

Introduction

GroenvermogenNL

RHIA/ NAG Hydrogen workshop
January 20, 2022

Groenvermogen
van de Nederlandse economie 

Agenda

- Introduction
- Scope
- How to get involved

NationaalgroEIFonds.nl

- Investment of € 20 billion for the next 5 years in projects that aim for sustainable economic growth
- Infrastructure, human capital, R&D&I
- Sustainable economic growth enables continued investment in health care, education and measures against climate change



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Upscaling



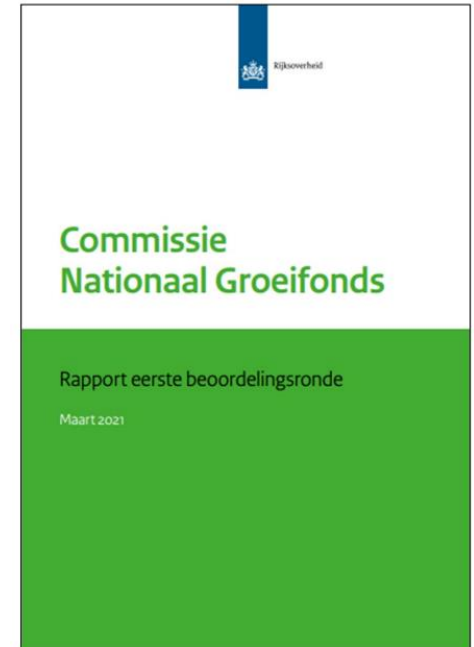
Developing human capital
for the energy transition



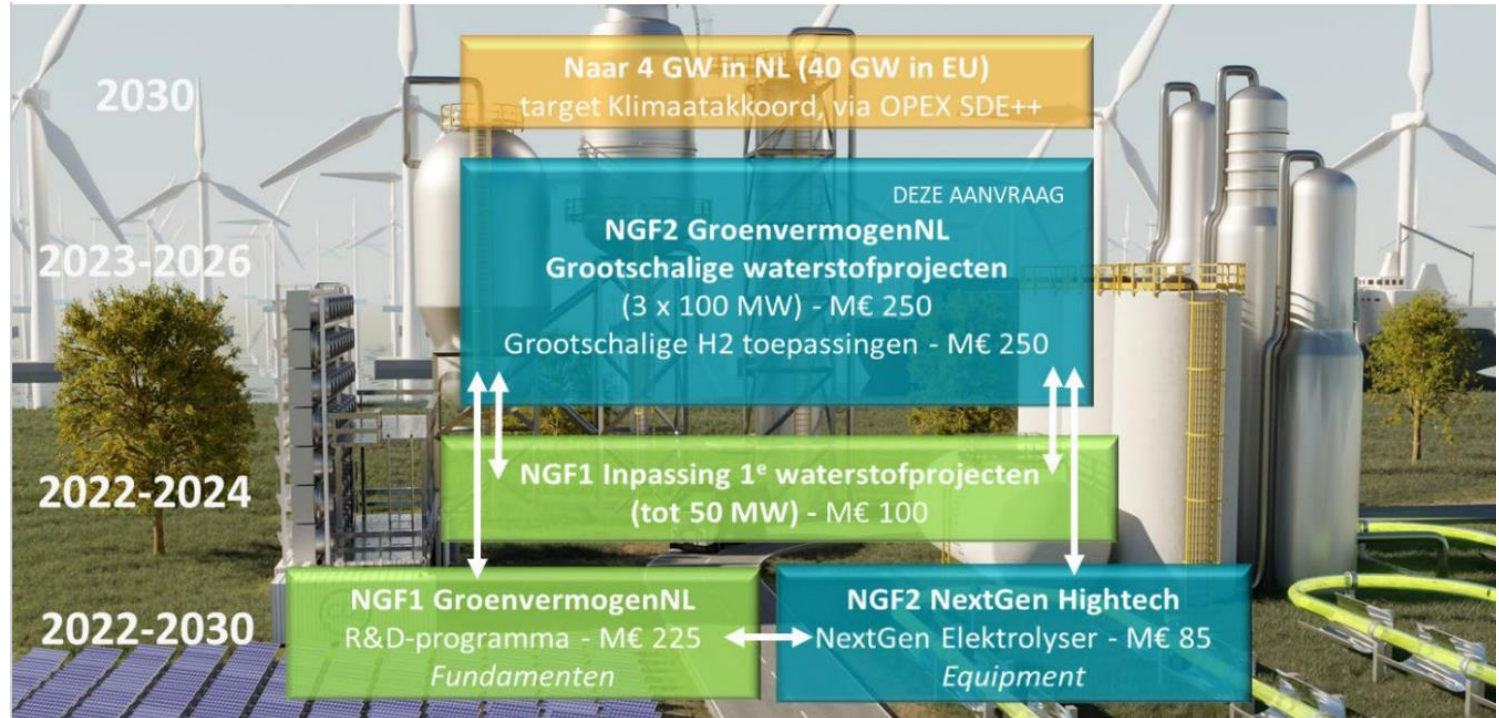
Coordinated R&D

Budget GroenvermogenNL

- Granted
 - Small scale pilot and demonstration projects (30 M€)
 - R&D (35 M€)
 - HCA (5 M€)
- Reservation
 - Small scale pilot and demonstration projects (70 M€)
 - R&D (142 M€)
 - HCA (45 M€)



The bigger picture



Agenda

- Introduction
- **Scope**
- How to get involved

Work packages

- | | | |
|----|---|-------|
| 1. | Making carbon neutral H ₂ | M€ 35 |
| 2. | Transport & storage of H ₂ | M€ 27 |
| 3. | Direct use of H ₂ | M€ 26 |
| 4. | H ₂ and green e ⁻ for C-based chemistry | M€ 36 |
| 5. | H ₂ and green e ⁻ for N ₂ -based chemistry | M€ 21 |
| 6. | H ₂ and green e ⁻ for 'specialties' | M€ 20 |
| 7. | Socio-economic aspects & impl. | M€ 12 |
| 8. | Human capital | M€ 50 |

Transport & storage of H₂

(27 M€ + 10-40% co-finance)

- Goals related to
 - Grid requirements for H₂ transport
 - Safety
 - Upscaling
 - Off shore Hydrogen production
 - Multi-disciplinary aspects of large scale hydrogen storage
- Activities include
 - Knowledge development transport & storage infrastructure
 - Development safety standards
 - Development transition roadmap NW-Europe
 - Analysis offshore hydrogen production

Direct use of H₂

(26 M€ + 10-40% co-finance)

- Goals related to
 - Direct use in energy-intensive industry
 - Introduction in shipping, rail and road transport
 - Impact of incentives to introduce Hydrogen in transport
 - Introduction into the built environment – impact on grid, techno-economic analysis & incentives
- Activities include
 - Feasibility and analysis: MOF storage, future energy grid, incentives
 - Development: advanced H₂ combustion, storage and bunkering
 - Measurements: NO_x
 - Demonstrations: validated modular EMS for PEM FC, advanced H₂-ICE for one or more heavy-duty applications

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Coordinated R&D&I

- GroenvermogenNL proposition is a framework
- Contours including responsibilities and budgeting to be agreed on in sandpits and subsequent detailing (2~3 months)
- Sandpits
 - Multi-day workshop to agree on outline scope, responsibilities and budget
 - Scope based on: GroenvermogenNL, ECCM advice, NWP (Gap analysis), commitment for co-financing (10~40%)
 - GroenvermogenNL board will advise on participants based on application
 - First one in ~March, thereafter ~monthly
 - Executed by NWO in collaboration with RvO
- Goals sandpits
 - Stimulate mission driving long term research
 - Opportunity to realize a-typical collaboration for maximal impact
 - Open and transparent
 - Lowers paperwork fund applications

The background of the slide is a photograph of a modern building with a green roof. A prominent feature is a tall, conical structure with a metallic, reflective surface, supported by a network of dark cables. The sky is a clear, bright blue with a few wispy white clouds. The overall scene is bright and sunny.

Thank you!

Questions?

GroenvermogenNL.org

Groenvermogen van de Nederlandse economie



Nederland staat met de rest van de wereld voor een immense klimaatopgave. Onze florierende, op fossiele grondstoffen gebaseerde maatschappij en industrie moeten worden omgebouwd. Dit doet Nederland met groene waterstof als trekkkracht voor die transitie. Ook kan Nederland een nieuwe industrie en een aantrekkelijk vestigingsklimaat opbouwen. Goed opgeleide mensen zijn nodig om de klimaattransitie mogelijk te maken.

Dat is wat GroenvermogenNL doet: opschalen & innoveren, ombouwen & opbouwen, omscholen & opleiden.



National ecosystem

of hydrogen pilots, demonstration plants and knowledge infrastructure

Overview of investment projects for the 'Green Empowerment of the Dutch Economy' Growth Fund proposal (in Dutch: Groenvermogen van de Nederlandse Economie). It is an indicative list of projects.

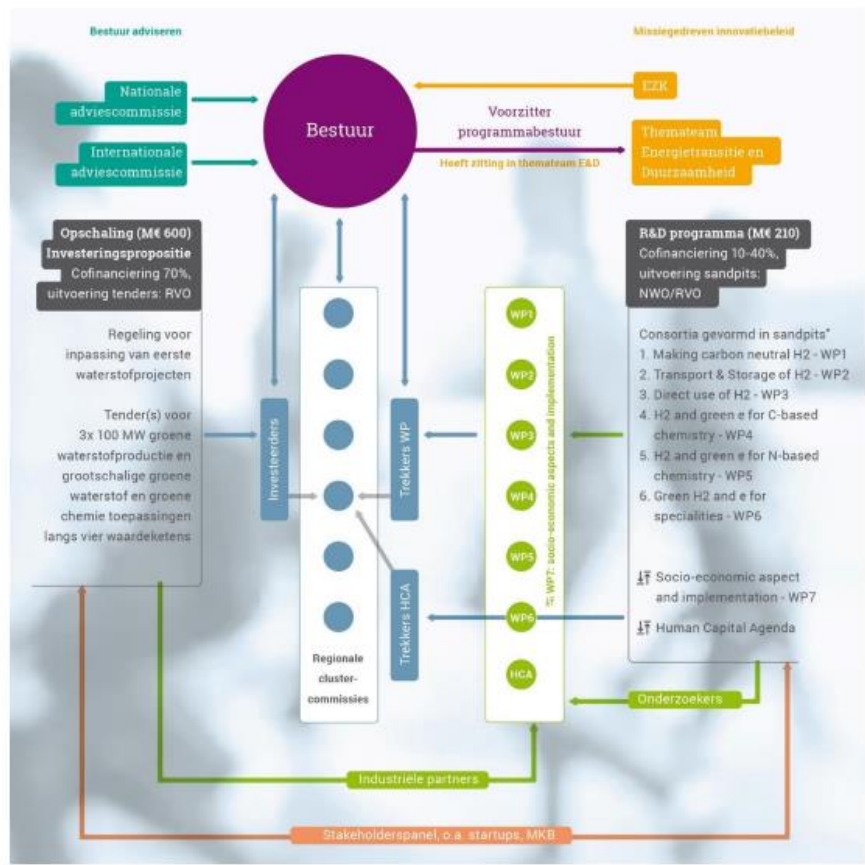
Pilot project locations

<p>SCW supercritical Water Gasification - 100 MW Scaevola New Energy, SCW Systems</p> <p>NCHIP Investa - 0.1 MW Investa, BCI, TAGA</p> <p>Nymca - 200 ton/yr Nymca, Hiflow</p> <p>KiNetics - 100 MW Tos, Shell, Neoray, Port of Amsterdam</p> <p>Hephaestus Neoray, Tos</p> <p>Hydrogen Delta silver - 300-300 MW Zeland Factory, SDR, North Sea Port</p> <p>Hydrogen Delta sluisak - 300 MW Tos, SDR, North Sea Port</p> <p>Hydrogen Delta Central - 300 MW SDR, North Sea Port, SDR-consortium</p> <p>SteelChemicals Steel, ArcelorMittels</p> <p>FosHydro - 1 MW TNO, Neoray Energy, Neoray, Inventa</p> <p>Shell - 250 MW</p> <p>NH2city - 250 MW BP, Neoray, Port of Rotterdam</p> <p>WCC - 250 km</p> <p>e-CHOR - 5 MW eCHOR-consortium</p> <p>Janol 1 - 1000 /keruone / day Urban Oxochemie, Clivoxene, Sanfins, Inventa, FDI, Solynto, Schiphol Group</p> <p>Fast Track Large scale Electrolyser - 40 - 100 MW (Not public yet)</p> <p>Curly 1 - 10 MW (Not public yet)</p> <p>MULTIPPLY - 2.5 MW CFA, Neoray, Paul Wurth, Dupla, Sunfin</p> <p>SCW-consortium - Conversion of 1.5 Mtpa Steelmills</p> <p>N-Vision - Multiple GW size DutchEnergy, Shell, BP, Air Liquide, Vopak, H&R, Geacore, Impact, Onyx</p>	<p>POCR2 - 10 Mt/y MAM, Geacore, Geacore, Port of Den Helder, Geacore (Den Helder, Oostvaardersplassen) H&R, New Energy Coalition, private/industry-led</p> <p>H2 Maritime Den Helder - 1 MW Engie, Physalis, Danes, Allander, Port of Den Helder, New Energy Coalition</p> <p>H2 Wind turbines Wieringermeer - 4.8 MW wind turbines / 1 MW electrolysis VNGO, TNO, Lagerway</p> <p>HyNetherlands - 100 MW Engie-consortium</p> <p>H2 production - 100 MW H&R/Enagis</p> <p>Dwells 1 / 20 MW Neoray, Geacore, Scaevola</p> <p>Dwells 2 - 50 MW Neoray, Solynto, S&V Energy</p> <p>Dwells 3 - 30 MW Neoray, Geacore</p> <p>SCW - 300 MW SCW-consortium</p> <p>H2M Engie, Geacore</p> <p>H2 from Steelmills - 300 MW SCW-consortium</p> <p>Power-to-fuel - 100 MW Netherlands, VTTI, KLM, Lufthansa, Siemens, Lind Gas, Port of Amsterdam, UTwente</p> <p>REN Bio gasifier - 300 MW ton/y Bio Energy Netherlands</p> <p>Pilot plant synthetic kerosene Solynto, Port of Amsterdam - consortium partners</p> <p>Hofhuizen electrolyser and filling station - 1 MW (5 ton/y) Hofhuizen</p> <p>Nelly - 10 MW Vemtel</p> <p>High tech manufacturing industry Advanced Steel and systems and technology for green hydrogen Amongst others: FULFIRM, Vinyon, VTI, Nedstack, Hytec, MAGNET, Arnhem, Geacore</p> <p>National public-private research and innovation programme Hydrogen and Green Chemistry</p> <ul style="list-style-type: none"> • Making carbon neutral H₂ • Transport & storage of H₂ • Direct use of H₂ • H₂ and green electrons for carbon-based chemistry • Green H₂ and electrons for nitrogen based chemistry • Green H₂ and electrons for intermediates and specialty chemicals • Socio-economic aspects and National Human Capital Agenda <p>In each industrial cluster projects aimed at the transport and/or storage of hydrogen and projects on hydrogen import are also under construction.</p> <p>Hyplanus</p> <p>BRG2 - 50 MW Chemical, Turgas</p> <p>H2 for industry - 38 km H₂ Chemical</p>
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Planning



Governance



- Bestuur
- Gebruikerscommissies
- Adviescommissies
- R&D consortia
- Stakeholderspanel
- ⚡ Doorsnijdend thema

Governance

Programmabestuur met uitvoerend mandaat: regie, verbinden en outreach.

Bijgestaan door een secretariaat (ca 4 fte).

De voorzitter neemt plaats in het **Themaoverleg Energie en Duurzaamheid** voor inpassing in het missiegedreven innovatiebeleid.

Uitvoerende commissies bestaande uit

investeerders, trekkers van de zeven programmalijnen en de zes learning communities. Komen op regelmatige basis en in wisselende samenstelling bijeen en m.n. ook in zes regionale clustercommissies.

1. Noorden
2. Amsterdam/NoordHolland
3. Rotterdam/Moerdijk
4. Zeeland
5. Brainport/Arnhem
6. Chemelot

Adviserend een nationale en internationale adviescommissie voor positionering in het (inter)nationale landschap en benchmarking.

Stakeholders panel kennisdeling gericht op startups en MKB, in met name de maakindustrie zodat zij hun productportfolio kunnen aanpassen, ten behoeve van verdere opschaling.

