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July 2nd 2020

## Approach of the National Hydrogen Strategy

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NOW Online Seminar

Dr. Geert Tjarks | Head of Division International Cooperation Dr. Julius von der Ohe | Program Leader International Energy Concepts

## NOW-GMBH.DE

## Survey

## FOR HOW LONG DO YOU KNOW OUR COMPANY NOW GMBH?

- a) Since 2020 or less than a year
- b) Since more than a year
- c) Since more than two years
- d) Since more than five years
- e) Since 12 years

## TOWARDS SUSTAINABLE ENERGY AND MOBILITY

Integrated implementation of German national funding programs by NOW GmbH





## NATIONAL HYDROGEN STRATEGY



## THE NATIONAL HYDROGEN STRATEGY (NWS)

NATIONALE WASSERSTOFF-STRATEGIE Schüsselelemmt



- Interministerial strategy of the federal government
- Acknowledgement of the role of hydrogen in the energy system
- Integration of ongoing and planned programs of the government
- Definition of additional necessary measures
- 38 concrete measures across the complete value chain
- Budget: 7 billion Euro (national) + 2 billion Euro (international)
- Focus on green hydrogen

Die Bundesregierung

**Die Nationale** 

Wasserstoffstrategie

## **GERMANYS FEDERAL CLIMATE PROTECTION PLAN**



All sectors with ambitious objectives



## **RENEWABLE ENERGY IN THE GERMAN ENERGY SYSTEM**

Contribution of renewable energy to electrity and energy consumption



Percent

Share of Renewable Energy in total energy consumption

Source: BMWi, Energiedaten: Gesamtausgabe 10.2019

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Share of Renewable Energy in total electric power consumption

### **ENERGY IMPORT OF GERMANY**



Nettoimport dependency of energy 2018



Quelle: Arbeitsgemeinschaft Energiebilanzen (AGEB)

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## **CURRENT POLITICAL DEVELOPMENTS**

Various political Strategies & Funding programs





Goals alone are not sufficient. We need implementation of measures.

## NATIONAL HYDROGEN STRATEGY

Coordination of activities in different sectors and for different applications



#### Potential:

- Establishment of Germany as leading market
- Fulfilment of national climate targets
- Export of technology and resources



**= 11 |** 10.07.2020

## THE ROLE OF HYDROGEN IN TOMORROW'S INTEGRATED ENERGY SYSTEM







## MEASURES OF THE STRATEGY NATIONAL



## NOW-GMBH.DE

## Survey

## IN WHICH SECTORS AND SEGMENTS DO YOU SEE GREEN HYDROGEN IN THE FIRST PLACE?

More than one answers are possible

- a) In transport (direct use of hydrogen)
- b) In transport (power-based liquid fuels)
- c) In heat
- d) In refineries
- e) In steel production
- f) In chemical industries

## THE 38 MEASURES OF THE STRATEGY

Integration of new, planned, and ongoing measures of the all ministries



## THE GOVERNANCE STRUCTURE

Implementation monitoring and refinement of the strategy



<sup>1</sup> e.g at Director-General level

Source: National Hydrogen Strategy

## **HYDROGEN PRODUCTION**

Measures 1 to 4: operation framework for electrolysis





## **HYDROGEN PRODUCTION**

Measures 1 to 4: operation framework for electrolysis

#### Goal

Partly meet demand of 90-110 TWh by 2030 with up to 5 GW installed capacity by 2030 and additional 5 GW by 2035

#### Measures

- Improvement of regulatory framework, evaluation of price components, establish CO2 pricing, aim to exempt EEG taxation
- 2. Enabling new business and cooperation models (regulatory unbundling).
- 3. Support of industry by funding electrolysis
- 4. Assignment of Offshore-areas for green H2 production



Source: Press release TÜV Süd https://www.tuvsud.com/en/press-andmedia/2019/march/power-to-gas-plants-in-first-commercial-applications



## **USE IN TRANSPORT SECTOR**

Measures 5 to 13: Fuel cell applications and power-based fuels

#### Goal

Ramp up of fuel cell applications over all segments and respective infrastructure as well as power-based fuels.

#### Measures

- 5. Implementation of Renewable Energy Directive II
- 6. Strengthen National Innovation Program HFC
- 7. Support for power-based liquid fuels
- 8. Support a respective infrastructure for hydrogen powered vehicles
- 9. Support the development of next phase of AFID (Alternative Infrastructure Directive) on the European Level
- 10. Establishment of a supply industry for fuel cell systems
- 11. Target driven development of Clean Vehicle Directive
- 12. Carbon-based differentiation of truck toll
- 13. International harmonization of standards (RCS)



#### **Status Quo**

100 Hydrogen refueling stations until 2021 and first fleets of passenger vehicles, busses and trains.



Source: FAUN



Source: Alstom



Market activation

#### Measure 6: National Innovation Program Hydrogen and Fuel Cell Technology

NIP 2016 - 2026

Research and development



with market activation

## **USE IN TRANSPORT SECTOR**

Measure 6: HyLand projects within NIP





## **INDUSTRIAL USE**

Measures 14 to 17: Market for green hydrogen in the industry sector

#### Goal

Substitute existing industrial usage of grey H2; enable decarbonization of additional processes, e.g. green steel production

#### Measures

- 14. Support for transition to GHG low / neutral processes: three programs on ,decarbonizing the industrial sector', Hydrogen use in industrial production' (2020-2024) and ,avoiding and using CO2 in industries relying on base substances'
- 15. Pilot program for Carbon Contracts for Difference (CfD).
- 16. Consideration of demand quote for climate-friendly base substances
- 17. Stakeholder processes for long term decarbonization strategies:
- Chemical industry
- Steel
- Logistics
- Aviation
- Other sectors



#### **Status Quo**

Existing market of 55 TWh grey H2 Three programs and first projects initiated



Source: Thyssenkrupp Steel, Carbon2Chem

## **USE FOR HEAT AND BUILDING**

Measures 18 and 19: Fuel cell CHP and H2-Readiness

#### Goal

Support further deployment of FC systems for residential use Enable use of H2 in power sector

#### Measures

- 18. Continue established programs within Energy efficiency incentive program
- 19. Asses possibility to fund 'H2 ready' installations under combined heat and power act



Typical innovation and establishment process of new technologies



## **INFRASTRUCTURE AND SUPPLY**

Measures 20 to 22: Infrastructure for hydrogen supply

#### Goal

Establish secure, reliable and needs-based supply, leverage existing infrastructure, initiate needed new elements

#### Measures

- 20. Stakeholder process to identify need for action and complete recommendations for action.
- 21. Improve links between electricity, heat and gas infrastructure (Planning, financing, regulatory framework, EU-integration)
- 22. Build-up of demand based refueling infrastructure (incl. rail and water ways). Availability to individual and commercial operator, focus on fleets





Leaflet | © GeoBasis-DE / BKG | Ingenieurgruppe IVV mit Berechnungen ISB, DLR, RLI | Version 1.0 | Lizenzinformation

## **RESEARCH, EDUCATION AND INNOVATION**

Measures 23 to 25: integration and bundling of research activities

#### Goal

Secure future success by support of research and training specialists as foundation for research and innovation

#### Measures

- 23. Development of hydrogen-Roadmap to serve as guideline highlighting the areas with need for research and action
- 24. Demonstration projects for international supply chains.
- 25. Cross ministry research campaign ,hydrogen technologies 2030' (various measures incl. Real life laboratories)





#### Reallabore: 11 H<sub>2</sub> Projekte 1 | CCU P2C Salzbergen 3 | DOW Stade – Green MeOH

- 4 | Element Eins
- 5 | H2 Wyhlen
- 7 | Norddeutsches Reallabor
- 9 | ReWest100
- 12 | EnergieparkBL
- 13 | GreenHydroChem
- 14 | H2Stahl
- 15 | HydroHub Fenne
- 18 | RefLau

Source: Reallabore der Energiewende, BMWi

## **RESEARCH, EDUCATION AND INNOVATION**

Measures 26 to 29: Various activities for research and education

#### Goal

Secure future success by support of research and training specialists as foundation for research and innovation

#### Measures

- 26. Pioneering project for scientific policy advice
- 27. Continuation of German Aviation research program for hybrid-electric aviation (power trains and on-board power supply)
- 28. Continuation of maritime.green funding program (25 Mio. € from 2020-2024)
- 29. Foster education and vocational training nationally and internationally



Source: GO4H2 project NIP





## MEASURES OF THE STRATEGY INTERNATIONAL

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## Survey

## WHERE DO YOU SEE THE BIGGEST POTENTIAL FOR INTERNATIONAL COLLABORATION?

More than one answers are possible

- a) Developing supply chains
- b) Demonstrating technology at scale in joint projects
- c) Accelerating deployment through political cooperation
- d) Developing common regulation, codes and standards
- e) Establishing sustainability and certification criteria

## **GLOBAL DRIVERS FOR HYDROGEN**



Acknowledging local potential of hydrogen



## HYDROGEN IN THE INTERNATIONAL CONTEXT

Potential hydrogen production cost by PV- and wind power





Notes: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. Electrolyser CAPEX = USD 450/kW<sub>e</sub>, efficiency (LHV) = 74%; solar PV CAPEX and onshore wind CAPEX = between USD 400–1 000/kW and USD 900–2 500/kW depending on the region; discount rate = 8%.

Source: IEA analysis based on wind data from Rife et al. (2014), NCAR Global Climate Four-Dimensional Data Assimilation (CFDDA) Hourly 40 km Reanalysis and solar data from renewables.ninja (2019).

Source: The Future of Hydrogen, IEA 2019

## **NEED FOR ACTION AT EUROPEAN LEVEL**

Measure 30: establishing standards for sustainability and quality





Source: NOW GmbH

## **NEED FOR ACTION AT EUROPEAN LEVEL**

Measure 31 to 33: Strengthen European market through collaboration

#### Goal

Leverage internal European market and collaboration; use EU presidency to progress hydrogen, e.g. in the context of legislation on sector coupling and gas market design

#### Measures

- 31. Intensify collaboration through joint cross border hydrogen project as part of IPCEI
- 32. Accelerate implementation for EU H2 initiatives as part of European Clean Deal
- 33. Evaluate possibility to establish European hydrogen society for joined development of international production capacities



Measures 34, 35 and 38: Energy partnership and hydrogen alliance

#### Goal

Assume global responsibility, make green hydrogen competitive, increase international cooperation to maximize opportunities for economic policy, climate change mitigation, foreign policy and development policy. Allow to convert production and the export of fossil fuels to hydrogen.

#### Measures

- 34. Integrate hydrogen into bilateral energy partnerships and dialogues with strategic partners
- 35. Increase collaboration with partners by establishing international hydrogen alliance
- 36. Dialogue with countries exporting fossil energies for energy transition processes





Measure 36: International, multilateral partnerships





H<sub>2</sub> Valley

Measure 36: International, multilateral partnerships





#### Potential of the Initiatives:

- Demonstration of and story line for H2 Technologies
- Stakeholder network
- Including existing initiatives
- Including national stakeholders in international activities
- Knowledge transfer and link between both national and international activities



Source: NOW GmbH

Measure 37: Pilot projects in partner countries



Environmental friendly use of H<sub>2</sub>/FC-Technology Off-grid and decentralized energy supply





Source: NOW GmbH

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## Thank you for your attention!

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