INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 2019: The Netherlands

Name	Mr. Wilco Fiechter
Contact Information	wilco.fiechter@rws.nl +31-6-5074 8061
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1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

In December 2018 the Draft of the Dutch Climate Agreement (DCA) has been published. In a multi-stakeholder process the most important stakeholders (several business organisations, ngo's, national, regional and local governments) have defined this draft DCA. It contains a set of about 600 measures, in order to reach the targets of the Climate Change policy (49% CO_2-redcution by 2030).

In this draft DCA hydrogen is seen as a robust element in the CO2-free energy and feedstock system. The outline of the draft agreement contains a separate chapter on hydrogen, composed by a cross-sectoral working group Hydrogen.

Policy measures and regulation will be defined as part of a programmatic approach. In addition to current innovation funds, an extra 30 to 40 million euro will be available each year to stimulate pilots and demonstration projects, in particular focussing on cost reduction and scaling up of electrolysis. Three phases are defined in the ambitions of the stakeholders :

1) 2019-2021: preparing large scale roll-out, facilitating projects, gaining experience, starting cost-reduction
2) 2022-2025: preparing for scaling up to 500 MW, creating hydrogen clusters, regional infrastructure
3) 2025-2030: scaling up to 3-4 GW electrolysis capacity, connections with storage and expansion of national infrastructure, depending on cost reduction path and supply of green electricity. "

The ambition is to accelerate the development and roll-out of green hydrogen by means of a programmatic approach. The aim is not only to lower the costs for renewable electricity, but also to accelerate the reduction of the production costs and investment costs for electrolysis, to allow green hydrogen to play a key role in the future.
Costs fase 1: 35-40 mln eur/year"

In March 2019 PBL, the independent environmental assessment agency of the Netherlands (*PBL (Netherlands Environmental Assessment Agency)*
published the assessment of the National Climate Agreement. Regarding 'Hydrogen' their verdict was:

If electrification is not well possible for technical or other reasons, then hydrogen is an alternative. After all, it is also a carbon-free energy carrier and can be produced directly from electricity (green hydrogen) via electrolysis. The DCA (Draft Climate Agreement) mentions the great potential of green hydrogen. An ambitious program is presented.

The most concrete agreement is the commitment of 30 to 40 million euros annually from the innovation program. However, this concerns half of the money needed for concrete demo projects. No binding agreements have been made in the DCA about contributions from the industry. The further growth announced in the program to 3 - 4 GW electrolysis capacity in

2030 will not be achieved with the proposed instruments for the industry and electricity sector. Partly the same problem arises here as with hybrid electrification in industry: it is very uncertain whether it will be cost-effective; because this depends on future electricity prices. Moreover, producing hydrogen does not provide a direct emission reduction; this only occurs when hydrogen is used instead of fossil energy. Realization would also mean a major extra challenge for electricity production, in the order of magnitude 10 to 20 TWh extra production, assuming around 4000 - 5000 full load hours for electrolysis installations.
The proposed ambitious program also deals with the application of hydrogen. The potential for this is also highly valued, but there is no specific supporting policy for this in the DCA. In mobility, hydrogen demand is very limited, in industry, hydrogen boilers for the heat supply are relatively expensive and in the built environment it is not mentioned for a relevant contribution in 2030. "

Regarding hydrogen in mobility:

"For lighter trucks, electrification can probably be battery-powered. The first (light) electric trucks are already on the market. For heavier trucks it is more obvious that the electricity is generated with a fuel cell. The technology is not expected to be used on a large scale in 2030, but to pave the way it is wise, as provided for in the DCA (Draft Climate Agreement), to invest in the required hydrogen refuelling infrastructure. This infrastructure could also be used for passenger cars. Stimulating hydrogen for passenger cars, as is the case in the DCA, has the advantage that several options are possible for the future: there is no silver bullet, we have to investigate in and develop different zero emission technologies. On the other hand, it has the disadvantage that it will take many years before an attractive range of hydrogen-powered passenger cars is created."

2. Hydrogen and Fuel Cell R&D Update

In February 2019 a large R&D-programme on energy innovation was launched (DEI: Demonstration Energy Innovation). Budget approximately € 100 Million.
With several hydrogen-related topics like integration of more flexible power in the power-system and heating of building without natural gas.
https://www.rvo.nl/subsidies-regelingen/demonstratie-energie-innovatie

Last year several (feasibility) studies were announced, concerning:
- Production of green hydrogen by electrolysers, scale: from 1 MW up to 100 MW
- Use of hydrogen for heating buildings and parts of cities.

3. Demonstration, Deployments, and Workforce Developments Update

No new developments since last Country Update:

Last Country Update:
A 4th hydrogen refuelling station (HRS) opened in January 2018 in Groningen (northern part of The Netherlands). For now, this HRS only refuels at 350 bar, and is especially designed for a (demonstration) project of 2 FC Buses for public transport in the Groningen-area. This demonstration project started in February 2018.

Another demonstration project with 2 Hydrogen Buses started in the Arnhem-region (eastern part of NL) last September.

At the moment there are 8 FC-buses running in service, in 4 different regions.

Scaling-up
In order to get costs down it is important to scale-up the production of the FC-buses. This is the goal of the FCH JU JIV- project . Several Dutch parties (province of Groningen and South-Holland) are participating in JIVE-2 that has the aim is to introduce 50 FC-buses in to service by 2020.

4. Events and Solicitations
On the international Hydrogen Day, at the 8th of October, the international H2 Challenge will take place. This event, this rally will happen in several countries. The aim is to rise attention for (the benefits of) hydrogen in general, and more specific: for the benefits and the fun of driving on hydrogen. Participating in this rally will show you that driving on hydrogen is a real alternative.

All members of the IPHE are invited to join this event!
If you are interested in joining us in this event, please contact us.

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

Programme for the demonstration of low-carbon technologies and innovations in transport
Multi-annual demonstration programme (financing for example Living Labs) will be published in April 2019
(Expected) Budget Call of 2019: €30 Million
Focus of this Call 2019:

- Acceleration of development and demonstration of low-carbon vehicles (transportation of goods and passengers small (M2) and large (M3) buses;
- In this call the development and demonstration of mobile machines, Light Electric Vehicles and ships (inland and short sea shipping) are eligible;
- Deployment and use of infrastructure for alternative fuels; and,
- Co-financing of EU-supported infrastructure for alternative fuels (mainly hydrogen).

Several regional initiatives are ongoing. The most important:
Hydrogen Valley Initiative in Groningen (Northern Netherlands), a joint roadmap of several companies and (local) government with the goal of scaling up production (and consumption) of hydrogen. The produced hydrogen is preferably green and for an intermediate period blue (produced out of fossils with CCS).

Latest Developments on offshore Windpower:
One of the companies will be submitting a bid in the Dutch offshore wind tender for the Dutch Coast. As part of its proposal to the Dutch government, this company is working to establish green hydrogen projects based on power from its Dutch offshore wind farms.

6. Regulations, Codes & Standards, and Safety Update

N/A.
In the last Country Update:
The Hydrogen Innovation Safety Program was set up and launched in 2017. Program Leader is NEN, the Dutch Normalisation and Safety Institute.
Several working groups are operational, on the subjects of:

- Permit for a HRS;
- Risk management and instructions for the First Responders; and,
- Codes and Regulations.

Summary Country Update November 2018: The Netherlands

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles[1]	2.000 by 2020 (15.000 by 2025)	58 as of Dec. 2018	Working Group Demand Gathering, (part of the Dutch Hydrogen Platform). Main Task: Stimulate en co-ordinate activities of fleet-owners and HRS-business. Work in progress: Preparations for a new covenant 'Hydrogen in Mobility' are started. (Preliminary targets between brackets.)	Some Fiscal measures: • No purchase tax (BPM) • No road tax (MRB). • Low addition of 4% (instead of 22%) per year (Income tax) • Fiscal rebate on investments in a hydrogen car(9% of investments costs)
FC Bus	100 by 2020	12 (scheduled), 8 in operation	• National Agreement on Zero Emission Regional Public Transportation By Bus • Dutch provinces (South-Holland and Groningen) are partner in JIVE-2 (i.e. FCH JU project on scaling up Public Transport buses on hydrogen)	Fiscal rebate on investments in a hydrogen bus (9% of investments costs)
Fuel Cell Trucks[2]	500 by 2020 (3.000 by 2025)	8 as of Dec. 2018	Green Deal Zero Emission InnerCity Logistics https://greendealzes.connekt.nl/en/the-livable-city/	
Forklifts	No target	0		

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

[2] As above

H_2 Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
70 MPa On-Site Production	20 by 2020 (50 by 2025)	1	• Fuel Vision • Covenant (Green Deal) Sustainable Hydrogen Economy • National Agreement Climate Change • (New: Covenant H2 in Mobility)	Subsidy Scheme: Up to 100% Subsidy of the investments costs for a (public) HRS No Subsidy for operation
70 MPa Delivered		1		
35 MPa On-Site Production	20 by 2020 (50 by 2025)	2		
35 MPa Delivered		2		
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Small[4]	No target	0		
Medium[5]	No target	0		
Large[6]	No target	0		
District Grid[7]	No target	0		
Regional Grid[8]		0		

[3] Targets can be units installed and/or total installed capacity in the size range indicated
[4] <5 kW (e.g., Residential Use)
[5] 5kW – 400 kW (e.g., Distributed Residential Use)
[6] 0.3MW – 10 MW (e.g., Industrial Use)
[7] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[8] 30MW plus (e.g., Grid Storage and Systems Management)

Telecom backup	No target			
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Fossil Fuels[10]	Climate neutral as soon as possible (no CO2- emission well to wheel)	Large share of fossil fuelled H2-production (by SMR)	• Covenant (Green Deal) Sustainable Hydrogen Economy • National Agreement Climate Change	
Water Electrolysis[11] (PEM, Alkaline, SOEC)	500 MW by 2025 3 - 4 GW by 2030			
By-product H_2	No target	Large production facilities in Rotterdam harbour area and Groningen harbour area	Production based on chlorine-alkali production process, H2 as by-product.	
Energy Storage from Renewables	**Target[12]**	**Current Status**	**Partnership, Strategic Approach**	**Support Mechanism**

[9] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[10] Hydrogen produced by reforming processes
[11] Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)
[12] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

Power to Power[13] Capacity	No target	0		
Power to Gas[14] Capacity	No target	0		

[13] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

[14] Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)