# Texel Hydrogen & Oxygen Ecosystem

Gemeente Texel

.txl

hoogheemraadschap Hollands Noorderkwartier

FCH FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

NIOZ Sea Research

WaterstofNet

CLEAN ENERGY FOR EU ISLANDS

# Welcome at the clean energy for EU island workshop

## Do islands need green hydrogen for their clean energy transition?

**Arnold Boon**

**Texel municipality**

Project coördinator hydrogen project & smart energy systems

Sustainable Energy Innovation taskforce program Wadden islands

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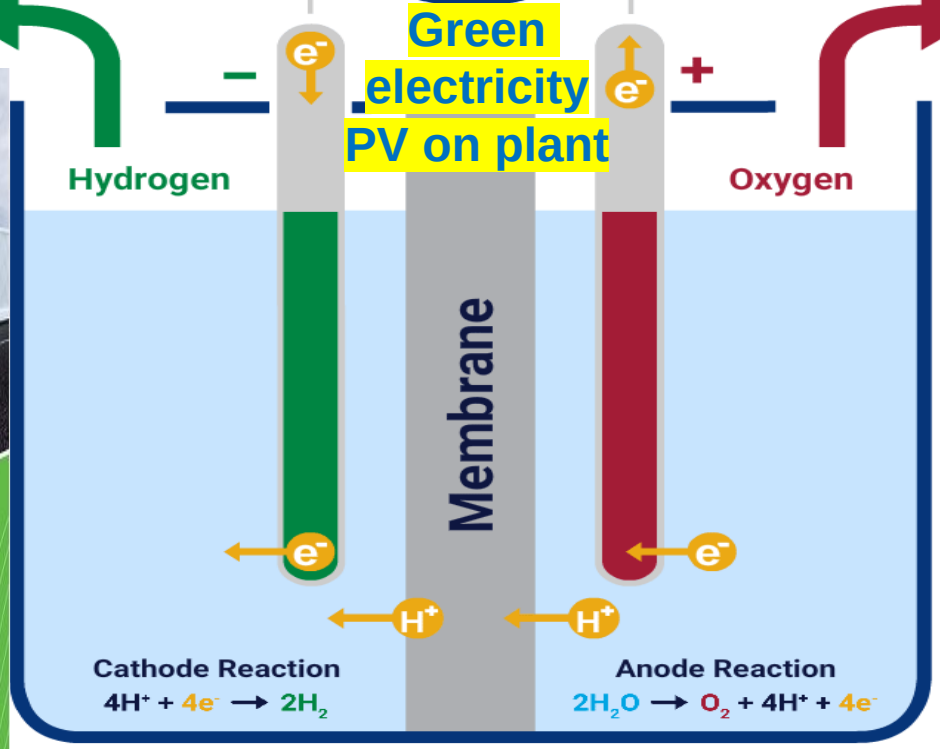
# Renewable Energy Value chain

## 1MW electrolyzer

Power Supply

Green electricity PV on plant

Hydrogen




Oxygen

**Energy saving**
**O2 injection**
>> Clean sewage water

Ozone (O3) generation
**Remove micro polutants**
( medincine/drugs residu)

*Cleaner effluent water in Natura 2000 Area and Wadden Sea*

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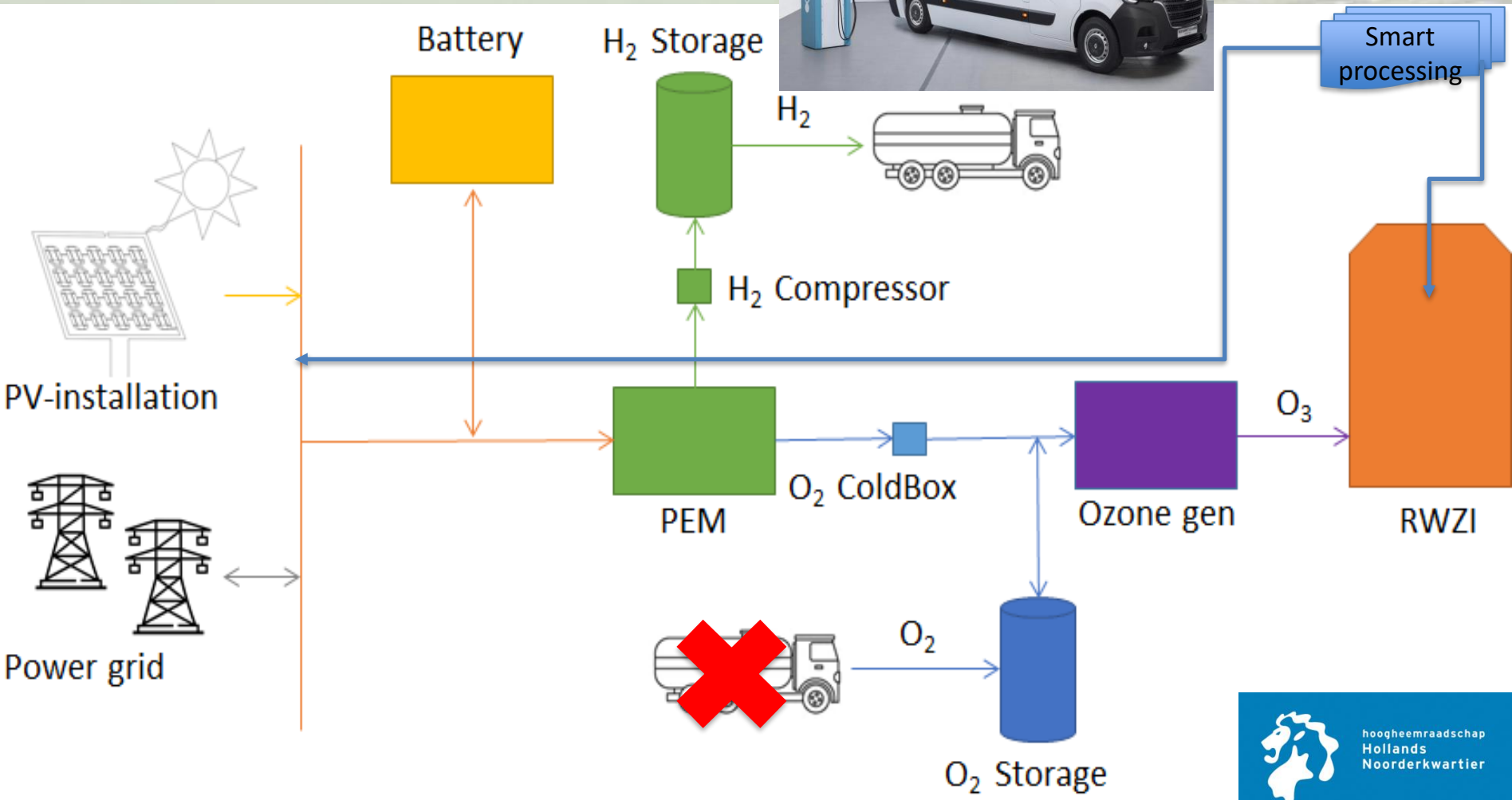
# Existing Smart Grid & battery storage at sewage plant

## Electrolyse for Oxygen and Ozone injection

**Green Hydrogen as a "by-product" for energy storage, transport & sea research vessel**

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H2 Texelhopper, on demand public transport

H2 Heavy transport

H2 Living Lab
on Sea research Vessel NIOZ

**Stakeholder Input**

**ZE Hydrogen Heavy & Public Transport & Sea Research Vessel(s)**

H2 Refuge truck

H2 Pick-up Truck
in Nature 2000 coastal zone

H2 bike path/road sweeper

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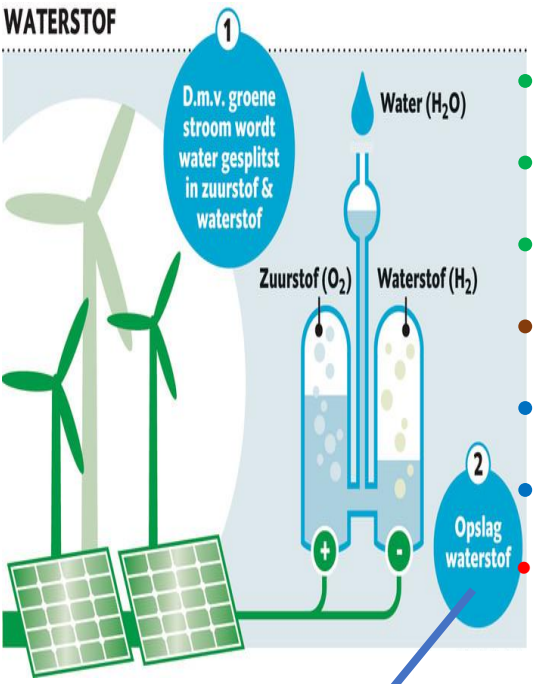
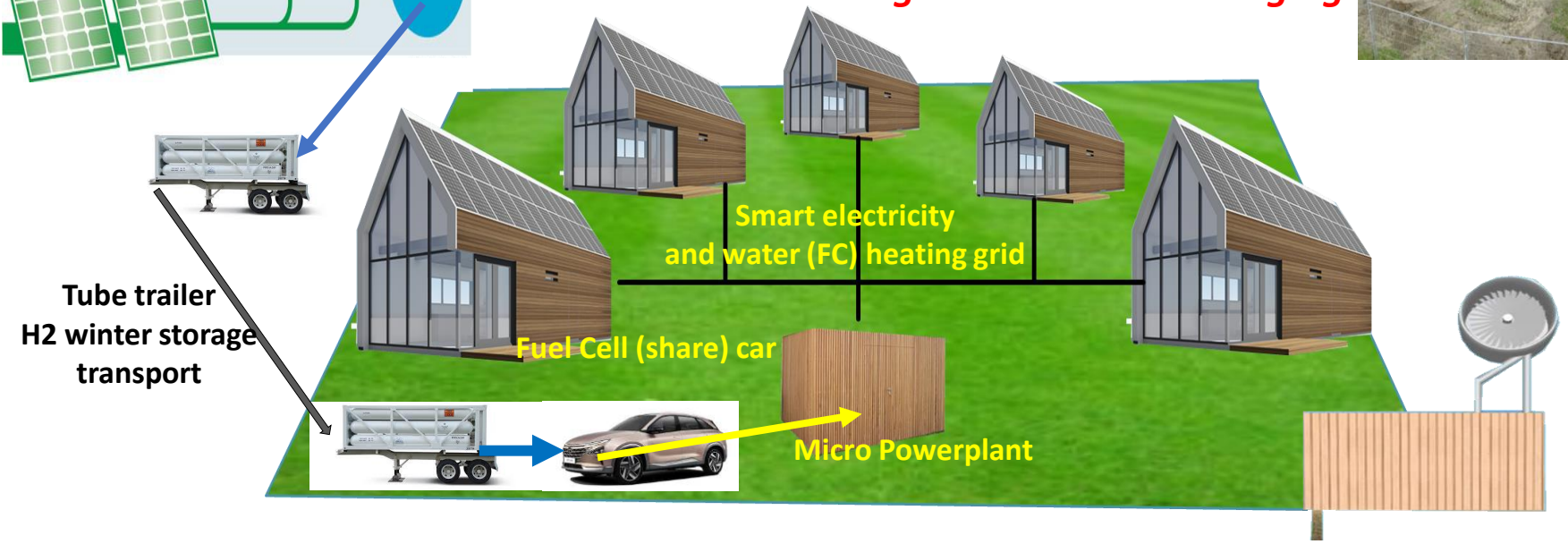
# Off Grid, All Electric, Social & Recreational Housing Pilots




- Daytime PV solar power
- Smart microgrid
- Eelctricity surplus in Li-ION battery
- Thermal short storage (2000 ltr)
- Hydrogen for winter storage
- Hydrogen for winter power
- *H2 business case & regulations too challenging*




Tube trailer
H2 winter storage
transport

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# Texel Island

Smart sector-coupling on islands

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

## Project Development Assistance (PDA)

### Key stakeholders

- Municipality of Texel (PDA Awardee + municipal fleet)
- Regional water authority (HHNK)
- Public transport / contracted taxi services (TBO)
- Living Lab for resesach vessel (NIOZ)
- Light commercial vehicles HHNK (*contractor, SBB, N/A*)
- *Residential (Woontij) N/A*
- *Agriculture and heavy transport ATT and AB Texel, N/A*

### Timeline for deployment (concept)

2021 — 2025 — 2030

- Preparation of implementation files
- Application to appropriate funding schemes
- Project execution and implementation
- Project scale-up assessment

### Budget

- **Total project portfolio: 9-12 MEU**
- ***Depending on H2 scenario)***

### Funding strategy

- Regional (Waddenfonds, IKW-Eilanden op Eigen Kracht, Programma Waddeneilanden, Provincie Noord-Holland)
- National (DKTI, SDE++, DEI+)
- Europe (Innovation Fund, Interreg, Life, Recovery and Resillaince Facility, NESOI Island Facility)

### Summary of work undertaken in the PDA process

- Knowledge and capacity building for stakeholders involved in the PDA
- Stakeholder visits, interaction and communication
- Tailored individual business case development for stakeholders in Dutch
- Acquisition of market and supplier information and pricing of products
- Assistance in the development of a matured tool for the techno-economic assessment of green hydrogen and oxygen production at wastewater treatment plant
- Overall business case development for the project
- Interaction with funding organisations through funding pitches and meetings
- Development of implementation strategy

# Overall Business Case Assessment and Project Budgeting

## FCH-JU Project Development Assistance Texel Hydrogen Project

| Electrolyser* | Storage* | Sectors | H2 Demand | Overall budget |
|---|---|---|---|---|
| **Scenario: continuous production of hydrogen (excess solar + grid) (120 kW electrolyser)** | | | | |
| Small | Small | All | 12334 kg | 5.8 MEUR |
| Small | Small | Transport only | 8179 kg | 4.4 MEUR |
| **Small** | **Small** | **Transport + maritime** | **9934 kg** | **5.2 MEUR** |
| **Scenario: production of hydrogen from excess solar supported by grid (1 MW electrolyser)** | | | | |
| Large | Medium | All | 12334 kg | 10.4 MEUR |
| Large | Medium | Transport only | 8179 kg | 8.9 MEUR |
| **Large** | **Medium** | **Transport + maritime** | **9934 kg** | **9.7 MEUR** |
| **Scenario: production of hydrogen only from excess solar (1 MW electrolyser)** | | | | |
| Large | Large | All | 12334 kg | 11.9 MEUR |
| Large | Large | Transport only | 8179 kg | 10.4 MEUR |
| **Large** | **Large** | **Transport + maritime** | **9934 kg** | **11.2 MEUR** |

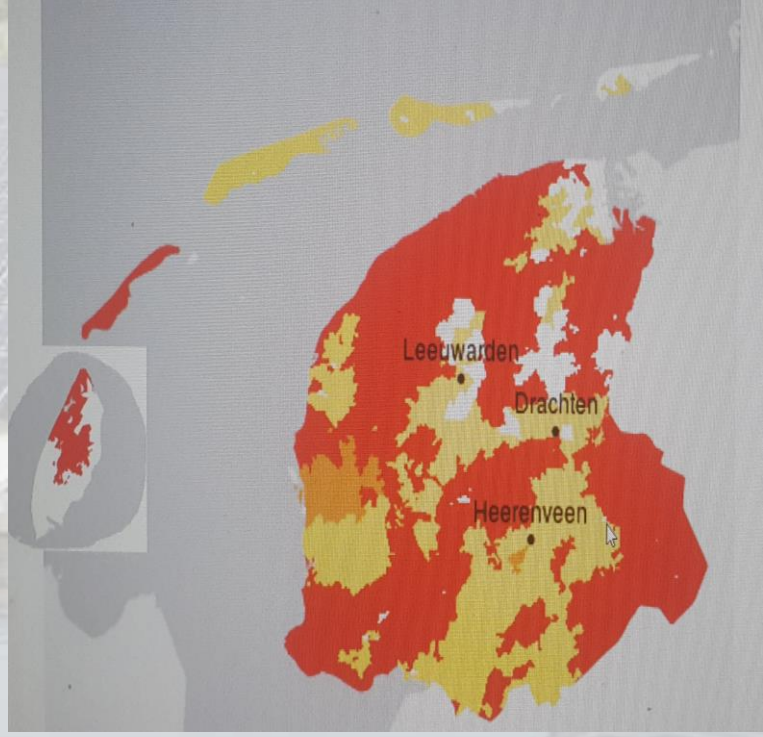
* Electrolyser small (120 kW), Electrolyser large (1000 kW), Storage small (HRS storage), Storage medium (HRS storage + 1000 kg), Storage large (HRS storage + 3000 kg)

# Conclusions Texel Municipality after FCH-PDA

- **Budget 8 to 12 M Euro** for total Texel Hydrogen project *(depending on chosen scenario)*
  - **80-100% Capex Funding** needed on H2 value chain parts.
  - **60-80 % Opex funding** needed on H2 value chain parts
  - **5 National and appr. 3 EU funds needed** for complex and high funding percentage
  - **Three investing stakeholders can continue**, *limited resources*
    - One stakeholder willing to test H2 technology by H2 technology suppliers
  - **Appr. 75% of budget @Texel municipality.**
  - **Innovation level H2 technologies** >> Back up (diesel) on next 2 year budgets.
- **H2TX project too complex for project management by Texel municipality.**
  - Decision made by Texel Board of Directors, agreement Board of Govenors
  - Resources in people and budget are too big for the small municipality of Texel.
- **Continuous focus on smart sector coupling energy management**
  - Several smart grid initiatives due to grid congestion
- **The Water authority, HHNK, board of directors will look at continuing project leadership and management**.
  - Texel municipality will then continu as stakeholder in a (smaller)H2TX scenario.

# Grid Congestion

## On all Dutch Wadden islands




- Local Energy scenarios on islands by grid provider for future needs.
- **Inventory** input island companies:
  - Transition to all electrical energy use
  - Renewable power production
- **Preventing Grid Congestion (RE)**

## Solutions

- Smart energy systems
- Smart sector coupling (hopefully with H2)

## Support needed to achieve ambitions

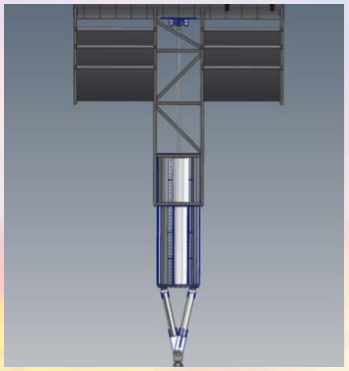
- To support local SME & municipality in:
- Innovative projects
- Transition to Zero Emission before 2030

# Sustainable energy innovations

*"Tested and realised on Texel"*

**Tidal Energy**

Pilot Projects
in Wadden Sea



**Wave Energy**

Pilot project
in North Sea

**Hybrid Ferry**

Ferry sails with
Hybrid energy system
with CNG and LI-Ion

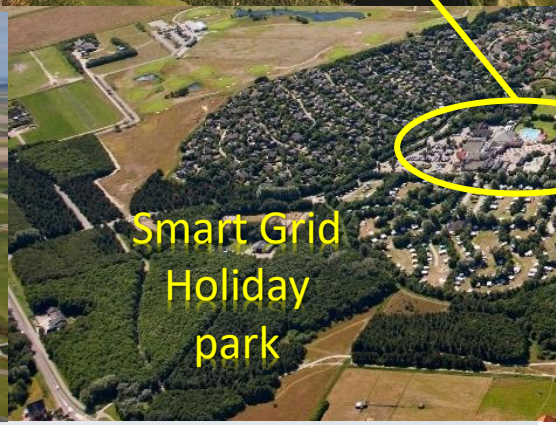
**Off-Grid Housing**

Social & Recreational
housing housing,

**Floating PV & Smart Grids**

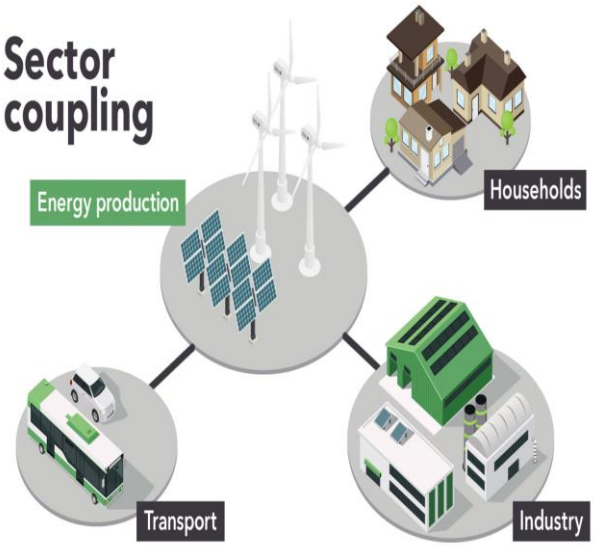
By Island companies !

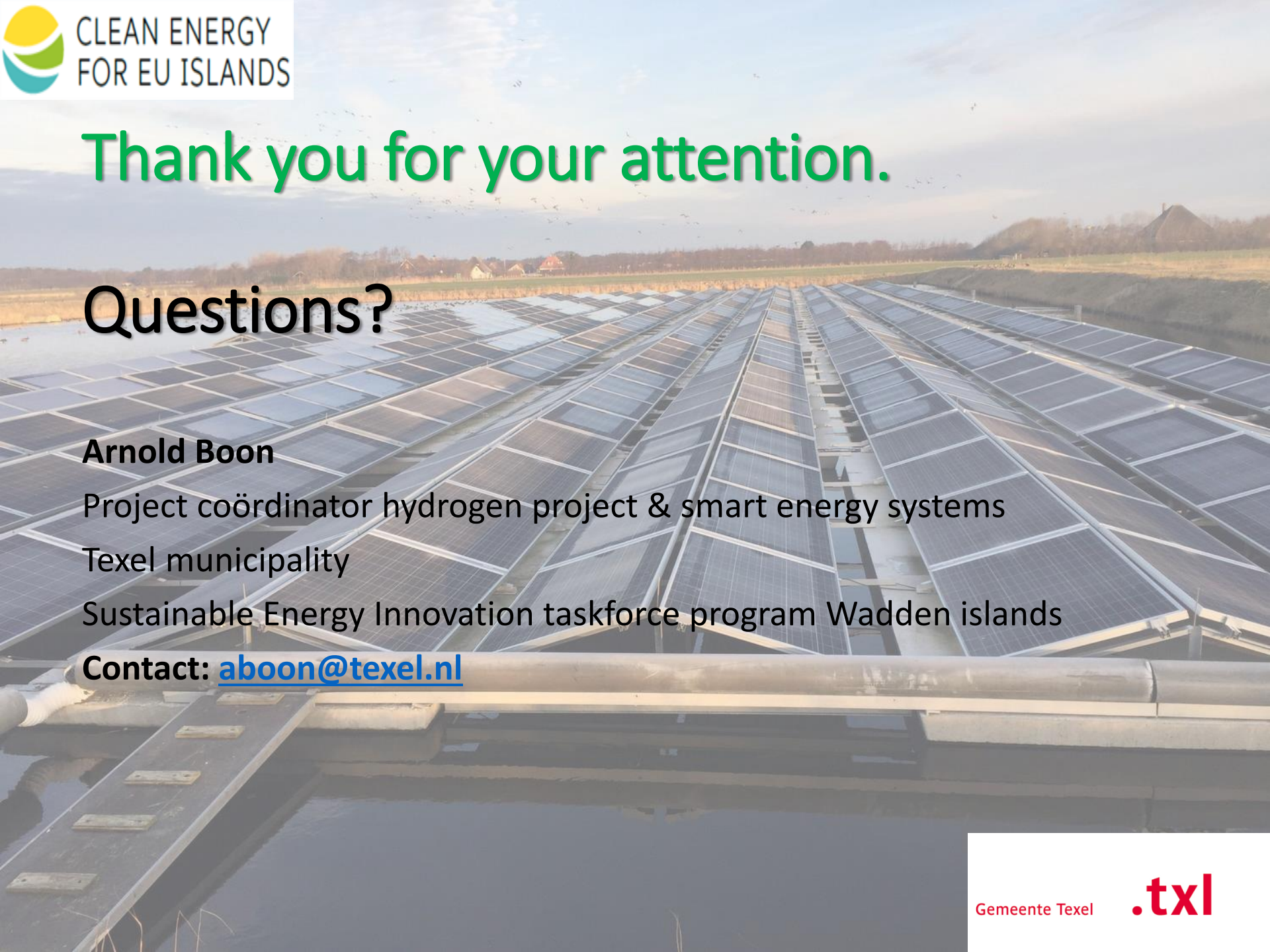
# Smart Sector-Coupling on Texel




United Nations Educational, Scientific and Cultural Organization · The Wadden Sea World Heritage since 2009 · WADDEN SEA WORLD HERITAGE · Common Wadden Sea Secretariat

## Potential Smart Grids on Texel by Island Co-operation(s)





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# Thank you for your attention.

## Questions?

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