



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 2019: Germany

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1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

The Federal Ministry of Transport and Digital Infrastructure and the NOW GmbH have launched the HYLAND projects within the National Innovation Program of Hydrogen and Fuel Cells. With a regional and integrated approach, these projects are the next step to establish hydrogen-based applications in the transport sector. Depending on their individual starting point, subsidising hydrogen regions in Germany should motivate municipalities and regions in a targeted way to develop their initial ideas for integrated concepts, put their plans into more concrete terms and work out these plans or implement them with the aid of the federal government. The varying levels of knowledge and experience in the different regions are taken into account in the funding process, as all regions should have the opportunity to become hydrogen regions. Funding for regions and municipalities ranges therefore from support for awareness campaigns or the initial organisation of actors' involvement (HyStarter), creating integrated concepts and in-depth analyses (HyExperts), to taking the step of being able to procure actual applications and implementing those concepts (HyPerformer).

The Federal Ministry for Economic Affairs and Energy has released the first funding call for large-scale R&D projects (Reallabore) within the 7th Energy Research Programme of the Federal Government of Germany. These projects address the large-scale energy related technologies, which can support the energy transition towards renewable energies. The call includes project funding for the topics 1) sector coupling and hydrogen technologies, 2) large-scale energy storage systems and 3) energy-optimised residential areas. The budget of these projects is 100 Mio. € per year until 2022. The target of those projects is to investigate the integration of large-scale hydrogen production and the development of a framework for the operation of the systems.

2. Hydrogen and Fuel Cell R&D Update

Within the National Innovation Program Hydrogen and Fuel Cells several R&D projects were approved in the second half of 2018. This includes projects for components of transport application as well as complete systems. A few projects are listed below.

- **DELFIN:** Development of new materials and production processes for high-pressure vessels for fuel cell vehicles
- **HYPERFORMANCE:** Standardized components platform for mobile fuel cell applications
- **HZWO:Stack:** PEM fuel cell modules for serial production
- **BLUEPOWER:** Fuel cell-based waste collection vehicle



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Further details of all projects funded by the NIP in 2018 are listed in the Annual Report 2018, which is available on the website of NOW GmbH.

3. Demonstration, Deployments, and Workforce Developments Update

The infrastructure for hydrogen fueling stations is expanding by the deployment of stations mainly by the company H2 Mobility. In the end of March 2019, the network comprises 64 stations and a further 27 refueling stations are currently under construction and in the planning stage. By the end of 2019, there are to be 100 refueling stations available to support the market launch of fuel cell vehicles.

The first two fuel cell trains went into a regular operation on a track in Lower-Saxony in the north of Germany. Until 2021 all of the 14 trains will be in operation in Lower-Saxony. The development of the Alstom Coradia iLint and the deployment of the trains are funded by the National Innovation Programme.

After a second call for FCEVs within the NIP II, the NOW received 319 applications of which 225 were approved. 505 FCEVs were registered in Germany in the end of 2018. In addition, 500 fuel cell power supply systems for critical infrastructures were approved in 2018. Mainly these systems are operated at digital radio networks.

As a first integrated project in the transportation sector the e-farm project was approved within the NIP II. The project will include 5 electrolyzers and 2 hydrogen refueling stations in the north of Germany. The hydrogen supply of the stations is realized by mobile storage trailers. In the first step, the infrastructure will supply fuel cell buses which will provide public transportation in the region.

Two large scale hydrogen projects were announced by collaborations of power grid and gas grid operators. The first project Hybridge by Amprion and Open Grid Europe aims to deploy a 100 MW system in the region of Lingen to convert electricity into hydrogen for the gas grid. Therefore, an existing gas pipeline will be repurposed for the use of pure hydrogen. The second project by Tennet, Gasunie and Thyssengas as a similar approach and will be deployed in Lower-saxony for sector coupling with a 100 MW water electrolyser.

4. Events and Solicitations

May 19 th , 2019	EVS 32 – International Electric Vehicle Symposium & Exhibition, Lyon
May 28 th , 2019	eMobil Convention 2019, Wiesbaden
Sep. 10 th , 2019	f-cell, Stuttgart

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

The second phase of the National Innovation Programme for Fuel Cell and Hydrogen Technology is in place since 2016. It relies on two funding mechanisms. One mechanism addresses R&D projects, directly linked to FCH topics. In this regard, several projects were approved in relevant time period. Mainly these projects address the support of the market uptake by decreasing costs and increasing lifetime. By that, single components as well as complete systems and production chains are considered within the approved projects. A brief



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overview of all projects will be given by the annual report of the NOW GmbH which will be published in the beginning of 2019.

The other funding mechanism within the NIP is to support the investment for the deployment of FCH technologies. In this context about 100 cars were funded as mentioned above.

Further on, many of the deployed fuelling stations were funded by the NIP. At some projects, these stations include the production of hydrogen by water electrolysis. An additional call was set up, to support the deployment of self-sufficient power supply for off-grid applications with fuel cell systems. Several projects in this context were approved for funding within the NIP.

6. Regulations, Codes & Standards, and Safety Update

After the Renewable Energy Directive was approved on the European Level, the integration into the national framework is under discussion. For that, it is important to generate incentives for a sufficient integration of advanced fuels into the fuel mix. Hydrogen as advanced fuel can be considered for the upstream process as well. This might lead to large scale deployments of water electrolysis systems in refineries.



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Summary Country Update April 2019: Germany

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles ¹	No target	505 (April 2019)		Subsidy for purchase for fleets (NIP II 3 rd call) incl. construction of refueling infrastructure
FC Bus	No target	21 buses (April 2019)	Joint procurement in Europe, funded by JIVE, FCH-JU and NIP I and II	Subsidy for purchase (NIP II call 2018) incl. construction/installation of refueling infrastructure
Fuel Cell Trucks ²	No target	2 trucks (April 2019)		NIP R&D activities
Forklifts	No target	Approx. 100 (April 2019)	Industry Network Clean Intralogistics Net (CIN)	NIP market activation
H ₂ Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
70 MPa On-Site Production	No target	n.a.	H2 Mobility	Subsidy for construction/ installation for publicly accessible stations for road transport (NIP II call 2018) incl. on-site electrolyser
70 MPa Delivered	100 by 2020 400 by 2025	64 (April 2019) 27 planed	H2 Mobility	Subsidy for construction/ installation for publicly accessible stations for road transport (NIP II call 2018)

¹ Includes Fuel Cell Electric Vehicles with Range Extenders

² As above



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35 MPa On-Site Production	No target	n.a.		• e.g., Subsidy for installation through a tax measure of an annual 50% capital expenditure write-off
35 MPa Delivered	No target	n.a.		
Stationary	Target Number ³	Current Status	Partnerships, Strategic Approach	Support Mechanism
Small ⁴	No target	1.900 funding approvals		KfW programme 433 of the Ministry of Economy and Energy (BMWi), a combination of fix rate and performance-related subsidies
Medium ⁵	No target	n.a.		
Large ⁶	No target	n.a.		
District Grid ⁷	No target	n.a.		
Regional Grid ⁸	No target	n.a.		

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)



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Telecom backup	No target	>400 units		Subsidy for procurement (NIP II call)
H₂ Production	Target⁹	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fossil Fuels ¹⁰	No target	30 Mio. Nm ³ /d		
Water Electrolysis ¹¹ (PEM, Alkaline, SOEC)	No target	>50 projects >55 MW electrolyser capacity installed As of Apr. 2019		
By-product H ₂	No target	4 Mio. Nm ³ /d		
Energy Storage from Renewables	Target¹²	Current Status	Partnership, Strategic Approach	Support Mechanism
Power to Power ¹³ Capacity	No target	n.a.		

⁹ Target can be by quantity (Nm³, 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

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



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Power to Gas ¹⁴ Capacity	No target	>50 projects		
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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)