TKI NIEUW GAS
Topsector Energie

Overview of Hydrogen Projects in the Netherlands

Peter de Laat for TKI Nieuw Gas

Spring 2020

Introduction

All around the world hydrogen activities are developing fast and new projects are announced on a weekly basis. Dutch industry, research institutions, consultants, NGO's and governments also take part in these developments and are jointly working on a large range of projects, aimed at realizing the potential role that hydrogen can play in the energy transition to a carbon neutral energy system in 2050. These projects not only focus on the Netherlands, but also seek to connect to our neighboring countries and the North Sea region.

In this slide deck we present an overview of Dutch pilot and demonstration projects on hydrogen which were found in the public domain. We hope that this overview inspires to continue to work on the realization of these projects and to start new ones. Of course this overview is not complete, it is just a picture of what is happening at the moment. If your project is not listed in this overview, or if the information we used is not accurate, please let us know so we can keep this overview up-to-date. Comments can be sent to office@tki-gas.nl.

Explanation of the information box

- Category — What is the main subject of the project in the hydrogen chain?
- Capacity — What is the size of the project in MW, tons H_2/hour or trucks build?
- Process phase — In which phase is the project:

concept	(idea development)
feasibility study	(first design)
FEED-study	(business case)
FID	(investment decision)
execution	(implementation, building)
commissioning	(test run)

- Project costs — The amount of subsidy or investment involved.
- Contact — Here, more information on the project or initiative is given.

Overview

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Production

Storage

Transportation

Distribution

Deployment: Energy Supply

Deployment: Industrial

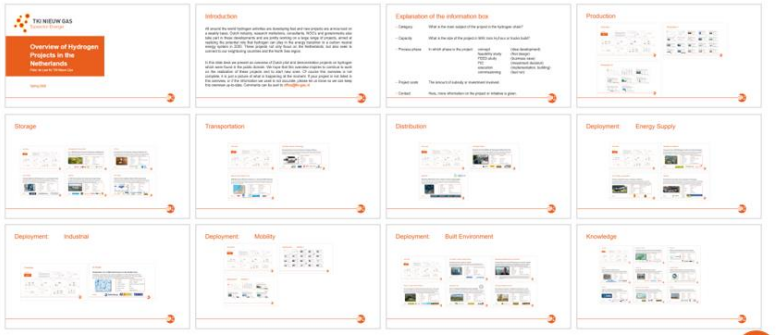
Deployment: Mobility

Deployment: Built Environment

Knowledge

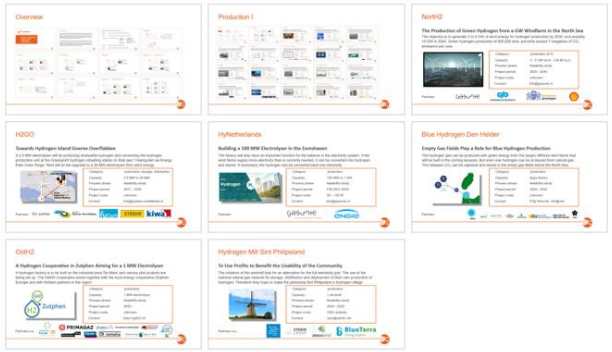
Production

Overview



Production I

Production II



Production I

Overview

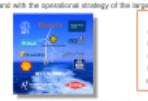
Production II

DJewels

Realisation of a 20 MW Electrolyser in Delfzijl

Hydrogen Delta

Designing a Gigawatt Electrolysis Plant for Zeeland

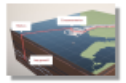


H2.50

Building a 250 MW Electrolysis Plant in Port of Rotterdam

Porthos

CCUS Infrastructure for Blue Hydrogen in Port of Rotterdam



Westereems

Building a 100 MW Hydrogen Plant for Westereems Wind Farm

Hemweg hub Amsterdam

Building a 100 MW Green Hydrogen Plant as part of a Hub

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Wood Gasification with Production of Hydrogen and CO_2

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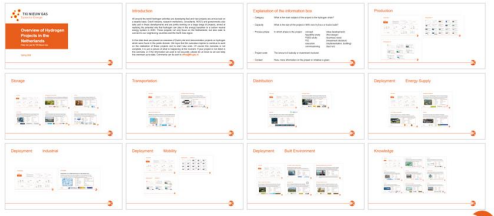
Hydrogen from Organic Waste

Producing Hydrogen by Gasification of Biomass in 'het Groene Hart'

Production II

Overview



Production I

NorthH2

The Production of Green Hydrogen from a GW Windfarm in the North Sea

The objective is to generate 3 to 4 GW of wind energy for hydrogen production by 2030, and possibly 10 GW in 2040. Green hydrogen production of 800,000 tons, prevents around 7 megatons of CO_2 emissions per year.

Category:	production of H_2
Capacity:	3 - 4 GW wind – 0,8 Mt H_2/y
Process phase:	feasibility-study
Project period:	2020 - 2040
Project costs:	unknown
Contact:	info@gasunie.nl

Partners: gasunie, Groningen Seaports, provincie groningen, Shell

H2GO

Towards Hydrogen Island Goeree Overflakkee

A 2.5 MW electrolyser will be producing renewable hydrogen and connecting the hydrogen production unit at the Greenpoint hydrogen refuelling station to Stad aan 't Haringvliet via Energy Park Oude-Tonge. Next will be the upgrade to a 26 MW electrolyser from wind energy.

Category:	production, storage, distribution
Capacity:	2.5 MW to 26 MW
Process phase:	feasibility-study
Project period:	2017 - 2030
Project costs:	unknown
Contact:	info@goeree-overflakkee.nl

Partners: 30+ parties, Goeree-Overflakkee, TU Delft, STEDIN, kiwa

HyNetherlands

Building a 100 MW Electrolyser in the Eemshaven

The factory will also have an important function for the balance in the electricity system. If the wind farms supply more electricity than is currently needed, it can be converted into hydrogen and stored. If necessary, the hydrogen can be converted back into electricity.

Category:	production
Capacity:	100 MW to 1 GW
Process phase:	feasibility-study
Project period:	FID 2021-2022
Project costs:	50 – 100 M
Contact:	info@gasunie.nl

Partners: gasunie, ENGIE

Blue Hydrogen Den Helder

Empty Gas Fields Play a Role for Blue Hydrogen Production

The hydrogen gas can be produced with green energy from the (large) offshore wind farms that will be built in the coming decades. But even now hydrogen can be produced from natural gas. The released CO_2 can be captured and stored in the empty gas fields below the North Sea.

Category:	production
Capacity:	large factory
Process phase:	feasibility-study
Project period:	2020 - 2022
Project costs:	unknown
Contact:	Thijs Pennink, info@nhn

Partners: nhn, Port of Den Helder

GldH2

A Hydrogen Cooperative in Zutphen Aiming for a 1 MW Electrolyser

A hydrogen factory is to be built on the industrial area 'De Mars' and various pilot projects are being set up. The GldH2 cooperative works together with the local energy cooperative Zutphen Energie and with thirteen partners in the region.

Category:	production
Capacity:	1 MW electrolyser
Process phase:	feasibility-study
Project period:	2020 -
Project costs:	unknown
Contact:	https://gldh2.nl/

Partners o.a.: Zutphen Energie, PRIMAGAZ, Zutphen, Provincie Gelderland, Clander, DR remeha

Hydrogen Mill Sint Philipsland

To Use Profits to Benefit the Livability of the Community

The initiators of the windmill look for an alternative for the full electricity grid. The use of the national natural gas network for storage, distribution and deployment of their own production of hydrogen. Therefore they hope to make the peninsula Sint Philipsland a hydrogen village.

Category:	production
Capacity:	1 windmill
Process phase:	feasibility-study
Project period:	2020 - 2022
Project costs:	120 k subsidy
Contact:	pens@stedin.net

Partners o.a.: STEDIN GROEP, zeeuwind, BlueTerra Energy Experts

DJewels

Realisation of a 20 MW Electrolyser in Delfzijl

Operated by Nouryon and Gasunie, it will provide 3,000 tons of green hydrogen per year, reducing CO2 emissions by up to 27,000 tons per year in combined activities with BioMCN.

Category:	production of hydrogen
Capacity:	20 MW > 60 MW
Process phase:	FID in 2020
Project period:	2020 -
Project costs:	16 M subsidy
Contact:	info@hinicio.com

Partners:

FCH, Nouryon, gasunie crossing borders in energy, BioMCN, McPhy Driving clean energy forward, Hinicio, DE NORA

Hydrogen Delta

Designing a Gigawatt Electrolysis Plant for Zeeland

Aims to design a GW hydrogen factory at 3 times lower costs than the current design. It should consider the capturing and delivery of hydrogen, heat and oxygen in a way that goes hand in hand with the operational strategy of the large-scale facility.

Category:	production of H_2
Capacity:	1 GW
Process phase:	FEED-study
Project period:	2019 -
Project costs:	TKI subsidy
Contact:	yvonne.vandelft@tno.nl

Partners: Institute for Sustainable Process Technology (ISPT), Nouryon, Shell, Yara, OCI Nitrogen, Gasunie, DOW Chemical, Ørsted, Frames, ECN part of TNO, Utrecht University and Imperial College London.

H2.50

Building a 250 MW Electrolysis Plant in Port of Rotterdam

The new factory will be able to produce 45,000 tons of green hydrogen annually. Because the hydrogen is produced from water with sustainable electricity, CO_2 emissions can decrease by 350,000 tons annually. BP will use the green hydrogen to desulphurise products.

Category:	production of H_2
Capacity:	250 MW
Process phase:	FEED-study
Project period:	2019 – 2022 (FID)
Project costs:	225 - 300 M
Contact:	hgj.regeer@portofrotterdam.com

Partners:

bp

Port of Rotterdam

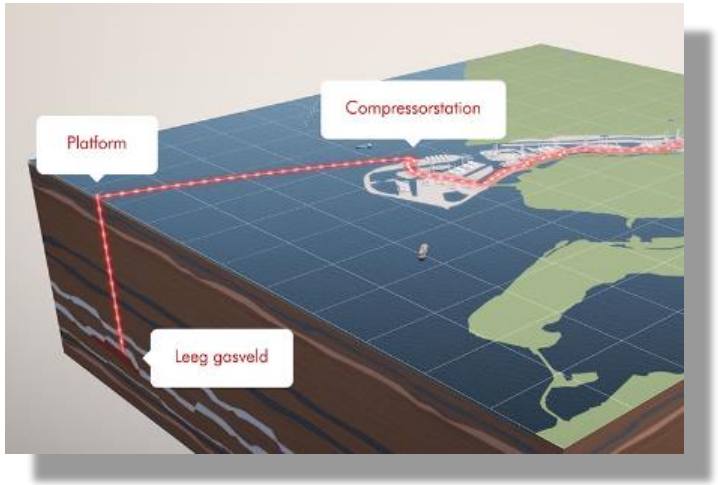
Nouryon

Porthos

Rotterdam CCUS

CCUS Infrastructure for Blue Hydrogen in Port of Rotterdam

Transfer of grey hydrogen production in the Port of Rotterdam into blue with CCUS into the North Sea bottom. Shell, ExxonMobil, Air Liquide and Air Products committed to this phase for creating a CO_2 infrastructure.



Category:	production of blue H_2
Capacity:	2,5 million ton CO_2 per year
Process phase:	FEED-study
Project period:	2020 – 2023
Project costs:	>20 M
Contact:	r.m.de.vries@gasunie.nl

Partners:

Port of Rotterdam

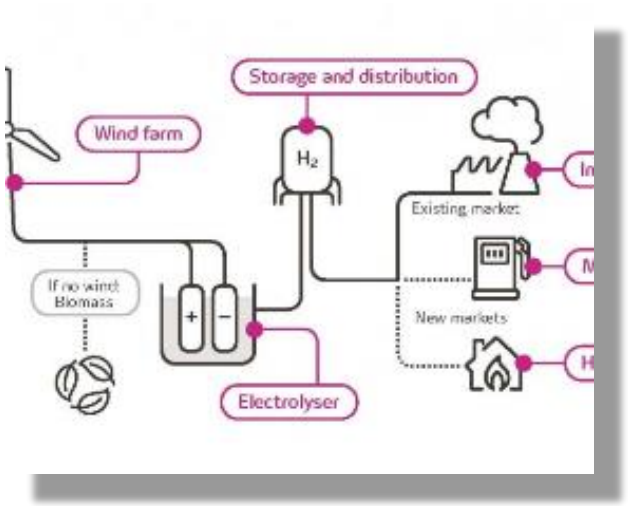
gasunie

ebn

Westereems

Building a 100 MW Hydrogen Plant for Westereems Wind Farm

The 100-megawatt capacity plant would be located on the site of the RWE-Eemshaven power plant and will be supplied with power from the adjacent wind farm Westereems owned by innogy.



Category:	production of green H_2
Capacity:	100 MW
Process phase:	feasibility-study
Project period:	2019 -
Project costs:	unknown
Contact:	sarah.knauber@innogy.com

Partners:

RWE innogy

Hemweg hub Amsterdam

Building a 100 MW Green Hydrogen Plant as part of a Hub

Building a 100 MW hydrogen powerplant on the Hemwegsite as part of a fossil free hub (production, storage and distribution) for providing green electricity, heating and fuels for Amsterdam Metropool Region.

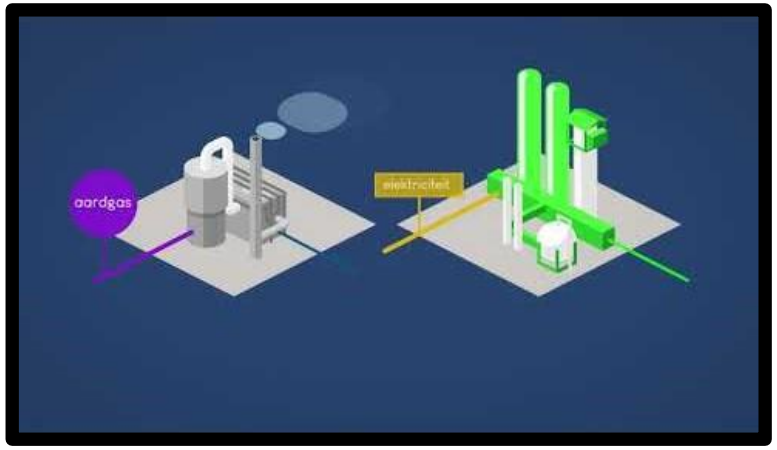
Category:	production of green H_2
Capacity:	100 MW
Process phase:	feasibility-study
Project period:	2019 -
Project costs:	unknown
Contact:	https://group.vattenfall.com/nl

Partners: VATTENFALL metropool regioamsterdam Port of Amsterdam

H-vision

The Production of Blue Industrial Hydrogen in Rotterdam

The production of hydrogen based on natural gas and through the reuse of refinery gases. The CO_2 released during production is captured and stored in empty gas fields below the North Sea or can be reused in the industrial area.



Category:	production of H_2
Capacity:	several installations
Process phase:	FEED-study
Project period:	2020 - 2026
Project costs:	2 B investment
Contact:	hgj.regeer@portofrotterdam.com

Partners: Air Liquide, BP, Deltalinqs, Gasunie, Havenbedrijf Rotterdam, Power Plant Rotterdam, Shell, Uniper en Vopak

GreenH2UB

Creating a Green Hydrogen Ecosystem in Noord-Brabant

Aims to develop a green hydrogen ecosystem. It will contain 3-10 MWA GreenH2UB plants (transformers) balancing the grid with hydrogen production for application and Deployment in industry, heavy mobility and built environment.

Category:	production of green H_2
Capacity:	10 x 3-10MW(330k-1m kg/y)
Process phase:	feasibility-study
Project period:	2019 - 2030
Project costs:	unknown
Contact:	www.greenh2ub.nl

Partners:

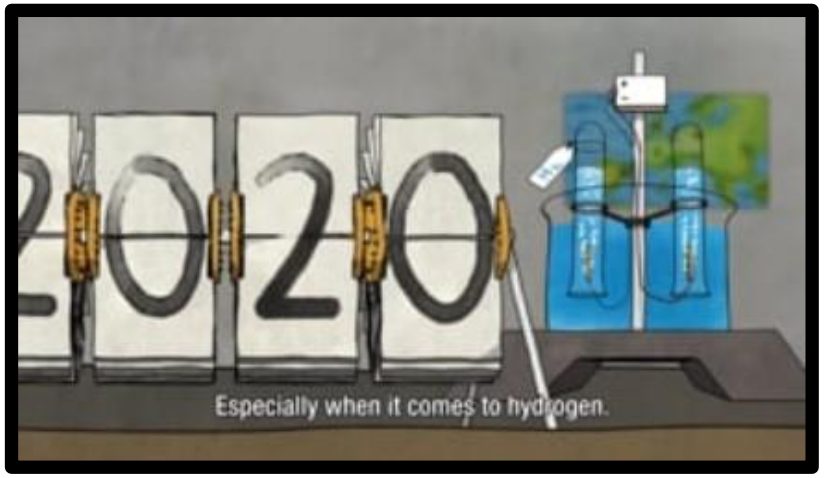
Brabantse Ontwikkelings Maatschappij BOM

FORCE RENEWABLE ENERGY

HEAVENN

H_2 Energy Applications in Valley Environments for Northern NL

The projects support focus on sectoral integration: the large-scale production of green hydrogen as a raw material for industry, the storage, transport and distribution of hydrogen and its application for energy supply for both industry and the built environment and in mobility.



Category:	production H_2 in Energy Valley
Capacity:	30 subprojects
Process phase:	execution
Project period:	2020 - 2025
Project costs:	90 M
Contact:	New Energy Coalition

Partners:

Hydrogen Delta

Aiming for a Gigawatt Factory in the Delta Region

Realisation of a large pilot (on a ~ 100 MW scale) and a large-scale green hydrogen factory (on a ~ GW scale) by 2025. Blue hydrogen is used in the transition to green. In addition, realisation of a hydrogen network in the port area, which is connected to the national network.

Category:	production, distribution
Capacity:	1 GW
Process phase:	concept
Project period:	2020 - 2030
Project costs:	>100 M
Contact:	www.smartdeltaresources.com

Partners:

GZI NEXT

A Second Life for the GZI Site in Emmen, with Hydrogen

Together they look at the possibilities of using the existing infrastructure for the generation of green gas through fermentation or gasification and for the generation of hydrogen. Wind, sun and renewable gas are seen as important components in the sustainable energy picture of 2050.

Category:	production, distribution
Capacity:	-
Process phase:	feasibility-study
Project period:	2018 -
Project costs:	unknown
Contact:	www.gzinext.nl

Partners:

Bio Energy Netherlands

Wood Gasification with Production of Hydrogen and CO_2

The wood gasification plant in Amsterdam will extract hydrogen and CO_2 from the syngas, which can be used for transport fuels and in the chemical industry, amongst others. Developing and testing a gas upgrading system linked to a gasifier for production of green hydrogen.

Category:	production
Capacity:	-
Process phase:	FEED-study
Project period:	2019 - 2021
Project costs:	TSE 500 k
Contact:	info@bioenergynetherlands.nl

Partners:

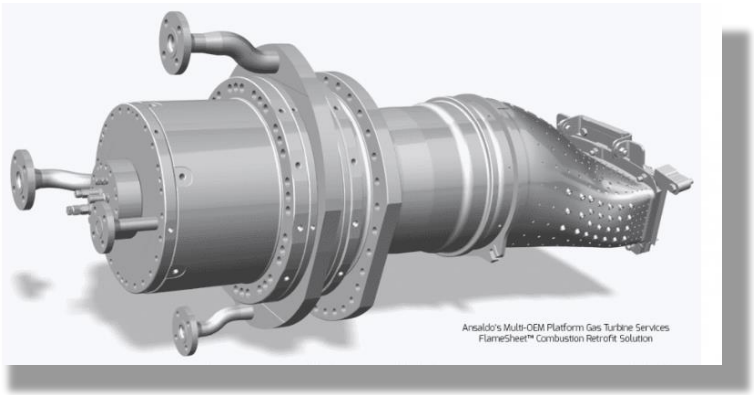
Bio Energy Netherlands

HYGEAR

Hydrogen Gas Turbine Retrofit

Hydrogen Gas Turbine Retrofit to Eliminate Carbon Emissions

To develop a cost effective ultralow emissions (sub 9ppm NOx and CO) combustion system retrofit for existing installed gas turbines in the output range of 1 MW to 300 MW. Fuel Fuel flexibility and stable operation is required from 100% natural gas to 100% hydrogen.



Category:	production
Capacity:	-
Process phase:	FEED-study
Project period:	2019 - 2020
Project costs:	TSE 500 k
Contact:	Huub Koeman, Ansaldo Energia

Partners: ANSALDO ENERGIA, OPRA TURBINES An Energas Group Company, AkzoNobel, EMMTEC A GETEC GROUP COMPANY, TU Delft, VATTENFALL Nouryon

Hydrogen Mill

Building a Windmill that Produces Hydrogen

The goal is to build a 4.8 MW Lagerweij windmill and a 2 MW electrolyser to demonstrate the production of hydrogen by windmills on the ECN test location in the Wieringermeer. This is part of the DUWAAL project that focusses on the hydrogen region of north-western Netherlands.

Category:	production
Capacity:	2 MW
Process phase:	FEED-study
Project period:	2020 -
Project costs:	unknown
Contact:	jwlangeraar@hy-gro.nl

Partners:

HYGRO

PosHYdon

Hydrogen Production from North Sea Water on an Offshore Platform

A 1 MW electrolyser in a sea container on the platform, the Q13a, is very suitable for this. It is a fully electrified offshore platform. This electrification with green electricity saves 16.5 kt of CO2 per year.

Category:	production
Capacity:	1 MW
Process phase:	FEED-study
Project period:	2019 - 2021
Project costs:	unknown
Contact:	Bas Rijke / neptuneenergy.com

Partners:

NEPTUNE ENERGY nexstep TNO innovation for life

H2ermes

Building a 100 MW Hydrogen Plant in Amsterdam for TaTa Steel

Deployment of hydrogen delivered by a 100 MW electrolysis plant to produce fuels and / or basic chemicals with the carbon monoxide (CO) and carbon dioxide (CO_2) in the residual gases from the steel production at TaTa Steel.

Category:	production
Capacity:	100 MW
Process phase:	FEED-study
Project period:	2019 -
Project costs:	150 M
Contact:	Jan.Egbertsen@portofamsterdam.com

Partners:

Port of Amsterdam
Port of partnerships

TATA STEEL

Nouryon

Molten Metal Methane Pyrolysis

Producing ‘Turquoise’ Hydrogen from Natural Gas

Methane pyrolysis produces hydrogen from natural gas with carbon (and not CO_2) as a valuable by-product. Affordable and commercially applicable within a few years. The applications are diverse. Think of additive for steel, filler in car tires, graphite, dye and soil conditioner.

Category:	production, knowledge
Capacity:	-
Process phase:	concept
Project period:	2019 -
Project costs:	unknown
Contact:	willem.frens@tno.nl

Partners:

TNO

VOLTA CHEM

Hydrogen from Organic Waste

Producing Hydrogen by Gasification of Biomass in 'het Groene Hart'

The pilot plant, the size of four parking spaces, is placed at a civil engineering company. Roadside grass and other organic waste is used for testing. The hydrogen obtained is initially used by Vermeulen Groep, who wants to make their business more sustainable.

Category:	production of H_2
Capacity:	?
Process phase:	FEED-study
Project period:	2019 - 2021
Project costs:	unknown
Contact:	info@nettenergy.com

Partners:

NETTEnergy

VERMEULEN GROEP

NortH2

The Production of Green Hydrogen from a GW Windfarm in the North Sea

The objective is to generate 3 to 4 GW of wind energy for hydrogen production by 2030, and possibly 10 GW in 2040. Green hydrogen production of 800,000 tons, prevents around 7 megatons of CO_2 emissions per year.

Category:	production of H_2
Capacity:	3 - 4 GW wind – 0,8 Mt H_2/y
Process phase:	feasibility-study
Project period:	2020 - 2040
Project costs:	unknown
Contact:	info@gasunie.nl

Partners:

gasunie

GRONINGEN SEAPORTS

provincie groningen

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Towards Hydrogen Island Goeree Overflakkee

A 2.5 MW electrolyser will be producing renewable hydrogen and connecting the hydrogen production unit at the Greenpoint hydrogen refuelling station to Stad aan ’t Haringvliet via Energy Park Oude-Tonge. Next will be the upgrade to a 26 MW electrolyser from wind energy.

Category:	production, storage, distribution
Capacity:	2.5 MW to 26 MW
Process phase:	feasibility-study
Project period:	2017 - 2030
Project costs:	unknown
Contact:	info@goeree-overflakkee.nl

Partners: 30+ parties

HyNetherlands

Building a 100 MW Electrolyser in the Eemshaven

The factory will also have an important function for the balance in the electricity system. If the wind farms supply more electricity than is currently needed, it can be converted into hydrogen and stored. If necessary, the hydrogen can be converted back into electricity.

Category:	production
Capacity:	100 MW to 1 GW
Process phase:	feasibility-study
Project period:	FID 2021-2022
Project costs:	50 – 100 M
Contact:	info@gasunie.nl

Partners:

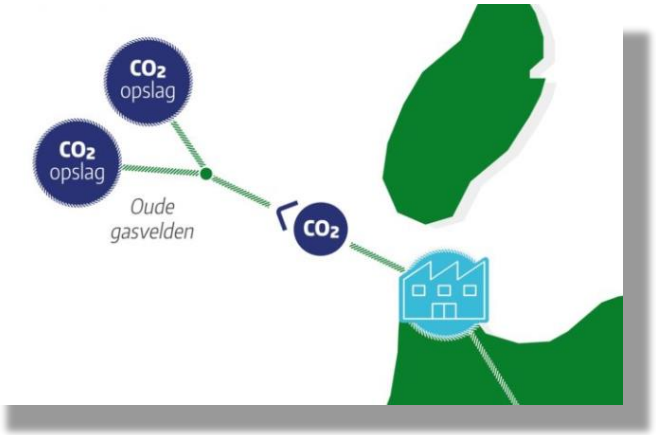
gasunie crossing borders in energy

ENGIE

Blue Hydrogen Den Helder

Empty Gas Fields Play a Role for Blue Hydrogen Production

The hydrogen gas can be produced with green energy from the (large) offshore wind farms that will be built in the coming decades. But even now hydrogen can be produced from natural gas. The released CO_2 can be captured and stored in the empty gas fields below the North Sea.



Category:	production
Capacity:	large factory
Process phase:	feasibility-study
Project period:	2020 - 2022
Project costs:	unknown
Contact:	Thijs Pennink, info@nhn

Partners:

nhn GasTerra gasunie New Energy Coalition DEN HELDER Provincie Noord-Holland PORT OF DEN HELDER NAM

GldH2

A Hydrogen Cooperative in Zutphen Aiming for a 1 MW Electrolyser

A hydrogen factory is to be built on the industrial area 'De Mars' and various pilot projects are being set up. The GldH2 cooperative works together with the local energy cooperative Zutphen Energie and with thirteen partners in the region.

Category:	production
Capacity:	1 MW electrolyser
Process phase:	feasibility-study
Project period:	2020 -
Project costs:	unknown
Contact:	https://gldh2.nl/

Partners o.a.:

Hydrogen Mill Sint Philipsland

To Use Profits to Benefit the Livability of the Community

The initiators of the windmill look for an alternative for the full electricity grid. The use of the national natural gas network for storage, distribution and deployment of their own production of hydrogen. Therefore they hope to make the peninsula Sint Philipsland a hydrogen village.

Category:	production
Capacity:	1 windmill
Process phase:	feasibility-study
Project period:	2020 - 2022
Project costs:	126 k subsidy
Contact:	pers@stedin.net

Partners o.a.:

Stichting Zeeuwse Publieke Belangen

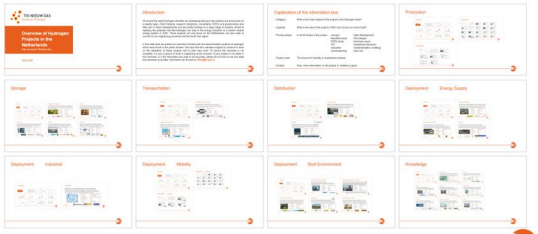
STEDIN GROEP

zeeuwind

BlueTerra Energy Experts

Storage

Overview



Hydrogenpilot Oosterwolde

An 1-2 MW Electrolyser Placed at a Solarpark for Netbalancing

Instead of reducing the generation at peak times, an electrolyser is used to convert electricity and water into hydrogen. In this way a peak load in the grid becomes is prevented. The hydrogen can then be used in hydrogen vehicles.

Category:	storage, knowledge
Capacity:	1-2 MW
Process phase:	execution
Project period:	2019 - 2021
Project costs:	unknown
Contact:	ben.tubben@qirion.nl

Partners: Qirion, HOLTHAUSEN, ecomunitypark

H2Fuel

A Technique for the Production, Storage and Release of H_2

The storage takes place under atmospheric conditions in a powder and the release takes place without added energy with very clean water. Hereby not only 100% of the hydrogen stored in the powder is released, but also the same amount of hydrogen from the water is harvested.

Category:	storage
Capacity:	scale up
Process phase:	FEED-study/proof of concept
Project period:	2019 -
Project costs:	unknown
Contact:	https://h2-fuel.nl

Partners: H2FUEL-SYSTEMS, Solid. Hydro. Re.Gen

Cyrus SMith

Creating a Mobile 20 KW Electrolyser for Local Energy Storage

The fluctuating nature of renewable energy sources necessitates flexibility in our energy infrastructure. This is a feasibility study for a mobile unit that provides grid support at medium and low voltage level by converting green electricity into hydrogen.

Category:	storage, knowledge
Capacity:	20 KW
Process phase:	concept
Project period:	2019 - 2020
Project costs:	TSE 50 k
Contact:	J.F. Janssen, Hymatters

Partners: HAN, HyMatters, H2Consultancy

HyStock

A 1 MW P2G Installation with Large-scale Energy Storage

Converting sustainable electricity into hydrogen for transport and industry at the site of EnergyStock storage facility. The EnergyStock facility is ideally situated for this project thanks to buffer capacity and connection with the main gas and electricity infrastructure.

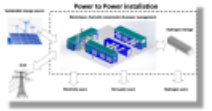
Category:	storage, production
Capacity:	1 MW
Process phase:	commissioning
Project period:	2018 - 2020
Project costs:	EU subsidy
Contact:	info@energystock.com

Partners: energystock, eon, Nouryon, ECN, TNO, Shell

P2P IPKW

Power-to-Power Installation Makes IPKW Energy Neutral

The P2P installation converts the peak current on location into hydrogen and stores it temporarily. The electricity can later be used for electricity, hot water or (hydrogen) gas. In this way we prevent large fluctuations in the electricity grid and is green energy available 24 hours a day.



Category:	storage, knowledge
Capacity:	1 MW
Process phase:	feasibility-study
Project period:	2019 -
Project costs:	unknown
Contact:	info@hygear.nl

Partners: Industriepark Kloosterveen Weerd, Nedtrack, HAN, DEKRA, HYGEAR, kiemt, INTSA, VEOLIA, HyET, allander

Hydrogenpilot Oosterwolde

An 1-2 MW Electrolyser Placed at a Solarpark for Netbalancing

Instead of reducing the generation at peak times, an electrolyser is used to convert electricity and water into hydrogen. In this way a peak load in the grid becomes is prevented. The hydrogen can then be used in hydrogen vehicles.

Category:	storage, knowledge
Capacity:	1-2 MW
Process phase:	execution
Project period:	2019 - 2021
Project costs:	unknown
Contact:	ben.tubben@qirion.nl

Partners: Qirion, gemeente ooststellingwerf, HOLTHAUSEN CLEAN TECHNOLOGY, ecomunitypark

H2Fuel

A Technique for the Production, Storage and Release of H_2

The storage takes place under atmospheric conditions in a powder and the release takes place without added energy with very clean water. Hereby not only 100% of the hydrogen stored in the powder is released, but also the same amount of hydrogen from the water is harvested.

Category:	storage
Capacity:	scale up
Process phase:	FEED-study/proof of concept
Project period:	2019 -
Project costs:	unknown
Contact:	https://h2-fuel.nl

Partners:

H2FUEL-SYSTEMS
Making Hydrogen work

Solid Hydro. Re.Gen

Cyrus SMith

Creating a Mobile 20 KW Electrolyser for Local Energy Storage

The fluctuating nature of renewable energy sources necessitates flexibility in our energy infrastructure. This is a feasibility study for a mobile unit that provides grid support at medium and low voltage level by converting green electricity into hydrogen.

Picture: McPhy.com

Category:	storage, knowledge
Capacity:	20 KW
Process phase:	concept
Project period:	2019 - 2020
Project costs:	TSE 50 k
Contact:	J.F. Janssen, Hymatters

Partners:

HAN

HyMatters

H2Consultancy
Making Fuelcell Systems

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Category:	storage, production
Capacity:	1 MW
Process phase:	commissioning
Project period:	2018 - 2020
Project costs:	EU subsidy
Contact:	info@energystock.com

Partners: energystock fast cycle gas storage, ebn, Nouryon, ECN, TNO innovation for life

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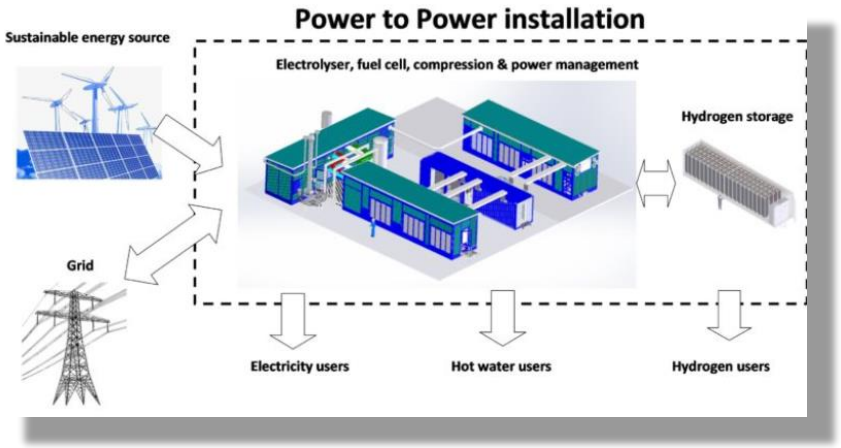
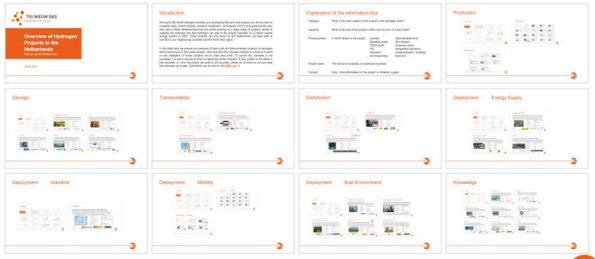


Category:	storage, knowledge
Capacity:	1 MW
Process phase:	feasibility-study
Project period:	2019 -
Project costs:	unknown
Contact:	info@hygear.nl

Partners: Industriepark Kleefse Waard, Nedstack, HAN, HYGEAR, NTSA Technopower, HyET Hydrogen Efficiency Technologies, DEKRA, kiemt, VEOLIA, alliander

Transportation

Overview



Hydrogen Sensor Technology

Developing Better Sensors for Natural Gas / Hydrogen Mixtures

The project aims to develop a technology that allows the cost-effective and sufficiently accurate measurement of the composition of natural gas / hydrogen mixtures, wherein high concentrations of hydrogen are mixed (typically up to 90%).

Category: transportation

Capacity:	-
Process phase:	concept
Project period:	2018 – 2020
Project costs:	TKI 225 k
Contact:	Huib Blokland, TNO

Partners: TNO, Liander, ENEXIS NETBEHEER, gasunie, Bronkhorst

Natural Gas Pipeline to H_2

YARA Receives 4,000 tons of Green H_2 / Year from DOW Chemical

The hydrogen released by Dow crackers is used as a raw material for high-quality Yara products. This will result in an initial decrease in energy consumption of 0.15 PJ per year. In addition, it would reduce CO_2 emissions by 10,000 tons.

Category:	transportation
Capacity:	4,000 tons H_2/year
Process phase:	commissioning
Project period:	2017 - 2020
Project costs:	unknown
Contact:	evanoosten@dow.com

Partners: Dow, YARA (Knowledge grows), SDR, gasunie waterstof services, AICL The Netherlands Terneuzen

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Category: transportation

Capacity:	-
Process phase:	concept
Project period:	2018 – 2020
Project costs:	TKI 225 k
Contact:	Huib Blokland, TNO

Partners:

TNO Liander ENEXIS NETBEHEER gasunie Bronkhorst®

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Capacity:	4,000 tons H_2/year
Process phase:	commissioning
Project period:	2017 - 2020
Project costs:	unknown
Contact:	evanoosten@dow.com

Partners:

DOW

YARA

Knowledge grows

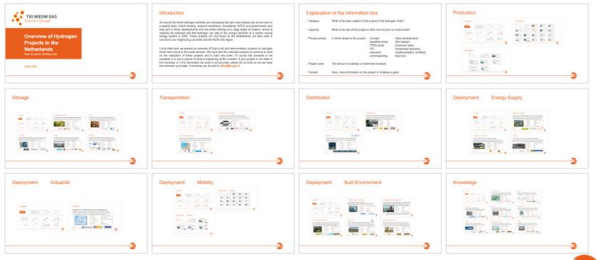
SDR PLATFORM

gasunie waterstof services

ICL The Netherlands Terneuzen

Distribution

Overview



Hydrogen Street

Research into Possibilities for Reusing the Natural Gas Grid

The grid operators in the Green Village investigate the behavior of gas stations and their meters. They also research the necessary safety measures, such as new working methods and tools. This gas grid is therefore available as a testing site for other parties to do research.

Category:	distribution
Capacity:	-
Process phase:	commissioning
Project period:	2020 - 2025
Project costs:	unknown
Contact:	Elbert Huijzer, Alliander

Partners: ENEXIS GROEP, STEDIN, alliander, THE GREEN VILLAGE

NSWPH

North Sea Wind Power Hub Programme

North Sea Wind Power Hub; a Chain in Future Energy Supply

The Hub-and-Spoke concept consists of modular hubs in the North Sea connecting offshore wind farms with interconnectors to bordering North Sea countries and facilitates sector coupling through power-to-Hydrogen conversion.

Category:	distribution
Capacity:	10 > 30 GW
Process phase:	FEED-studies
Project period:	2020 -
Project costs:	unknown
Contact:	info@northseawindpowerhub.eu

Partners: TenneT, ENERGINET, Port of Rotterdam, gasunie

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Category:	distribution
Capacity:	-
Process phase:	commissioning
Project period:	2020 - 2025
Project costs:	unknown
Contact:	Elbert Huijzer, Alliander

Partners:

ENEXIS GROEP

STEDIN NET

alliander

THE GREEN VILLAGE

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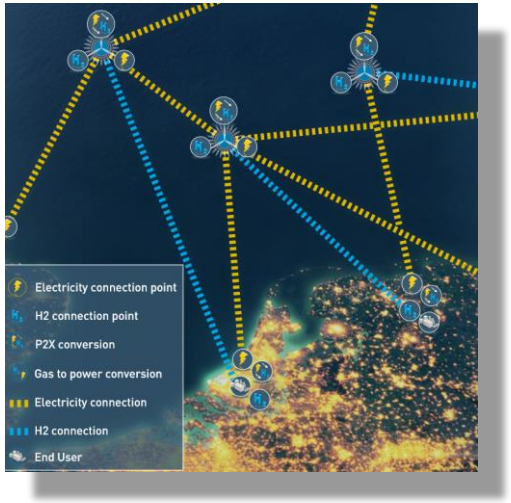
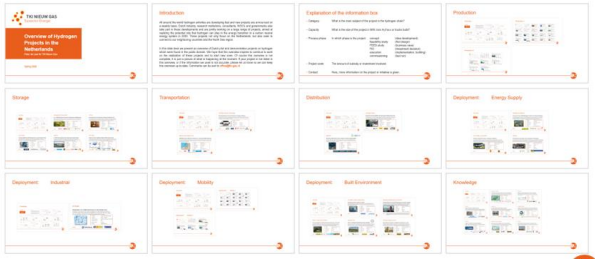


Category:	distribution
Capacity:	10 > 30 GW
Process phase:	FEED-studies
Project period:	2020 -
Project costs:	unknown
Contact:	info@northseawindpowerhub.eu

Partners:

Deployment: Energy Supply

Overview



Hydrogen-to-Magnum

Conversion of the 1,320 MW Magnum E-Plant into Fueled by Hydrogen

The natural gas plant will first use blue hydrogen after the conversion, where the CO_2 is captured and stored underground in Norway. In time, the plant will only use green hydrogen (obtained by electrolysis). Gasunie is investigating the possibility of storage of hydrogen in caverns.

Category:	deployment in energy supply
Capacity:	3 x 440 MW
Process phase:	FEED-study / execution
Project period:	2020 - 2030
Project costs:	unknown
Contact:	k.g.wiersma@gasunie.nl

Partners: gasunie new energy, VATTENFALL, equinor

H_2 Air Base Leeuwarden

Air Base Leeuwarden Focuses on Hydrogen and Biofuel

It is investigated whether the base itself can produce and store hydrogen, also for use in the vehicles and in the built environment. There are also plans to produce hydrogen with the 10 ha large solar park that has been developed. The hydrogen should also serve as emergency power.

Category:	deployment in energy supply
Capacity:	5 MW solar power
Process phase:	feasibility-study
Project period:	2019 - 2022
Project costs:	unknown
Contact:	www.defensie.nl

Partners: Koninklijke Luchtmacht

Hysolar

The Production and Supply of Green Hydrogen in Nieuwegein

The organization is installing a 2 MW electrolyser, which is linked to a large solar park. Eventually, the project will produce 250 tons of hydrogen per year. Approximately 750 cars or 25 buses will be able to run on this every day for an entire year11 Hyundai Nexo's have already been delivered.

Category:	deployment in energy supply
Capacity:	250 ton H_2 / year
Process phase:	execution
Project period:	2020
Project costs:	unknown
Contact:	www.hysolar.nl

Partners: hysolar, ALLIED WATERS, Aannemingsbedrijf Jos Scholman

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Project period:	2020 - 2030
Project costs:	unknown
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Partners:

gasunie new energy

VATTENFALL

equinor

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Category:	deployment in energy supply
Capacity:	5 MW solar power
Process phase:	feasibility-study
Project period:	2019 - 2022
Project costs:	unknown
Contact:	www.defensie.nl

Partners:

Koninklijke Luchtmacht

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Category:	deployment in energy supply
Capacity:	250 ton H_2 / year
Process phase:	execution
Project period:	2020
Project costs:	unknown
Contact:	www.hysolar.nl

Partners:

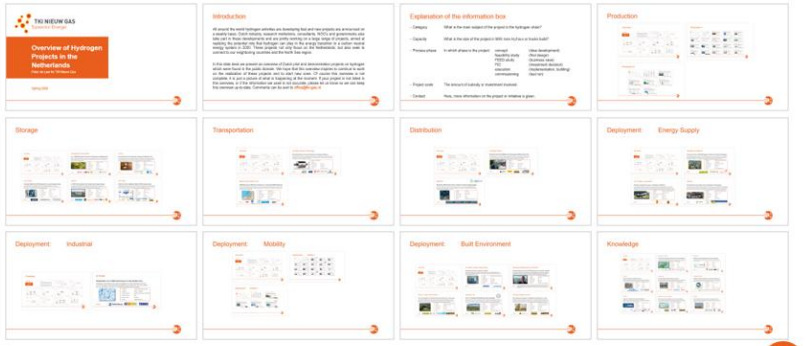
hysolar

ALLIED WATERS

Aannemingsbedrijf Jos Scholman

Deployment: Industrial

Overview



E-THOR

Realisation of a 5 MW Electrolyser in the Botlek Area

Investigation of the technical and economic feasibility of a 5 MW electrolyser at AVR and Tronox in the Botlek. This considers the possibilities for processing CO / CO_2 from residual gas, and possibly also fluid gas, into chemical compounds such as methanol.

Category:	industrial deployment of H_2
Capacity:	5 MW > 100 MW
Process phase:	feasibility-study until may 2020
Project period:	2020
Project costs:	unknown
Contact:	rijk@deltalinqs.nl

Partners: Deltalinqs AVR. TRONOX

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Category:	industrial deployment of H_2
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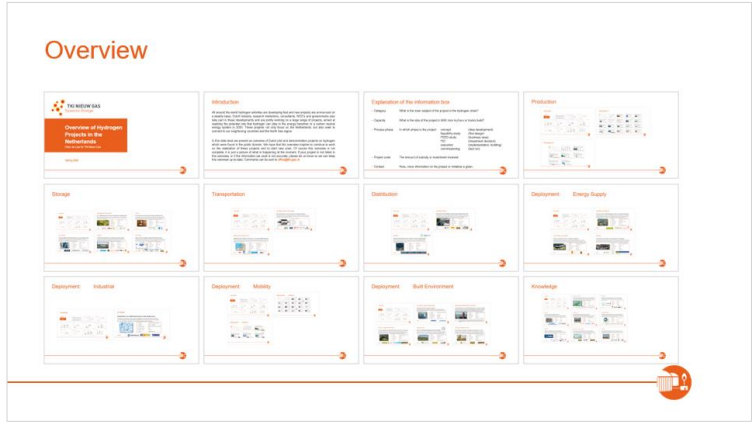
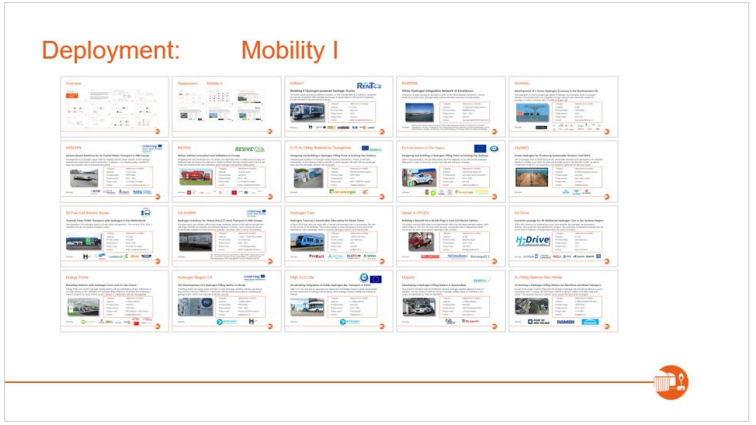
Project period:	2020
Project costs:	unknown
Contact:	rijk@deltalinqs.nl

Partners:

Deltalinqs AVR. TRONOX

Deployment: Mobility

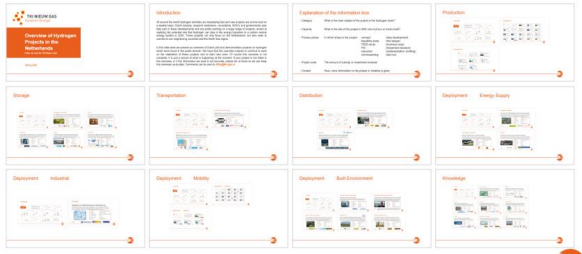




Deployment: Mobility I

Deployment: Mobility II

Overview



Deployment: Mobility I

5 H_2 Filling Stations by Greenpoint Fuels

To Develop and Construct 5 Hydrogen Filling Stations in NL

Greenpoint Fuels currently has pending permit applications for 5 hydrogen filling stations. Creating a network of tapping points; the filling stations will be located in Zeewolde, Ede, Bleiswijk, Oude-Tonge and Sliedrecht.

Category:	deployment in mobility
Capacity:	5 H_2 filling stations
Process phase:	FEED-study / execution
Project period:	2019 - 2023
Project costs:	unknown
Contact:	info@greenpointfuels.nl

Partners: GREENPOINT Pure fuels and energy, MEIJER & VAN EERDEN

45 Hydrogen Taxi's

Use of 45 Hydrogen Taxi's for Special Care (WMO) Transportation.

This is the first hydrogen taxi fleet in the Netherlands. 35 Toyota Mirai's are driving in The Hague and 10 in Ede. *"The client requires us to be available 24/7 with our fleet. Due to the large range of the hydrogen car and the fast refueling, Noot Personenvervoer can offer this."*

Category:	deployment in mobility
Capacity:	45 H_2 taxi's
Process phase:	commissioning
Project period:	2019 - 2020
Project costs:	unknown
Contact:	info@noot.nl

Partners: NOOT voor het hele koor, Den Haag, LOUWMAN DEALERBEDRIJVEN

Hydrogen Ships Lauwersoog

Investigating the Possibility of Ships Sailing on Green Hydrogen

The coalition wants to start with the test ship 'Ecolution' of Wubbo Ockels. After a first test ship, the sustainable port coalition in the province of Groningen wants to expand to fishing vessels, tour boats, the brown fleet and agricultural vehicles in the future.

Category:	deployment in mobility
Capacity:	scale up
Process phase:	FEED-study
Project period:	2020 - 2030
Project costs:	1.2 M
Contact:	www.wadduurzaam.nl

Partners: NEXT GENERATION SHIPYARDS, gasunie, Rabobank

THRUST

Towards Hydrogen-based Renewables Used for Ship Transportation

Enabling a shipping industry without harmful emissions. The Rotterdam water taxi in 2020 is a beautiful calling card for the application of hydrogen. This launches a commercial, emission-free solution for inland shipping, which can be scaled up towards the maritime sector.

Category:	deployment in mobility
Capacity:	scale up
Process phase:	FEED-study/ execution
Project period:	2020 -
Project costs:	unknown
Contact:	https://thrust.enviu.org/

Partners o.a.: enviu, Gemeente Rotterdam, NMRI, Future Proof Shipping

H2RenT

Building 6 Hydrogen-powered Garbage Trucks

The trucks will be operating in different locations, so that municipalities and collection companies can become acquainted with hydrogen technology. A unique aspect is that service companies are also involved in the demonstration project.

Category:	deployment in mobility
Capacity:	6 trucks
Process phase:	execution
Project period:	2020 -
Project costs:	unknown
Contact:	stefan.neis@waterstofnet.eu

Partners:

RH2RINE

Rhine Hydrogen Integration Network of Excellence

Aiming for 10 ships running on hydrogen in 2030 on the Rhine between Rotterdam - Genoa , fueled by (at least) three hydrogen filling stations and three consortia of private parties.

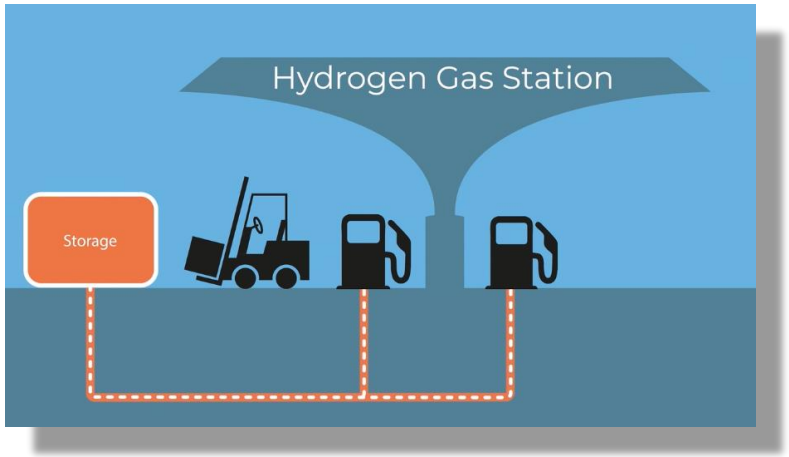
Category:	deployment in mobility
Capacity:	10 ships and 3 filling stations
Process phase:	feasibility-study
Project period:	2020 – 2030
Project costs:	unknown
Contact:	hgj.regeer@portofrotterdam.com

Partners: the Province of South Holland, the State of North Rhine-Westphalia, Ministry of Infrastructure and Water Management, Province of Gelderland, Port of Rotterdam Authority, Duisburg Port Authority RhineCargo, BCTN, EICB, Nouryon, Covestro, Air Products, Future Proof Shipping, HTS Group, NPRC, AirLiquide and Koedood.

DUWAAL

Development of a Green Hydrogen Economy in the Northwestern NL

The realization of a first hydrogen gas station in Alkmaar, two hydrogen trucks, a hydrogen sweeper, the development of an integrated storage, transport and distribution system for hydrogen. It will be combined with a 4.8 MW hydrogen mill.



Category:	deployment in mobility
Capacity:	2 MW
Process phase:	FEED-study
Project period:	2020 -
Project costs:	DKTI 2 M
Contact:	jwlangeraar@hy-gro.nl

Partners:

HYGRO

DIRK BARTEN · NXT · gp groot · Participatiefonds Duurzame Economie Noord-Holland · nhn Ontwikkelingsbedrijf Noord-Holland Noord · NPROXX · spaarne landen · TOYOTA MATERIAL HANDLING · Lagerwey · HVC · STADSWERK072 · TOYOTA · New Energy Coalition

H2SHIPS

System-Based Solutions for H_2-Fueled Water Transport in NW Europe

Development of a hydrogen supply chain for shipping (retrofit) inland vessels. A new hydrogen powered port vessel will be built in Amsterdam. In Belgium, a H_2 refueling system suitable for open sea operation, will be developed and tested.

Category:	deployment in mobility
Capacity:	1 port vessel
Process phase:	FEED-study
Project period:	2019 - 2022
Project costs:	7.2 M total EU project
Contact:	Jan.Egbertsen@portofamsterdam.com

Partners:

eifer European Institute for Energy Research

Port of Amsterdam Port of partnerships

TU Delft Delft University of Technology

TATA STEEL

REVIVE

Refuse Vehicle Innovation and Validation in Europe

Integrating fuel cell powertrains into 15 vehicles and deploying them in 8 sites across Europe. An additional task will explore the potential for ‘Waste-to-Wheel’ business models where the fuel cell trucks are combined with more affordable green hydrogen sourced from waste plants.

Category:	deployment in mobility
Capacity:	15 waste trucks
Process phase:	execution
Project period:	2019 - 2021
Project costs:	8.7 M total EU project
Contact:	stefan.neis@waterstofnet.eu

Partners:

5-10 H_2 Filling Stations by OrangeGas

Designing and Building a Hydrogen Filling Point at Existing Gas Stations

Designing and building 5-10 hydrogen fueling stations in Amsterdam, Utrecht, Zwolle and Leeuwarden. At the locations it will be possible to refuel hydrogen with both 700 bar (passenger cars) and 350 bar (larger vehicles such as buses).

Category:	deployment in mobility
Capacity:	350/700 Bar filling stations
Process phase:	FEED-study
Project period:	2019 -
Project costs:	DKTI + BENEFIC subsidy
Contact:	info@orangegas.nl

Partners:

H_2 Fuel Station in The Hague

Designing and building a Hydrogen Filling Point at Existing Gas Stations

After a long preparation, we can finally report that the installation of our 350/700 Bar hydrogen filling point is ready. At this point, anyone can help with testing by refueling.

Category:	deployment in mobility
Capacity:	350/700 Bar filling point
Process phase:	commissioning [in operation]
Project period:	2019 - 2020
Project costs:	unknown
Contact:	willem.frens@tno.nl

Partners:

BOVAG, bp, HYUNDAI, TOYOTA, ORANGEgas, STEDIN INFRADIENSTEN

SkyNRG

Green Hydrogen for Producing Sustainable Aviation Fuel (SAF).

Use of hydrogen from to refine frying fat into sustainable kerosene and biopropane in the SkyNRG initiative in Delfzijl. From 2022, the plant will annually produce 100,000 tons of SAF, as well as 15,000 tons of bioLPG, as a byproduct. CO_2 reduction would be 270,000 tons a year.

Category:	deployment in mobility
Capacity:	40 MW electrolyser capacity
Process phase:	execution
Project period:	plant open in 2022
Project costs:	unknown
Contact:	info@skynrg.com

Partners:

KLM Royal Dutch Airlines

SkyNRG

SHV ENERGY

50 Fuel Cell Electric Buses

Towards Clean Public Transport with Hydrogen in the Netherlands

Demonstration of 50 hydrogen buses on Dutch public transportation. This is part of JIVE, JIVE 2 subsidies and part of a greater European project.

Category:	deployment in mobility
Capacity:	50 buses
Process phase:	execution
Project period:	2018 - 2020
Project costs:	25 M total EU project
Contact:	stefan.neis@waterstofnet.eu

Partners:

H2-SHARE

Hydrogen Solutions for Heavy-duty (27 tons) Transport in NW Europe.

For large heavy-duty vehicles which travel longer distances, electric trucks with a hydrogen fuel cell range extender are possible zero-emission solutions. In the EU, such vehicles are not yet commercially available but have enormous potential. ‘H2-Share’ aims to unlock this potential.

Category:	deployment in mobility
Capacity:	1 truck, 1 mobile filling station
Process phase:	commissioning
Project period:	2020 - 2023
Project costs:	1.7 M Interreg subsidy
Contact:	stefan.neis@waterstofnet.eu

Partners:

VDL, Wystrach GmbH, Rai Automotive NL, BREYTNER, Colruyt Group, Cure, DHL, e-mobil BW, Hydrogen Europe, Dutch Ministry of Infrastructure and Water Management, TNO, WaterstofNet. The city of Helmond and VIL

Hydrogen Train

Hydrogen Trains as a Sustainable Alternative for Diesel Trains

In March 2020 train rides are made with a Coradia iLint-hydrogen train, to test whether this type of train can run in the timetable. The province wants to make rail transport in the north of the Netherlands more sustainable, which is currently still largely carried out by diesel trains.

Category:	deployment in mobility
Capacity:	1,000 km per filling
Process phase:	commissioning
Project period:	2020
Project costs:	unknown
Contact:	info@prorail.nl

Partners:

ProRail

arriva a DB company

ALSTOM · mobility by nature ·

DEKRA On the safe side.

Diesel to PFCEV

Building a Retrofit for a 30 kW Plug-in Fuel Cell Electric Vehicle

The project includes R&D towards an experimental 30kW fuel cell range extender system, which will be tested in a PFCEV city truck. After success, a production line is designed for retrofit conversion kits and a more generic application than vehicles.

Category:	deployment in mobility
Capacity:	30 kW
Process phase:	feasibility-study
Project period:	2018 - 2020
Project costs:	TSE 460 k
Contact:	sales@newelectric.nl

Partners:

NEW ELECTRIC
HIGH PERFORMANCE EV DRIVE TRAINS

H2Consultancy
Making Fuelcell Systems

Garage7 I
Engineering

H2-Drive

Incentive package for 90 Additional Hydrogen Cars in the Arnhem Region

With a 50% discount on refueling and much more benefits, like hydrogen car introductory training, pick-up service and replacement transport. This promotion is intended for people who live and/or work a maximum of 30 kilometers from the center of Arnhem.

Category:	deployment in mobility
Capacity:	90 cars
Process phase:	commissioning
Project period:	2020 -
Project costs:	1 M
Contact:	www.h2-drive.nl

Partners: Gemeente Arnhem, provincie Gelderland, gloedcommunicatie, H4 Lease, Herwers Hyundai, kiemt, K Plus V

Energy Points

Refueling Stations with Hydrogen From and For the Future

Energy Points are modern hydrogen fueling stations with groundbreaking design. Holthausen is currently working on the realisation of 2 hydrogen filling stations in Groningen and Amsterdam. These 2 projects are being worked out and realised in collaboration with the municipalities.

Category:	deployment in mobility
Capacity:	2 refilling stations
Process phase:	execution
Project period:	2020-2020
Project costs:	DKTI-subsidy + 500 k A'dam
Contact:	lead@holthausen.nl

Partners:

HOLTHAUSEN CLEAN TECHNOLOGY
Hogeschool van Amsterdam
ESA
century AUTOCROEP
TRUCKLAND
Gemeente Groningen
Gemeente Amsterdam
Port of Amsterdam Port of partnerships
Hanze University of Applied Sciences Groningen

Hydrogen Region 2.0

The Development of a Hydrogen Filling Station in Breda

This filling station will supply green hydrogen to both passenger vehicles (700 bar) and heavy-duty vehicles (350 bar). PitPoint is in discussion with the waste service Breda considering its garbage trucks, which is an important potential customer.

Category:	deployment in mobility
Capacity:	1 refilling station
Process phase:	FEED-study
Project period:	2020 - 2022
Project costs:	Interreg and DKTI-subsidy
Contact:	info@pitpoint.nl

Partners:

High V.LO City

Accelerating Integration of Public Hydrogen Bus Transport in Cities

High V.LO City does this by supporting the deployment of hydrogen buses in public transportation and the construction of hydrogen filling stations at the strategic locations Delfzijl and Antwerp by PitPoint.

Category:	deployment in mobility
Capacity:	2 refilling stations
Process phase:	execution
Project period:	2012 - 2022
Project costs:	FCH-subsidy
Contact:	info@pitpoint.nl

Partners:

PITPOINT CLEAN FUELS

H2point

Developing a Hydrogen Filling Station in Roosendaal.

This project is localised near the Rotterdam-Antwerp hydrogen pipeline adjacent to the A17 highway. The next project of H2Point will be a hydrogen refilling station in Oosterhout. The project is subsedised by TDKI and BENEFIC.

Category:	deployment in mobility
Capacity:	2 refilling stations
Process phase:	execution
Project period:	2020 Roosendaal ready
Project costs:	1.5 M per station
Contact:	www.h2point.nl

Partners:

H_2 Filling Stations Den Helder

To Develop a Hydrogen Filling Station for Maritime and Road Transport

As part of the project, Damen Shipyards will develop a hydrogen ship that will be offered to a pool of potential users. To supply the electrolyser, ENGIE is going to realize a 2.6 MWp solar park locally. The expected maximum capacity will be around 400 kg of green hydrogen.

Category:	deployment in mobility
Capacity:	2 refilling stations/ 400 kg H_2
Process phase:	FEED-study
Project period:	2019 - 2021
Project costs:	1.4 M DKTI
Contact:	info@podh.eu

Partners:

PORT OF DEN HELDER

DAMEN

ENGIE

5 H_2 Filling Stations by Greenpoint Fuels

To Develop and Construct 5 Hydrogen Filling Stations in NL

Greenpoint Fuels currently has pending permit applications for 5 hydrogen filling stations. Creating a network of tapping points; the filling stations will be located in Zeewolde, Ede, Bleiswijk, Oude-Tonge and Sliedrecht.

Category:	deployment in mobility
Capacity:	5 H_2 filling stations
Process phase:	FEED-study / execution
Project period:	2019 - 2023
Project costs:	unknown
Contact:	info@greenpointfuels.nl

Partners:

GREENPOINT® Pure fuels and energy

MEIJER & VAN EERDEN

45 Hydrogen Taxi’s

Use of 45 Hydrogen Taxi's for Special Care (WMO) Transportation.

This is the first hydrogen taxi fleet in the Netherlands. 35 Toyota Mirai’s are driving in The Hague and 10 in Ede. *“The client requires us to be available 24/7 with our fleet. Due to the large range of the hydrogen car and the fast refueling, Noot Personenvervoer can offer this.”*

Category:	deployment in mobility
Capacity:	45 H_2 taxi’s
Process phase:	commissioning
Project period:	2019 - 2020
Project costs:	unknown
Contact:	info@noot.nl

Partners:

NOOT voor het hele koor

Den Haag

LOUWMAN DEALERBEDRIJVEN

Hydrogen Ships Lauwersoog

Investigating the Possibility of Ships Sailing on Green Hydrogen

The coalition wants to start with the test ship 'Ecolution' of Wubbo Ockels. After a first test ship, the sustainable port coalition in the province of Groningen wants to expand to fishing vessels, tour boats, the brown fleet and agricultural vehicles in the future.

Category:	deployment in mobility
Capacity:	scale up
Process phase:	FEED-study
Project period:	2020 - 2030
Project costs:	1.2 M
Contact:	www.wadduurzaam.nl

Partners:

NEXT GENERATION SHIPYARDS

gasunie crossing borders in energy

Rabobank

THRUST

Towards Hydrogen-based Renewables Used for Ship Transportation

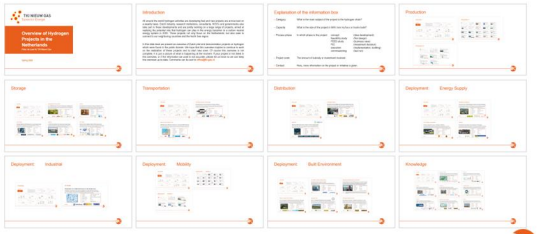
Enabling a shipping industry without harmful emissions. The Rotterdam water taxi in 2020 is a beautiful calling card for the application of hydrogen. This launches a commercial, emission-free solution for inland shipping, which can be scaled up towards the maritime sector.

Category:	deployment in mobility
Capacity:	scale up
Process phase:	FEED-study/ execution
Project period:	2020 -
Project costs:	unknown
Contact:	https://thrust.enviu.org/

Partners o.a.:

Deployment: Built Environment

Overview



H2 Ready Central Heating Burner

Developing a H_2 Burner System as a Retrofit.

The goal is to develop a burner system that can replace the current natural gas burner. This means that future boilers for hydrogen can be produced. However, already installed boilers can also be converted with a retrofit.

Category:	deployment in built environment
Capacity:	-
Process phase:	FEED-study
Project period:	2018 - 2020
Project costs:	TSE 250 k
Contact:	Eliart de Wit, Hygear

Partners: ATAG, HYGEAR

Hydrogen Neighbourhood Hoogeveen

100 Newly Built Houses and 430 Existing Houses Connected to Hydrogen

The newly built Nijstad-Oost residential area has been designated as a demonstration project for the application of hydrogen in newly-built houses. The destination plan will soon be brought into execution. Construction is expected to start in 2021. Other houses will be connected later.

Category:	deployment in built environment
Capacity:	530 houses
Process phase:	FID
Project period:	2020 - 2022
Project costs:	TSE 400 k
Contact:	Kees Boer, gem. Hoogeveen

Partners:

Power-To-Gas (P2G) Phase II

Power to Hydrogen for Residential Heating of Apartments in Rozenburg

Decentralized integration of wind and solar energy via hydrogen from electrolysis for the heat supply of the built environment. The hydrogen is delivered by the regular natural gas pipelines to the boiler house of the apartment complex where the first hydrogen boilers are tested.

Category:	deployment in built environment
Capacity:	500 residential houses
Process phase:	execution
Project period:	2018 - 2023
Project costs:	unknown
Contact:	albert.vandermolen@stedin.net

Partners: STEDIN, DNV-GL, BEKAERT, CR remeha

Hydrogen City

City on 't Haringvliet Switching to Green Hydrogen.

The hydrogen is to be used to heat the 600 houses in the village. The existing gas network can be used for the purpose, so no new network needs to be laid. The four "gas district stations" that still operate on natural gas are being converted and a different gas meter must be installed.

Category:	deployment in built environment
Capacity:	600 residential houses
Process phase:	FEED-study
Project period:	2018 - 2030
Project costs:	unknown
Contact:	stadaardgasvrij@gmail.com

Partners: Goeree-Overflakkee, STEDIN, kiwa

Hydrogen Neighbourhood

Pilot Heating with Hydrogen in Neighbourhood Berkeloord, Lochem

At Berkeloord there are relatively old, sometimes even monumental buildings. Residents are looking for sustainable alternatives for natural gas. Since cooking cannot be done with hydrogen; induction would be the most obvious option. In winter 2020/2021 the pilot will be carried out.

Category:	deployment in built environment
Capacity:	10 - 15 residential houses
Process phase:	FEED-study
Project period:	2020 - 2021
Project costs:	unknown
Contact:	info@lochemenergie.net

Partners: LOCHEMENERGIE, alliander, CR remeha

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Developing a H_2 Burner System as a Retrofit.

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3 pilot hydrogen central heaters

Category:	deployment in built environment
Capacity:	-
Process phase:	FEED-study
Project period:	2018 - 2020
Project costs:	TSE 250 k
Contact:	Ellart de Wit, Hygear

Partners:

ATAG JOUW COMFORT ZONE

HYGEAR

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Capacity:	530 houses
Process phase:	FID
Project period:	2020 - 2022
Project costs:	TSE 400 k
Contact:	Kees Boer, gem. Hoogeveen

Partners: Stork Nederland BV, Nederlandse Gasunie NV, GasTerra BV, Nederlandse Aardolie Maatschappij N.V., Bekaert Combustion Technology BV, N-TRA BV (onderdeel netwerkbedrijf RENDO), Instituut Fysieke Veiligheid (IFV), Cogas Innovatie & Ontwikkeling B.V, Nedstack B., JP-Energiesystemen B.V, Hanze University of Applied Sciences, Provincie Drenthe, Stichting New Energy, Visser & Smit Hanab Distributie B.V, Green Planet Pesse B.V, DNV-GL Netherlands B.V., Arcadis Nederland B.V, BAM Infra Energie & Water B.V, Haskoning BV, DHV Nederland B.V, Enexis Netbeheer B.V en Liander N.V en gemeente Hoogeveen.

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Decentralized integration of wind and solar energy via hydrogen from electrolysis for the heat supply of the built environment. The hydrogen is delivered by the regular natural gas pipelines to the boiler house of the apartment complex where the first hydrogen boilers are tested.

Category:	deployment in built environment
Capacity:	500 residential houses
Process phase:	execution
Project period:	2018 - 2023
Project costs:	unknown
Contact:	albert.vandermolen@stedin.net

Partners: STEDIN.NET, Ressort Wonen, Gemeente Rotterdam, DNV·GL, BEKAERT better together, remeha

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City on 't Haringvliet Switching to Green Hydrogen.

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Project costs:	unknown
Contact:	stadaardgasvrij@gmail.com

Partners:

gemeente Goeree-Overflakkee

STEDIN.NET

kiwa

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Category:	deployment in built environment
Capacity:	10 - 15 residential houses
Process phase:	FEED-study
Project period:	2020 - 2021
Project costs:	unknown
Contact:	info@lochemenergie.net

Partners:

LochemEnergie Je eigen energie

alliander

remeha

Knowledge

Overview

Hydrogen Coalition

A Sustainable Hydrogen Economy in 2030 in the Netherlands

At least 27 public and private organizations in the Netherlands are building on an infrastructure for green hydrogen. In a guide to the Dutch government, they formulated four concrete pillars for the rapid and effective development of the hydrogen economy in the Netherlands.

Category: knowledge
Capacity: -
Process phase: execution
Project period: 2018 -
Project costs: unknown
Contact: Joris Thijssen, Greenpeace

Partners a.o.:

HydroHub

Building a Hydrohub Megawatt Test Centre in Groningen

Developing a test center for testing innovations in electrolysis systems (PEM and alkaline) of 250 KW as a steppingstone towards future gigawatt scale production of sustainable hydrogen by the process industry.

Hydrohub

Category: knowledge
Capacity: 250 KW
Process phase: execution
Project period: 2018 - 2022
Project costs: TKI subsidy
Contact: carol.sraa@ept.eu

Partners a.o.: ECN | TNO

Ampère

Advanced Materials for PEM Electrolyzers

The goal is to establish a structural collaboration between the electrolyser knowledge parties, i.e. the manufacturers of electrolysers and the knowledge institutes, as well as Dutch component suppliers. They aim to take a concrete step in the cost-efficiency of electrolyser technology.

Category: knowledge
Capacity: -
Process phase: execution
Project period: 2017 - 2020
Project costs: FME 2M €
Contact: info@tno.nl

Partners: ECN | TNO, nydron energy, PTG, FUJIFILM

Alkaliboost

Developing Better Alkaline Electrolyser Stacks

The power of alkaline technology is that the electrochemical stacks are relatively cheap, because no expensive or noble metals are used. The committed parties are developing and testing new alkaline stack designs that make it possible to operate at a much higher current density.

Category: production, knowledge
Capacity: -
Process phase: concept
Project period: 2018 - 2023
Project costs: TBE 5M €
Contact: Gerhard Reinsmeis, Nouryon

Partners: Nouryon, AkzoNobel, TU/e

HYDROGREENN

HYDROGen Regional Energy Economy Network Northern NL

Promoting business development of hydrogen applications in or from the northern Netherlands. The hydrogen applications are used to contribute to the green innovation of energy management, mobility, industry and chemistry. There are now 60+ partners involved.

Category: knowledge, networking
Capacity: -
Process phase: execution
Project period: 2019 -
Project costs: unknown
Contact: sp@kema@noorce-inkbeoord.nl

Partners a.o.: AkzoNobel, Arcadis, Hoffmauss, Gasunie, CleanPort, New Energy Coalition, Nuon, Shell, Gasterra, Enbrance, TNO, Stoà, Provincie Groningen, SBE, Rosata, Siemens en Ministerie van Infrastructuur en Milieu

HyDelta

Research on Obstacles on Hydrogen Deployment

HyDelta is a national cooperation program that removes barriers that delay or halt hydrogen projects. The project that are stranded struggle for example with gaining permits, infrastructural challenges and a lack of clarity about safety regulations.

HyDelta

Category: knowledge, networking
Capacity: -
Process phase: execution
Project period: 2020 -
Project costs: unknown
Contact: www.hydelta.nl

Partners a.o.: ERIG, Gasunie, kiwa, TNO

Hydrogen House Apeldoorn

Demonstration and Learning Model House for Training Employees

The aim is to initially train approximately fifteen technicians and teach them how to use hydrogen and water networks. They will soon have to be able to apply this in practice, first of all in project Lochem. The house is also intended for the installer of Remeha hydrogen boilers.

Category: knowledge
Capacity: 1 house
Process phase: execution
Project period: 2020 - 2021
Project costs: unknown
Contact: info@allander.com

Partners: allander, kiwa, remeha

Fieldlab

Experimenting with Small-scale Generation of Hydrogen on Farms

TNO and WUR are starting a hydrogen pilot project in the Fieldlab in Lelystad. Here experiments are being conducted with small-scale generation of hydrogen on farms, using solar and wind energy produced at the same location.

Category: knowledge
Capacity: small-scale
Process phase: execution
Project period: 2020 - 2026
Project costs: unknown
Contact: peter.exxon@tno.nl

Partners: ACRRES, TNO

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At least 27 public and private organizations in the Netherlands are building on an infrastructure for green hydrogen. In a guide to the Dutch government, they formulated four concrete pillars for the rapid and effective development of the hydrogen economy in the Netherlands.

Category:	knowledge
Capacity:	-
Process phase:	execution
Project period:	2018 -
Project costs:	unknown
Contact:	Joris Thijssen, Greenpeace

Partners o.a.:

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Building a Hydrohub Megawatt Test Centre in Groningen

Developing a test center for testing innovations in electrolysis systems (PEM and alkaline) of 250 KW as a steppingstone towards future gigawatt scale production of sustainable hydrogen by the process industry.

Hydrohub

Category:	knowledge
Capacity:	250 KW
Process phase:	execution
Project period:	2018 - 2022
Project costs:	TKI subsidy
Contact:	carol.xiao@ispt.eu

Partners o.a.:

ISPT
Institute for Sustainable Process Technology

ECN › TNO innovation for life

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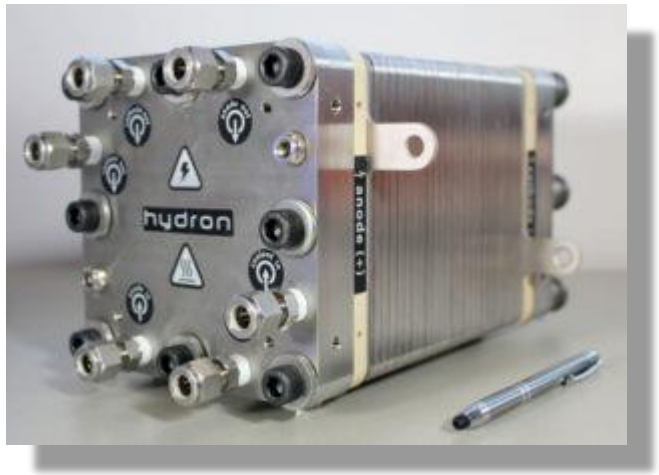

Category:	knowledge
Capacity:	-
Process phase:	execution
Project period:	2017 - 2020
Project costs:	FSE 250 k
Contact:	Info@tno.nl

Partners:

ECN | TNO innovation for life

hydron energy

PTG EINDHOVEN

FUJIFILM Value from Innovation

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Developing Better Alkaline Electrolyser Stacks

The power of alkaline technology is that the electrochemical stacks are relatively cheap, because no expensive or noble metals are used. The committed parties are developing and testing new alkaline stack designs that make it possible to operate at a much higher current density.

Category:	production, knowledge
Capacity:	-
Process phase:	concept
Project period:	2018 - 2023
Project costs:	TSE 500 k
Contact:	Gerhard Remmers, Nouryon

Partners:

Nouryon AkzoNobel TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

HYDROGREENN

HYDROGen Regional Energy Economy Network Northern NL

Promoting business development of hydrogen applications in or from the northern Netherlands. The hydrogen applications are used to contribute to the green innovation of energy management, mobility, industry and chemistry. There are now 80+ partners involved.

Category:	knowledge, networking
Capacity:	-
Process phase:	execution
Project period:	2019 -
Project costs:	unknown
Contact:	spijksma@vnoncw-mkbnoord.nl

Partners o.a.: AkzoNobel, Arcadis, Holthausen, Gasunie, ChemPort, New Energy Coalition, Nuon, Shell, Gasterra, Entrance, TNO, Stork, Provincie Groningen, SBE, Rosato, Siemens en Ministerie van Infrastructuur en Milieu

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Category:	knowledge, networking
Capacity:	-
Process phase:	execution
Project period:	2020 -
Project costs:	unknown
Contact:	www.hydelta.nl

Partners o.a.:

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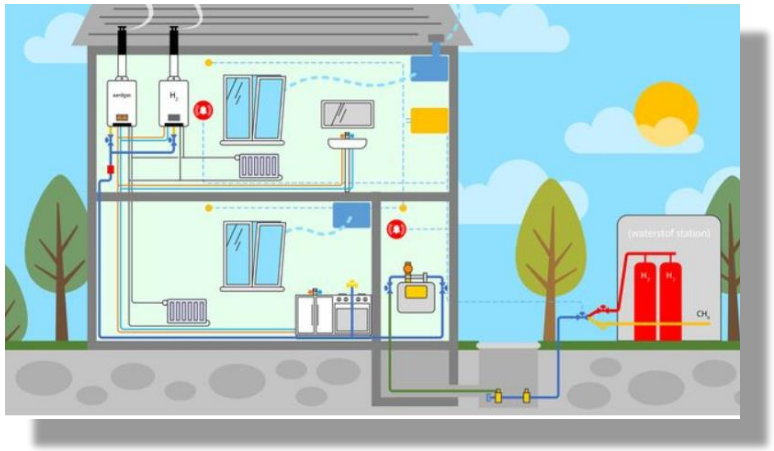

Category:	knowledge
Capacity:	1 house
Process phase:	execution
Project period:	2020 - 2021
Project costs:	unknown
Contact:	info@alliander.com

Partners:

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Experimenting with Small-scale Generation of Hydrogen on Farms

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Category:	knowledge
Capacity:	small-scale
Process phase:	execution
Project period:	2020 - 2025
Project costs:	unknown
Contact:	peter.eecen@tno.nl

Partners:

Application Centre for Renewable Resources ACRRES Initiative of Wageningen University & Research

Ministerie van Economische Zaken en Klimaat

TNO