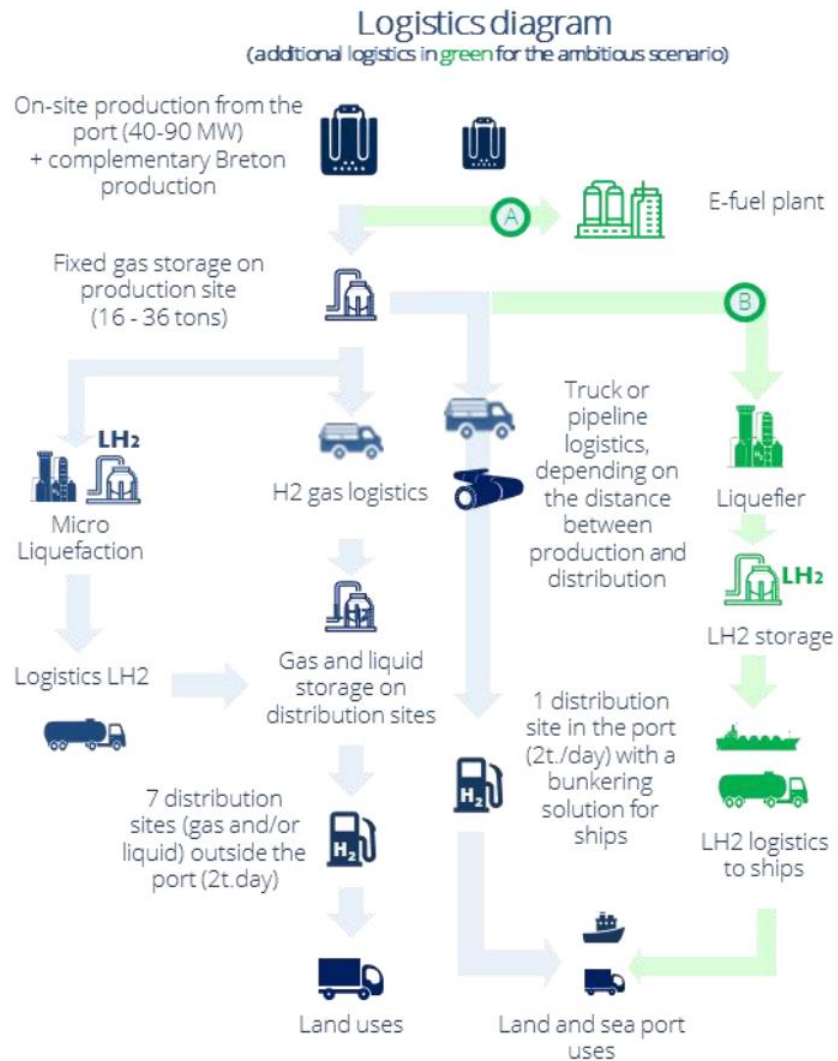


	2030	2040	2050
Estimated annual H2 volume for land-based uses	375 t/year	3340 t/year	5720 t/year
Number of stations	1-2	5	8
Distribution capacity	1t/d	2 t/d	2 t/d



# Région Bretagne - Hydrogen Study, Phase 2

H2 Study Phase 2 - Supply Chain 2050





# Région Bretagne - Ammonia Study, Phase 1

- 1 Introduction
- 2 Ammonia : General presentation
- 3 Production
- 4 Regulation
- 5 A subject at the heart of geopolitical issues
- 6 Mapping of principal actors
- 7 Uses of ammonia : prospective elements
- 8 Ammonia for maritime transportation

# Région Bretagne - Hydrogen & Ammonia Study

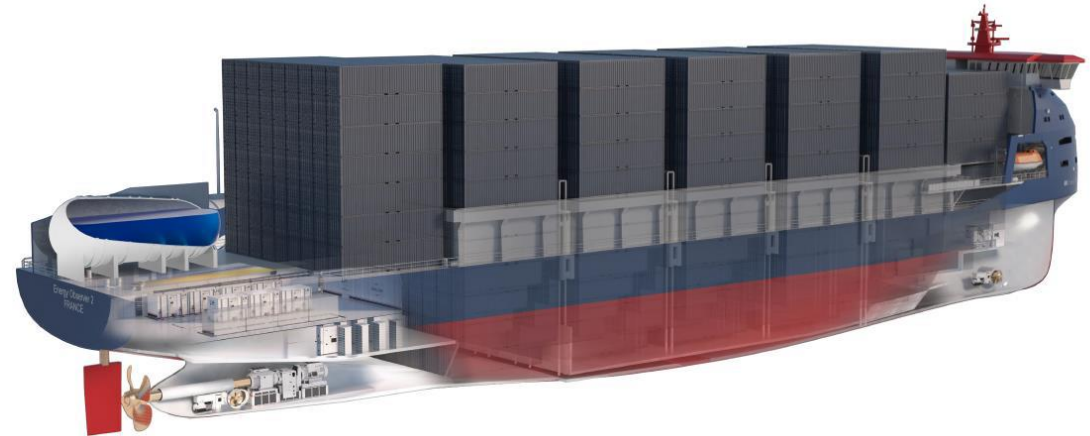
## Focus: Brittany's 0-emission fishing fleet by 2050:

- First 100% H2 fishing boat to be tested in July 2024 in Brittany
- H2 internal combustion engine retrofit on a mussel fishing amphibious barge



## Focus: a container feeder, powered by liquid hydrogen

- Initiating port cryogenics infrastructures: case of the port of Brest
- 100% electric cargo for 2029 challenge



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# Région Bretagne - Hydrogen & Ammonia Study

Focus: In the port, attracting and arousing interest

- Test rental project: station and H2 port handling equipment's for companies operating in the port
- At the port of Saint Malo in 2024, at the port of Brest in 2025



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# Egersund - Methanol as Energy Carrier

## Scope of the Feasibility Study

- Mapping of the CO2 resources
- Evaluation of the means of transportation of CO2
- Identification of potential storage site
- Identification of the potential production site
- Assessment of the expenses for the mapping, transportation, and storage



# Egersund – Methanol as Energy Carrier

## Study on green methanol for the port of Egersund

**Objective:** To support decision making process for further exploration and planning for producing green methanol as an alternative renewable fuel for ships from locally available resources.

CO<sub>2</sub> Emission in 2023: 20,700 t/y

- More than enough for fuel of 1 containers vessel as ca. 15,100 t/y of CO<sub>2</sub> is needed
- BUT: The fish industry in the study area has strong seasonal variation in operation (as in CO<sub>2</sub> emissions)

CO<sub>2</sub> captured from nearby  
emission sources  
Green hydrogen



e-methanol

OR

Use biomass resources



Bio-methanol

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# Egersund – Methanol as Energy Carrier

## Current Capacity

- Nominal input: 1 MWeI
- Nominal production: 390 kg/d or 135-140 t/y

## Estimated demand

- With all simplifications: ~16 times larger unit (2,100 t/year) is needed for fuel of only one container vessel

Alternative pathways: Combination of resources!

Green H<sub>2</sub> & Biomass → Bio e methanol



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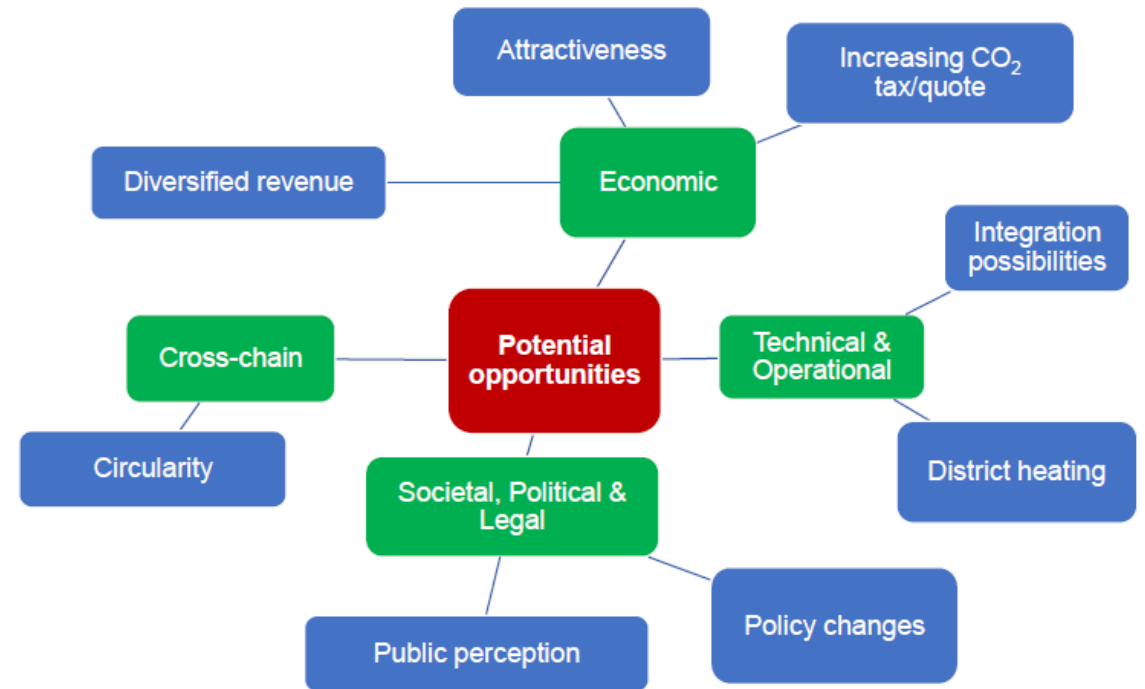
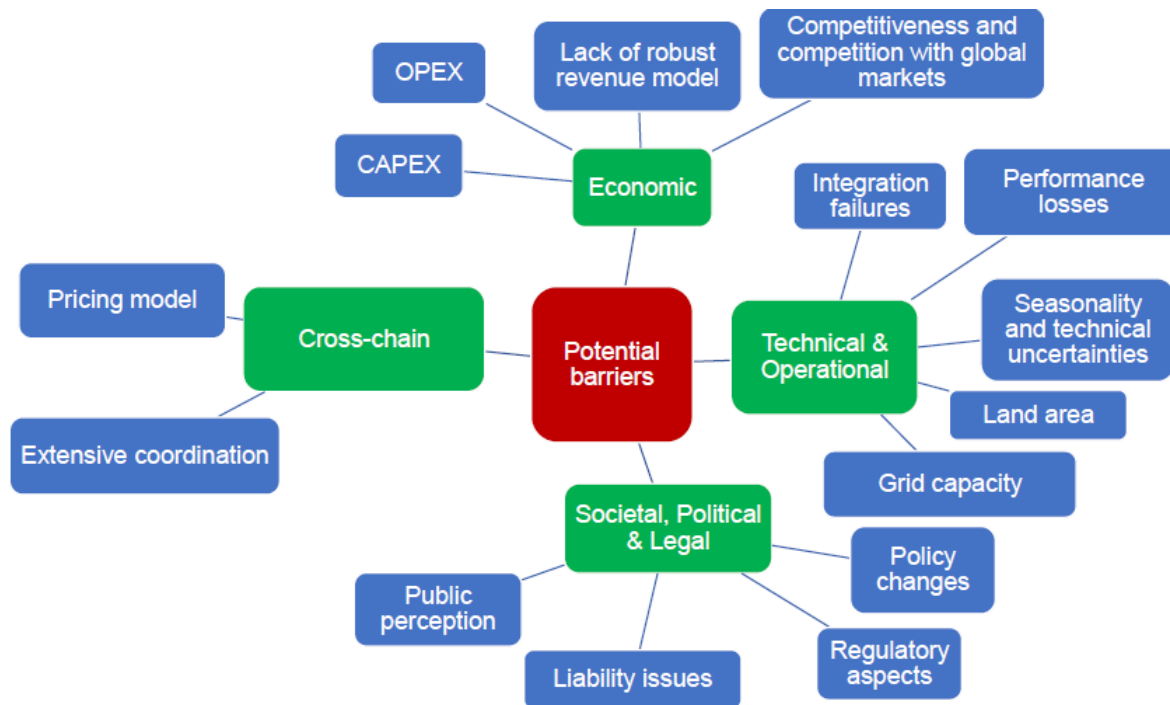
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# Egersund – Methanol as Energy Carrier

## Potential Barriers

vs

## Potential Opportunities

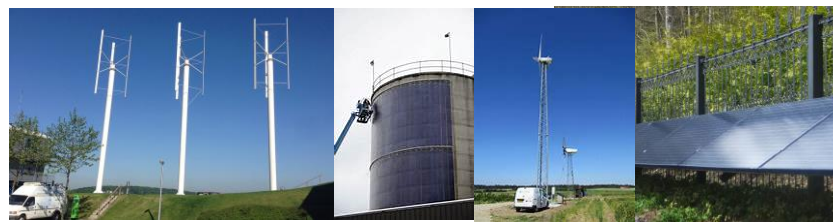


# Niedersachsen Ports – Small Scale Solutions for Renewable Energy Production

Large-scale solutions make sense, but are not feasible everywhere



How can small-scale solutions fill the gap?



- Difficult to approve (noise, distances etc.)
- require high investments
- Statics on old buildings not sufficient

- Every kw needed
- Bridging the experience gap
- Overview about best solutions
- Integrate solutions into port infrastructure

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# Niedersachsen Ports

## Power consumption hotspots

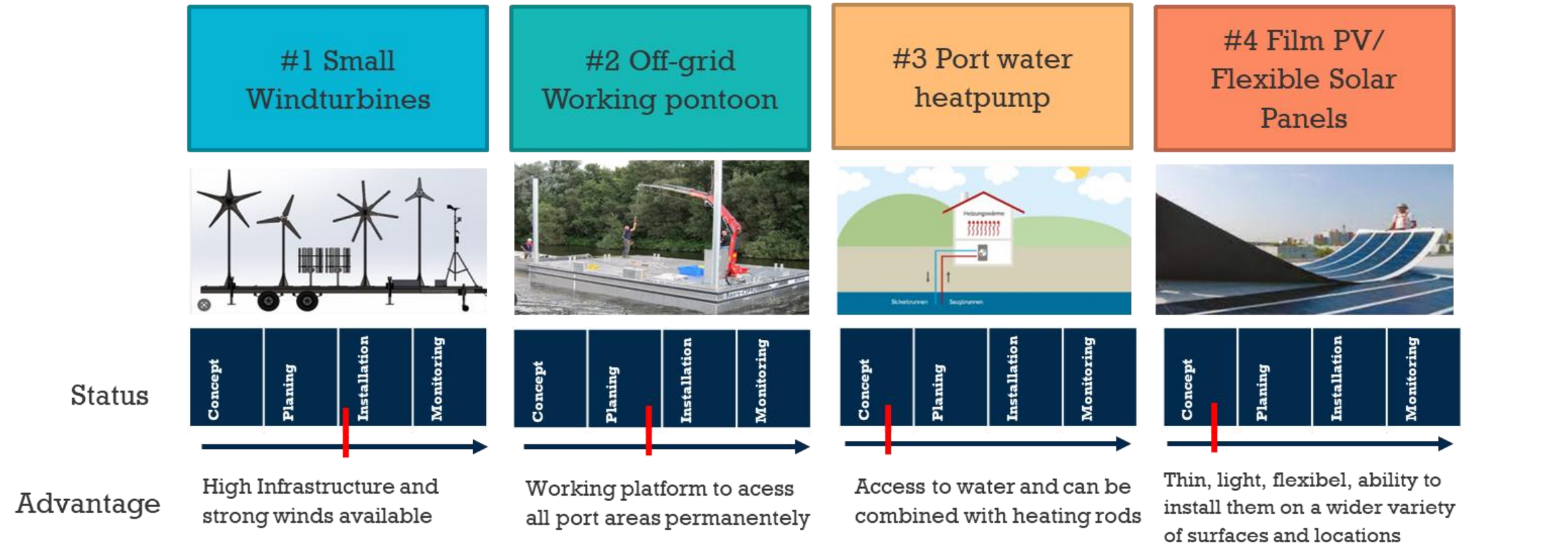


## Natural Gas consumption hotspots





# Niedersachsen Ports - Testfields



# Niedersachsen Ports – Next Steps

## Potential Study

- Accomplish study
- Present study to customers Nov. 13th
- Publish study results as website/interactive

## #1 Small Windturbines

- Finish statics
- Install turbines
- Install monitoring hard- and software

## #2 Off-grid Working pontoon

- Purchas components
- Install components on pontoon
- Put into service

## #3 Port water heatpump

- Check feasibility
- Develop concept
- Find location
- Investment decision

## #4 Film PV/ Flexible Solar Panels

- Check feasibility
- Develop concept
- Find location
- Investment decision

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# Port of Trelleborg - Renewable Energy Inland Transport

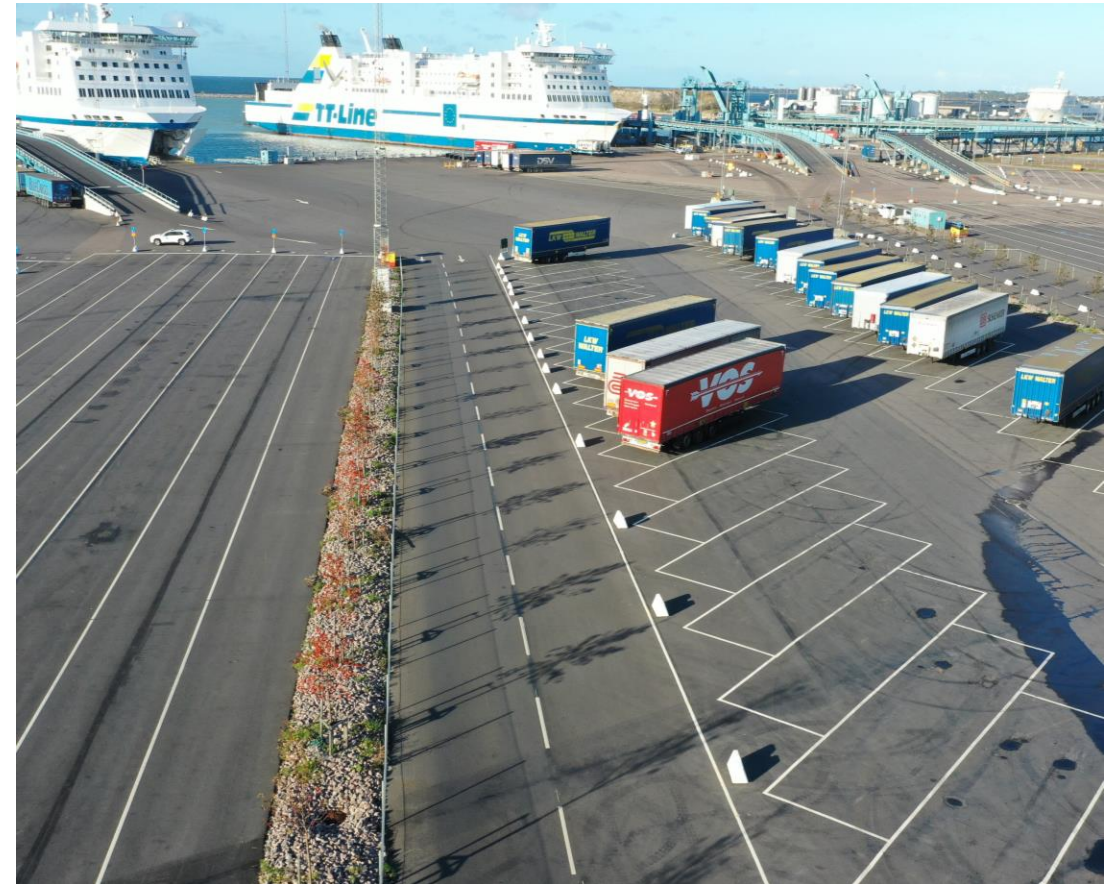
## Status and current state

- Procurement with SWECO is finalized and work has started
- The external expertise analyze is divided into 3 steps including interviews with the vehicle manufacturers:

**Step 1:** Current situation and the future distribution 2030

**Step 2:** Future in a longer perspective (2050)

**Step 3:** Forecast 2030, forecast 2050, and documentation



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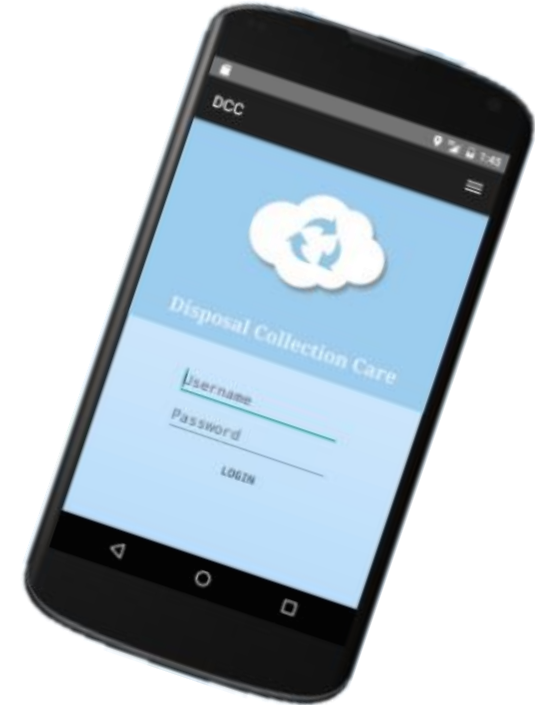


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# Disposal Collection Care – Market tool pilot

Innovative cloud solutions for greener future in waste handling and biofuel production:

- Create and manage ports, users, fractions, metrics, and carriers.
- Access and monitor transactions between suppliers/sellers and buyers.
- Handle all associated data across the platform



[Home - Disposal Collection Care](#)

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# BDI - Craft Port Eco-System Platform

## Actions in 2023:

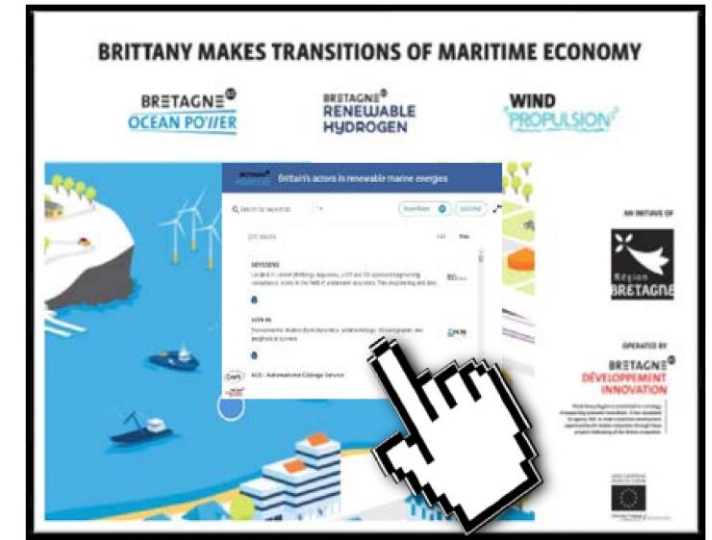
Realisation of the survey to describe the value chain of the industrial ecosystem & Craft database population and platform implementation (working in collaboration with the Brittany Region)



## Actions in 2024:

Development of a **graphical tool** enabling to visualize a H2 ports and the related industrial ecosystem.

**Mobilisation:** Inform the players in the ecosystem and mobilise them around the project, in particular the players from Brest



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