MISSION INNOVATION

August 2022

National Innovation Pathway Round-up

THE NETHERLANDS

National Innovation Pathway Round up – The Netherlands

Introduction

Mission Innovation members agreed to develop **National Innovation Pathways (NIPs)** to describe and build collective understanding on how each member plans to pioneer clean energy technologies to meet their climate and energy goals.

Each member has their own approach to developing and identifying innovation needs and priorities, with some already having undertaken extensive strategy development. The Roundup provides a **single location of summary information on countries' innovation priorities** utilizing existing sources of information so members and interested stakeholders can easily find key information of interest.

All MI members were asked to provide answers to a survey (Annex A) providing as much information as possible, with some questions being optional. The survey asked questions relevant to each element of the National Innovation Pathway described in the Joint Launch Statement:

1. Energy transition scenarios and priority national-level energy innovation needs / priorities until at least 2030;
2. Strategies or national-level plans to address these energy innovation needs / priorities, including institutional design and working internationally
3. Information on how Members will measure innovation outcomes and innovation ecosystem developments;
4. Members' preferred modes and methods of collaboration; and
5. Any further supporting evidence that was used to identify the energy innovation needs / priorities, such as analysis of domestic competitiveness, economic opportunities or national level climate and clean energy plans.

Members will be asked to refresh this document annually if significant changes to national policy have taken place.

1. Clean Energy Innovation Strategy

1.1 Summary

In line with the European Fit For 55 package, the Netherlands increased its CO2 reduction target from 49% to 55% reduction in 2030 compared to 1990. The Netherlands is targeting CO_2-reduction on a sectoral level with the Dutch Climate Agreement of 2019 for the Electricity Sector, Industry, Mobility, the Built Environment and Agriculture & Land-use. In 2019, the knowledge and innovation challenges for these sectoral Missions have been translated into the Integrated Knowledge and Innovation Agenda on Climate and Energy (IKIA) and 13 Multi-Year Mission-Driven Innovation Programs (MMIPs). Through sectoral Mission teams - composed of end-users, private actors, knowledge institutes and government agencies – all Dutch innovation efforts concerning Climate and Energy across all TRL-levels are guided towards the Missions and MMIPs of the Climate Agreement. Our international innovation efforts are also in line with the IKIA, so that the various initiatives contribute to the Missions of the Climate Agreement.

In 2020, the Knowledge and Innovation Covenant (KIC) has been signed by private and public parties. This KIC gives insight in and commitment of foreseen financial means for RD&D. In the years between 2020-2023, the financial means for climate and energy are about €1 billion per year. About €320 mln public funding and €590 mln private funding for RD&D.

This spring, the policy agenda of our national climate policy for the coming ten years has been published. Besides that, a €35 billion Climate Fund is being developed. The Climate Fund is one of the main instruments of the Coalition Agreement to enable financing for measures that contribute to the goal of at least 55% CO2 reduction by 2030. Between 2024 and 2030, the Climate Fund will invest in large scale innovation projects related to, amongst others, the following topics: energy infrastructure, converting gas plants to green hydrogen plants, heat transition, nuclear energy, and early phase upscaling of new energy technologies.

1.2 Methodology

The Dutch government is using the knowledge and creativity of the Dutch business community and knowledge institutions to achieve our climate goals. The focus is on the realization of the Integrated Knowledge and Innovation Agenda on Climate and Energy (IKIA) and Multi-Year Mission-Driven Innovation Programs (MMIPs). By involving the private sector and the demand-side of innovation in aligning our energy innovation investments (from fundamental research to demonstration/implementation), policies, regulations, market conditions and international efforts, we aim to create focus and mass in clean energy investments. This provides a more predictable and focussed framework for investors to invest in low-carbon innovations. The MMIPs allow to develop calls for proposals to stimulate fundamental research and grant schemes to support pilot and demonstration projects. Multi-year collaborations between companies, knowledge institutions and other parties are encouraged.

In 2019, the content of the MMIPs was determined in consultation with the private sector and knowledge institutes. This year, the IKIA and MMIPs will be recalibrated together with industry, knowledge institutions and governments. With this, we determine the required innovation effort and commitment to meet the targets of the Coalition Agreement and the EU Fit For 55 package.

Table 1: RELEVANT DOCUMENTS AND POLICIES

Document or policy name	Description of the document or policy	Specific outcomes, goals or targets identified in the document or policy	Year	Web Link(s)
National Climate Agreement – The Netherlands	The English translation of the National Climate Agreement of the Netherlands, presented to the House of Representatives on the 28th of June, 2019.	By 2030, the Dutch government wants to reduce the Netherlands' greenhouse gas emissions by 49% compared to 1990 levels, and a 95% reduction by 2050. Note that this year (2022) the 49% reduction target was increased to 55% - in line with the EU Fit For 55 package. In 2050, we aim to be climate neutral.	2019	National Climate Agreement - The Netherlands | Publicatie | Klimaatakkoord
Draft Climate Policy Programme	The draft Climate Policy Programme describes the main lines of climate policy for the period up to 2030. It provides an overview of the main policy instruments per sector with which the government intends to achieve the target of at least 55% CO2 reduction by 2030.	55% CO2 reduction by 2030, climate neutral in 2050.	2022	Ontwerp Beleidsprogramma Klimaat | Publicatie | Rijksoverheid.nl
The Integral Knowledge and Innovation Agenda (IKIA) for the energy transition	The Integral Knowledge and Innovation Agenda (IKIA) consists of 13 multi-year mission-driven innovation programs (MMIPs) that give direction to specific development goals, and thereby contribute to the perspective that	- A completely CO2-free electricity system in 2050 - A CO2-free built environment in 2050 - A climate-neutral industry with the reuse of raw materials and products in 2050	2019	https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/documenten/publicaties/2019/03/12/innoveren-met-een-missie

	is needed in the construction, installation and energy sector to invest in the development of innovation.	- Emission-free mobility for people and goods in 2050 - A net climate-neutral agriculture and nature system in 2050		
Knowledge and Innovation Covenant 2020-2023 (KIC)	In the KIC, the private sector, knowledge institutes and governments confirm their commitments to important innovation themes - Energy Transition & Sustainability being one of them.	Invest 4.9 billion euros per year in knowledge and innovation (€2.05 billion of private investments and €2.85 billion of public investments) for the period 2020-2023.	2019	https://www.nwo.nl/sites/nwo/files/documents/Kennis%20en%20innovatieconvenant%202020-2023.pdf

2. Clean Energy Innovation Priorities

2.1 Overview of Clean Energy Innovation Priorities

Table 2: CLEAN ENERGY INNOVATION PRIORITIES

Innovation priority	Focus of innovation activity (tick all that apply)	Targets/Goals (if applicable)	Technologies or topics of interest	Total RD&D funding allocated, (include budget years where applicable)	Planned demonstration Investments (include budget years and indicate if domestic or international spending where possible)	Links to relevant reports or plans
A completely carbon free electricity system in 2050	☑ Early-stage research ☑ Applied research ☑ Product development ☑ Demonstration ☑ Commercialisation *The Innovation Missions focus on all TRL levels, from fundamental research to demonstration and implementation*	Intermediate targets 2030: - On a yearly basis, at least 35 TWh of electricity will be produced by onshore wind and solar installations > 15 kW - At least 49 TWh of electricity will be produced by offshore wind	- Offshore wind - Onshore wind - (Next generation) PV - System integration	*We track investments in RD&D in a different way, see table below.*		https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/documenten/publicaties/2019/03/12/innoveren-met-een-missie
A carbon-free bult environment in 2050	☑ Early-stage research ☑ Applied research ☑ Product development ☑ Demonstration	Intermediate targets 2030: - 200,000 existing homes per year off natural gas (1.5 million homes in total)	- Electrification - Heat pumps - District heating - System integration			https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/

	☑ Commercialisation *The Innovation Missions focus on all TRL levels, from fundamental research to demonstration and implementation*	- 15 percent of utility buildings and social real estate off natural gas - At least 20% of local energy consumption (including EV) will be produced locally (in the built environment) in an sustainable way				documenten/publicaties/2019/03/12/innoveren-met-een-missie
A climate neutral industry with the re-use of raw materials and products in 2050	☑ Early-stage research ☑ Applied research ☑ Product development ☑ Demonstration ☑ Commercialisation *The Innovation Missions focus on all TRL levels, from fundamental research to demonstration and implementation*	Intermediate targets 2030: - Using 50% less primary raw materials - Greenhouse gas emissions from production processes and the waste sector are reduced to around 36 Mton CO2 equivalent - Electrification and CO/CO2 reuse are achieved - CCS is being used cost-efficiently - Sustainable hydrogen is on its way to implementation - Biobased raw materials are seen as the standard	- CCU/CCS - Electrification in industry - Biorefinery - Hydrogen			https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/documenten/publicaties/2019/03/12/innoveren-met-een-missie
Emission-free mobility for people and goods in 2050	☑ Early-stage research ☑ Applied research ☑ Product development ☑ Demonstration ☑ Commercialisation *The Innovation Missions focus on all TRL levels, from fundamental research to demonstration and implementation*	- 1.9 million electric vehicles - 1/3 of energy consumed in mobility is renewable - 8 billion fewer business (car) kilometres made on a yearly basis - At least the 32 largest municipalities have zero-emission zones for urban logistics	- EV - Electrification - Biofuels			https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/documenten/publicaties/2019/03/12/innoveren-met-een-missie

This table shows our public RD&D spending, divided into different categories according to the IEA questionnaire.

	2019	2020	2021
A1. Energy efficiency: industry	€ 31,1	€ 106,9	€ 75,0
A2. Energy efficiency: residential and commercial buildings	€ 28,4	€ 14,0	€ 2,5
A3. Energy efficiency: mobility	€ 41,4	€ 2,3	€ 77,9
A4. Energy efficiency: other	€ 23,8	€ 11,9	€ 18,9
B1. Oil and gas	€ 1,5	€ 0,5	€ 0,5
B3. CO2 capture and storage	€ 7,0	€ 5,9	€ 10,1
C1. Solar energy	€ 15,5	€ 18,1	€ 21,2
C2. Wind energy	€ 46,5	€ 15,5	€ 14,1
C3. Ocean energy	€ 0,0	€-	€ -
C4. Biofuels	€ 8,2	€ 7,2	€ 13,3
C5. Geothermal energy	€ 10,9	€ 3,6	€ 4,7
C6. Hydroelectricity	€ -	€ -	€ -
C7. Other Renewable Energie Sources	€ 0,2	€ -	€ -
D1. Nuclear Fission	€ 7,0	€ 7,0	€ 7,7
D2. Nuclear Fusion	€ -	€ -	€ -
E1. Hydrogen	€ 14,3	€ 14,4	€ 56,4
E2. Fuel cells	€ -	€ 0,5	€ 5,3

F1. Electric power generation	€ -	€ 0,2	€ -
F2. Electricity transmission and distribution	€ 2,3	€ 13,3	€ 17,4
F3. Energy storage	€ 20,2	€ 8,4	€ 9,9
G1. Energy system analysis	€ 11,7	€ 4,5	€ 13,2
G2. Basic (not-specific) energy research	€ 0,9	€ -	€ 0,5
G3. Other	€ -	€ 8,2	€ 12,2
Total	**€ 271,0**	**€ 242,4**	**€ 360,7**

We work with governments, knowledge institutes and the private sector on the innovations that are needed to achieve the Missions as formulated in Table 2. The Topsector Energy (TSE) plays an important role in this. The TSE consist of various Top Consortia for Knowledge and Innovation (TKIs) in which governments, knowledge institutes and Dutch organizations come together. TKIs are formed around the themes of the Missions. On a yearly basis, we decide together with the TSE and TKI's what the priorities for RD&D are to achieve the targets formulated in the Missions and the underlying MMIPs. Together we launch new programs and mobilize public and private funding for RD&D projects across all TRL-levels.

2.2 Tracking Progress (Optional)

We set up an Innovation Monitoring Unit (IMU) that measures progress towards addressing our energy innovation priorities as formulated in the Integrated Knowledge and Innovation Agenda on Climate and Energy (IKIA). The IKIA consists of 5 Missions (Electricity Sector, the Built Environment, Industry, Mobility, Agriculture & Land Use). These Missions again consists of 13 Multi-Year Mission Driven Innovation Programmes (MMIPs). For each MMIP, the knowledge and innovations that need to be developed to complete the missions have been worked out.

The IMU investigates the efforts made within the Missions of the IKIA. Information is provided on:

- Deployment at the Missions and MMIPs level (quantitative)
- Deployment to sub-programs within MMIPs (qualitative, based on expert judgement)

The Progress Report made by the IMU shows if we are on track to meet the targets formulated in the IKIA. Besides that, it provides information on the distribution of type of innovation activities; the deployment of public funds; the distribution between public/private investments; and the type of organisations that made the investments.

3. Private Sector Engagement (Optional)

The Netherlands supports public-private collaboration through various policies:

- General policies, such as the public-private allowance, which facilitates private contributions for public-private partnerships for research and innovation within the Top Sectors.
- Energy-innovation policies, requiring a private contribution (in-cash or in-kind). For example the Renewable Energy Scheme (HER) (on average 50%), the DEI+ (on average 75%), the MOOI (on average 40%). In 2021, the Dutch government has invested €181 million euros in energy innovation through various subsidy schemes, with €298 million euros in private contributions. This means that on average, 62% of the investments are private contributions.
- Private actors are part of the Mission Teams, prioritizing innovation efforts within MMIPs. By involving the private sector and the demand-side of innovation in aligning our energy innovation investments (from fundamental research to demonstration/implementation), policies, regulations, market conditions and international efforts we aim to create focus and mass in clean energy investments. This provides a more predictable and focussed framework for investors to invest in low-carbon innovations.
- A dedicated investment agency – Invest-NL – aims to invest in innovative, low-carbon technologies with a higher risk profile. This venture capital should trigger new investments from the private sector to bring innovative technologies onto the market.
- In the Knowledge and Innovation Covenant (KIC) both public and private actors specify their intended contribution to the Dutch mission oriented Topsector policy. This amounts to roughly €355 mln public funds and €590 mln private funds per year (2020-2023) on climate and energy innovation.
- The Dutch National Growth Fund was created to enhance the structural growth of the Dutch economy. This investment fund will invest €20 billion between 2021 and 2025 in large-scale investment projects and programs with a minimum subsidy

amount of €30 million per proposal. Each proposal requires a private contribution of at least 50%. Subsidy will be made available in three rounds. In April it was announced that €4,5 billion of the €6,3 billion that the government is making available in the second round is earmarked for projects relevant to the agreements in the Climate Agreement. Hundreds of millions will go, for example, to hydrogen, heat networks and a future-proof living environment. This money will be doubled with private money.

Annex A – National Innovation Pathway Roundup Survey Questions

1.1 Summary: Please provide a summary of your national clean energy innovation strategy i.e. the overall policies, framework and/or goals that help to define the innovation priorities you will describe in Section 2. We recommend including information about your national climate or energy targets (such as NDCs or renewable energy targets) as well as national innovation strategies and policies. You can share links to relevant documents in Table 1.

1.2 Methodology: Please describe the methodology to develop your national clean energy innovation strategy such as analysis, modelling or stakeholder engagement and include any links to relevant documents in Table 1. This will be used to help share learning between members**.**

2.1 Overview of Clean Energy Innovation Priorities: Please provide a list of your national clean energy innovation priorities (i.e. specific technologies, sectors or needs). Please complete Table 2 to provide information about where you are focusing in the innovation cycle for each priority; any targets or goals; RD&D interests; current allocated budgets (including specific demonstration funding) and links to relevant strategies or reports. In the text box following please provide a brief description of how you plan to respond to each innovation priority in the coming years, such as through future plans over the next 3-10 years to mobilise further investments for innovation, launch new major programmes and timelines for major demonstration projects**.**

2.2 Tracking Progress: Please describe how you plan to measure progress towards addressing your identified energy innovation priorities. Please describe any governance processes to manage and review energy innovation efforts and, where able, please list

tracking indicators that are commonly used (e.g. such as patents, publications, rates of company formation, follow-on capital and private co-investment, technology performance upgrades).

3. Private Sector Engagement: Please can you describe your strategic approach and priorities to engagement with the private sector to address the clean energy innovation priorities identified in section 2. This could include for instance prioritising co-funding of RD&D initiatives; incubator/accelerator programs that are funded (in part or fully) by the private sector; tax credits and other fiscal incentives; initiatives that the private sector can engage with, grants, de-risking instruments such as loan guarantees etc.

4. International Collaborations: Please describe your strategic approach to international collaboration to tackle your clean energy innovation priorities (e.g. do you have an international strategy, or particular types of collaboration you are prioritising).

5. National Energy innovation Ecosystem: Please provide an overview of your national institutions, funders and organisations and describe how they contribute to tackling the innovation priorities identified in Section 2. Please either provide this information in the box or complete Table 3.

6. Further Supporting Information: Please add below any further information about your national energy innovation needs or approaches to tackling these that has not been covered above.

Mission Innovation – Catalysing Clean Energy Solutions For All