

August 2022

# National Innovation Pathway Round-up

**NORWAY**



# National Innovation Pathway Round up – Norway

## 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

Development of Clean Energy technologies and solutions is a central part of the Norwegian Governments Energy Policy. Most recently this is described in the Government White Paper to the Parliament (Storting), “Meld. St. 11 (2021-22)”. In this document the Government describes the national and international energy situation, with a particular view to climate and energy security challenges, and their policies and measures to meet these challenges. Research, development and market introduction of new clean energy technologies and solutions is an important part of the policy, and the Government has a special focus on CCS, Hydrogen and offshore floating wind power.

The Ministry of Petroleum and Energy established a national energy advisory R&D strategic board in 2008. This body was tasked with developing a national energy R&D strategy. Energy21 is hence the national strategy for climate-friendly energy technology. The strategy presents recommendations to industry, research institutions and allocating authorities. The Energy21-strategy shall support Norwegian energy policy by contributing to increased value creation and secure, cost-effective and sustainable utilisation of Norwegian energy resources. The strategy is revised every fourth year and developed by a board constitutive of industry representatives appointed by the Minister of Petroleum and Energy.

The fifth revision of the strategy was announced June 2022. The updated strategy’s vision is to develop “Europe’s best energy system”. In the strategy, three major challenges were identified: 1) Decarbonisation of transport and industry; 2) Secure, competitive and environmentally friendly energy supply and 3) The development of new, green industries and

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marine energy technologies. The strategy includes eight priority areas: Hydropower, offshore wind, solar energy, batteries, hydrogen and CCS, as well as two core priority areas that are cross-sectoral: Integrated and effective energysystems and energy markets and regulations.

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## 1.2 Methodology

The Energy21-strategy has been formulated through an iterative process. In the process, 19 areas of strategic interest within the energy- and transport system have been evaluated. The process can be simplified into three steps:

1. The areas of strategic interest are compared with regards to their respective potential to contribute to the strategy's goals.
2. The areas of strategic interest are compared with regards to their respective potential for innovation and research needs. EU's associated research activities and Norway's potential role within these research areas are also being evaluated in this step.
3. The areas of strategic interest are evaluated altogether with regards to their potential to contribute to the strategy's goals (i.e. the governments long-term energy and climate goals)

Work meetings and ongoing dialogues have been held throughout the process with representatives from authorities, industry actors and research environments. Around 600 participants have contributed to the strategic process for the fifth revision of the strategy. Studies and reports, in addition to the collective competency of the board also plays an important role.

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**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)
An Energy Policy for Employment, Transition and security in times of uncertainty (Meld. St. 11 (2021-22))	Press release containing information about the Norwegian Government's supplementary white paper on energy policy.	Policies oil and gas and the domestic energy situation, including research and innovation, offshore wind, onshore wind, hydrogen, CCS and oil and gas	2022	<a href="https://regjeringen.no/en/aktuelt/an-energy-policy-for-employment-transition-and-security-in-times-of-uncertainty-/doc1072277">An Energy Policy for Employment, Transition and security in times of uncertainty – regjeringen.no</a>
Energy21	National strategy for climate-friendly energy technology.	Hydropower, offshore wind, solar energy, batteries, hydrogen, CCS, integrated and effective energy systems and energy markets and regulations	2022	<a href="https://www.energi21.no/en/nyheter/2022/03/nasjonal-forsknings-og-innovasjonsstrategi-for-ny-klimavennlig-energiteknologi">Nasjonal forsknings- og innovasjonsstrategi for ny klimavennlig energiteknologi (energi21.no) (in Norwegian)</a>
Climate Change Act	Target for greenhouse gas emissions to be reduced by 2030 and 2050.	50-55 % reduction of GHG emissions by 2030 compared to 1990-levels. 90-95% reduction of GHG emissions compared to 1990 levels.	2018, last updated 2021	<a href="https://lovdata.no/dokument/lovgivning/2018/06/01/lovg-2018-06-01-100">Act relating to Norway's climate targets (Climate Change Act) - Lovdata</a>

## 2. Clean Energy Innovation Priorities

### 2.1 Overview of Clean Energy Innovation Priorities

**Table 2: CLEAN ENERGY INNOVATION PRIORITIES**

Innovation priority	Focus of national innovation activity (tick all that apply)	Targets/Goals (if applicable) *	Technologies or topics of interest	Total R&D funding allocated (include budget years where applicable)  Numbers in thousands of USD	Planned demonstration investments (include budget years and indicate if domestic or international spending where possible)	Links to existing strategy, roadmap, plans or analysis
Hydrogen	<input checked="" type="checkbox"/> Early-stage research <input checked="" type="checkbox"/> Applied research <input checked="" type="checkbox"/> Product development <input checked="" type="checkbox"/> Demonstration <input checked="" type="checkbox"/> Commercialisation Other:	The Norwegian Government will contribute to the development of a coherent valuechain where production, distribution and use of hydrogen are developed in parallel. A Roadmap has been developed for Hydrogen with signposts for the production, distribution and use of hydrogen in 2025/2030 and 2050.	Clean hydrogen production, distribution and utilisation	2018: USD 22 700 2019: USD 19 100 2020: USD 49 400 2021: USD 66 800 committed	Examples of demonstration investments:  2021: NOK 1.6 billion granted three industry projects.  2022: NOK 1.12 billion granted five production plants	<a href="#">Norway 2022 – Analysis - IEA:</a> see page 47 to 49 for a summary of Norwegian hydrogen policy.  <a href="#">Grants to hydrogen projects   Heilo   Enova</a> (in Norwegian)

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					for renewable hydrogen and seven pioneering hydrogen and ammonia-powered vessels.	<a href="#">Enova grants more than 1 billion NOK to three industrial projects. Hydrogen is the climate solution in all three projects   Enova SF</a>  <a href="#">Enova supports hydrogen projects in the maritime sector with NOK 1.12 billion   Enova SF</a>
Offshore wind, with a particular emphasis on floating installations	<input checked="" type="checkbox"/> Early-stage research <input checked="" type="checkbox"/> Applied research <input checked="" type="checkbox"/> product development <input checked="" type="checkbox"/> Demonstration <input checked="" type="checkbox"/> Commercialisation Other:	The Norwegian Government aim to open up areas for offshore wind power production that will generate 30 000 MW of power in Norway by 2040. This is nearly equivalent to the amount of electricity currently produced in Norway and will require around 1 500 turbines.	Offshore wind	2018: USD 3 268 2019: USD 2 655 2020: USD 3 087 2021: USD 5 766 2022: USD 10 240 committed	Examples of demonstration investments:  2018: NOK 2.3 billion granted the Hywind Tampen project to establish 11 floating wind	<a href="#">Offshore wind - time line - regjeringen.no</a>  <a href="#">Enova supporting pioneer project - equinor.com</a>



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					turbines at 8,6 MW capacity each. The project will contribute to reductions of about 200 000 tonnes CO <sub>2</sub> -emissions per annum by replacing the gas used to power 5 oil- and gas platforms on the fields of Gullfaks and Snorre.	
CCS	<input checked="" type="checkbox"/> Early-stage research <input checked="" type="checkbox"/> Applied research <input checked="" type="checkbox"/> product development <input checked="" type="checkbox"/> Demonstration <input checked="" type="checkbox"/> Commercialisation Other:	The CCS project “Longship”, which is currently under construction, is a key part of the Government’s CCS policy and part of Norway’s contribution to the development of necessary climate technologies. The Government will facilitate commercial CO <sub>2</sub> storage on the Norwegian continental shelf. The Government will contribute to promote CCUS as an important tool in reaching the goals set out by the Paris Agreement.	CCS	2018: USD 16 910 2019: USD 21 400 2020: USD 17 560 2021: USD 17 560 2022: USD 20 240 committed	Examples of demonstration investments:  2021: The Government will grant a total of NOK 16,8 billion to the Longship project.	<a href="https://regjeringen.no/en/tema/Carbon+capture+and+storage-CCS-/document/Meld.St.33+2019-2020+Report+to+the+Storting+(white+paper)/regjeringen.no">Carbon capture and storage - CCS - regjeringen.no</a>  <a href="https://regjeringen.no/en/tema/Meld.St.33+(2019-2020)+Report+to+the+Storting+(white+paper)/regjeringen.no">Meld. St. 33 (2019–2020) Report to the Storting (white paper) (regjeringen.no)</a>

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Hydrogen

There are many projects under development in Norway with funding from the allocating authorities that plan to produce, distribute and use hydrogen produced with low to zero emissions. Two new research centres for environmentally friendly energy was announced in 2022 on hydrogen and ammonia: [HYDROGENi](#) led by SINTEF and [HyValue](#) led by NORCE. The centres' research will cover the whole hydrogen valuechain and will run from 2022-2030.

Offshore wind

A framework have been established for opening the areas of Utsira North and Southern North Sea II for offshore renewable energy production. The Government plans to carry out the next licensing round for new offshore wind areas in 2025. A new research centre for environmentally friendly energy on offshore wind became operational in 2021, [NorthWind](#). NorthWind is led by SINTEF and will run from 2021-2029.

CCS

The Longship projects includes carbon capture at Norcem's cement factory in Brevik planned operational in 2024, and carbon capture at Hafslund Oslo Celsio's waste incineration facility in Oslo planned operational in 2026. Northern Lights, a collaboration between Equinor, Shell and Total, are building the CO<sub>2</sub> transport and storage part of Longship. Phase one of Northern Lights is to be completed mid-2024 with a capacity of up to 1,5 million tonnes of CO<sub>2</sub> per year.

The research centre for environmentally friendly energy, [NCCS](#) is led by SINTEF and was established in 2016. NCCS has as goal to fast-track CCS deployment through industry-driven, science-based innovation that addresses major barriers identified in CCS demonstration and industry projects. The research centre will operate for eight years from 2016 to 2024.

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## 2.2 Tracking Progress (Optional)

The Norwegian Ministry of Petroleum and Energy conducts evaluations on a regular basis focusing on research outcomes concerning in particular new energy production, increased energy efficiency and emission reductions. The number of research publications, PhD- and postdoctorates employed-, and the funding of new research projects are amongst the parameters included in annual reviews of the relevant R&D programmes.

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### 3. Private Sector Engagement (Optional)

The SkatteFUNN R&D tax incentive scheme is a Government program designed to stimulate research and development (R&D) in Norwegian trade and industry. The incentive is a tax credit and comes in the form of a deduction from a company's payable corporate tax. To be eligible for the program, companies need to be based in Norway and liable to pay corporate tax to Norway. Furthermore, the company must seek to develop a new or improved product, service or production through a dedicated R&D project that will generate new knowledge, skills and capabilities within the company. Most of the projects that utilises the scheme are small- and medium enterprises. The largest thematic area is the energy system and utilization of energy sources. Most of the projects that is focused on utilizing energy sources are concentrated on offshore wind. Hydropower and solar power are also large areas, and there has been an increased growth in projects within batteries and hydrogen.

## 4. International Collaboration (Optional)

Participation in international programmes for RD&D is considered an important way for Norwegian research- and technology environments to access networks, infrastructure, markets, capital and world-leading competency that goes beyond what national programmes can offer. Particularly important is participation in the Horizon Europe Framework Programme and the European Research Area (ERA). Norway has an ambition to capture 2,8% of the Horizon Europe Framework Programme funding and provides support to contribute to high-quality projects and applications to the programme. Norway also hosts European research infrastructures, including ECCSEL ERIC which is the European Research Infrastructure for CO<sub>2</sub>-capture, utilisation, transport and storage (CCUS). Norway also engages in cooperation with third countries that share similar research priorities, particularly concerning CCS, but also offshore wind and hydrogen.

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## 5. National Energy Innovation Ecosystem (Optional)

**Table 3: CLEAN ENERGY INNOVATION INSTITUTIONS**

Institution name	Description of role	Innovation priority(ies) that they contribute to (taken from Table 2)	Description of funding modalities (e.g. grants, co-investment, where in tech development cycle focused)	Links
The Research Council of Norway	The Research Council of Norway is an administrative agency with special powers under the Ministry of Education and Research. It manages research funding from all the Norwegian ministries, and allocates funds to basic and applied research and innovation within all fields and disciplines.	<p>The Norwegian Research Council is responsible for managing most of the public funding available for energy research. The funding is allocated to various programmes and funding schemes that together cover the entire energy field, including energy efficiency, renewable energy and carbon capture and storage.</p> <p>The most important initiatives in the energy field are the research programme ENERGIX and the Centres for Environment-friendly Energy Research (FME scheme).</p>	The programmes employ funding instruments that cover long-term basic and applied research, technology development, small-scale pilot projects and social science research. Public funding is available to cover 100% of the costs of the basic research. Private actors are required to provide at least 50% of the funding for projects further along the innovation chain.	<a href="https://forskningset.no">Energy, transport and low emissions - portfolio (forskningset.no)</a>
Gassnova	Gassnova SF is a state-owned enterprise owned by the Ministry of Petroleum and Energy. Gassnova SF works to ensure that capture, transport and storage of CO <sub>2</sub> (CCS) can become a relevant solution in mitigating climate change. The main	CLIMIT is a national programme for research, development and demonstration of technologies for capture, transport and storage of carbon.	CLIMIT supports projects in all stages of the development chain, from long-term basic research to build expertise to demonstration projects for CCS technologies. The main focus is on technology development, but it is also considered important to identify	<a href="#">About the CLIMIT programme and the funding opportunities</a>

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	goal is to promote cost-effective and future-oriented solutions for CCS. By facilitating technology development and sharing experience from developing the “Longship” CCS Project in cooperation with the industry players.	The CLIMIT programme involves collaboration between Gassnova SF and the Research Council of Norway. The Research Council manages research and development, while Gassnova manages piloting and demonstration activities. The board for the CLIMIT programme makes decisions on funding awards.	opportunities for future commercialisation and value creation in Norwegian industry.	
Enova	Enova SF is a state enterprise owned by the Ministry of Climate and Environment. Its task is to promote a shift towards more environmentally friendly energy consumption and production, as well as the development of energy and climate technology.	Enova supports companies in the public and private sector with necessary capital expenditure for implementing energy- and climate friendly solutions. Enova contributes to the wider utilisation of well-known technologies.	The funding covers projects from the pilot phase to commercialisation, assisting companies with testing out the technology and demonstrating that it works under ordinary conditions.	<a href="#">About Enova – Learn about our work   Enova</a>
Innovation Norway	Innovation Norway is a state-owned enterprise owned by the Ministry of Trade, Industry and Fisheries and county municipalities. It promotes nationwide industrial development to both the business economy and Norway’s national economy, and helps release the potential of different districts and regions by contributing towards innovation, internationalisation and promotion.	Under the Environmental Technology Scheme Innovation Norway provides grants for development and demonstration of innovative products or processes that solve an environmental problem. The scheme provides grants for innovation projects. The purpose of an innovation project is to develop or significantly improve a new product, process or services. At the core of the project are research and development activities. Grants for innovation projects are	Funding provided by Innovation Norway will be based on an overall assessment of the enterprise and project. The grant will only partially cover project costs; additional funding must be obtained from other sources.	<a href="#">Grants for Environmental Technology (innovasjon.no)</a>

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		intended to strengthen the enterprise’s competitiveness and trigger the potential for sustainable growth. The overarching goal is lasting value creation in Norway.		
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## **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

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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