Mission-driven acceleration of the green transition - call for innovative project ideas within CCUS

INNO-CCUS pool 2

Application Deadline: March 21, 2023
Project duration: Minimum one year. The latest project end is May 31 2027.
Total budget for this call: Maximum DKK 80 million
Investment per project: From minimum DKK 3 million to maximum DKK 10 million.

All details about the call and application process are described in section 1-11 below.

1. About INNO-CCUS – Partnership and roadmap

The INNO-CCUS Partnership has been established to contribute significantly to achieving the Danish government's climate goals on CO_2 reduction through CCUS solutions.

We are a mission-driven public-private partnership working with chemical and Biological CO_2 capture, transportation, geological storage and broad utilization, e.g. platform chemicals, building materials, biochar, but not green fuels (that are covered in MissionGreenFuels).

INNO CCUS aims to accelerate the implementation of CCUS technologies by facilitating a broad partnership between industry, academia and other public institutions working on strategic research and innovation that removes major barriers to making CCUS happen from 2025 (in Denmark, Europe, and the world.)

The INNO-CCUS roadmap describes a number of paths on how CCUS can be the key to balancing the short-term urgent needs to stop and compensate for large fossil-based CO_2 emissions with CCS technologies with a long-term need for maximized utilization of green carbon in biological capture technologies that deliver cost-efficient, globally scalable and innovative solutions and products.

Five workstreams across the CCUS value chain provide the backbone of the roadmap activities:

Workstream 1 – Chemical CO_2 capture

Workstream 2 – Biological CO_2 Capture and Storage

Workstream 3 – Geological CO_2 Storage

Workstream 4 – CO_2 Utilization

Workstream 5 – Society and Systems analysis

The workstreams are described in further detail here.

Background info – the four Innomissions

Denmark is committed to acting on and reducing climate change and has set goals to:

70% reduction of greenhouse gas emissions (GHG) in Denmark by 2030 and net-zero emissions by 2050, strengthen the environment and nature and contribute to increased competitiveness of the Danish businesses and industries.

The government and all parliamentary parties have defined four missions as stated in the "Green solutions of the future - Strategy for investments in green research, technology, and innovation"

and the Research Reserve agreement for 2021. These missions focus on challenges critical for Denmark to address to reach our GHG ambitions, and present significant opportunities for the Danish economy, drawing on Denmark's competitive advantages and capabilities. With the missions, the government sets a long-term direction for green research, innovation, development, and demonstration, accelerating the development of new green solutions and technologies. This is a strategic research and innovation effort over several years.

This call text relates to Innomission 1 - CCUS and is announced by the INNO-CCUS Partnership.

2. What is called for?

The INNO-CCUS partnership invests in ambitious, cross-industrial research and innovation projects that can create new, concrete solutions to issues and challenges towards 2030 and 2050 outlined in the INNO-CCUS partnership goals, which relates to the published INNO-CCUS roadmap.

The projects should focus on ambitious results with high-value impact, whether in the form of new knowledge, improved and new processes, systems, products or solutions. The projects must create societal or economic value to enable sustainable transformation related to CCUS within Danish public and private companies and with customers in society, e.g., among citizens, states, regions, and municipalities. The impact of the project results must be assessed from a 2030 and/or 2050 perspective and support the INNO-CCUS partnership goals.

We call for research and innovation projects that address the challenges within the five INNO-CCUS workstreams. All applications within workstreams 1-4 must include elements from the area of workstream 5, Society and Systems Analysis (SSA), as an integral part of the project application. In addition, we also accept applications for projects that only focus on workstream 5. For project applications within workstreams 1-4, SSA must constitute at least 10% of the total budget.

The following section gives examples of themes and possible focus areas for each workstream. The examples are not meant to confine the content of an application, and it is not a criterion or advantage to address the examples specifically.

Workstream 1 - Chemical CO_2 capture
We are interested in novel project ideas within Chemical CO_2 Capture. Examples of potential themes and areas are given in Table 1.

Table 1: Example themes and possible topics for workstream 1

Example themes	Possible topics
CO_2 quality and impurities related to different CO_2 sources	Cost-effective cleaning technologies Transport considerations CO_2 specs for storage and utilization
Optimization of chemical CO_2 capture processes.	Process development and improved energy efficiency Capture rates and radically new capture methods Measuring technologies Improvements of DAC technologies
Addressing the environmental effects of CO_2 capture	Mitigation efforts Waste production and treatment Emissions of impurities from the capture plant
Processes relevant for transport of CO_2	Dedicated CO_2 infrastructure Low pressure systems for CO_2 transport in gas phase High pressure systems for trucks and supercritical CO_2

	Low temperature systems for trucks and CO_2 as dry ice

Workstream 2 - Biological CO_2 Capture and Storage

We are interested in novel project ideas within Biological CO_2 Capture and Storage. Examples of potential themes and areas are given in Table 2.

Table 2: Example themes and possible topics for workstream 2

Example themes	Possible topics
Biological capture related to circular materials	Building materials Wood Biofibres Algies
Feasibility and long-term effects of biochar	Stability and toxicity of biochar
Carbon dynamics in biosystems	Management options and practices for optimal carbon storage and delivery of other services
Marine carbon storage	Upscaling marine carbon storage

Workstream 3 - Geological CO_2 storage

We are interested in novel project ideas within Geological CO_2 Storage. Examples of potential themes and areas are given in Table 3.

Table 3: Example themes and possible topics for workstream 3

Example themes	Possible topics
Monitoring	CO_2 leakage from a storage location Reservoir rock deformations, well- and seabed monitoring CO_2 plume movement in reservoir
Upscaling	Data collection Derisking activities and risk management Numerical modelling and predictions
Integrity of wells and facilities	The well and facility design Interface between wells and reservoirs
CO_2 thermodynamics	CO_2 phase behaviour in full value chain Effect of impurities Injection processes Transportation
Resources **for geological CO_2 storage**	Materials – fluids, injection processes Transportation

Workstream 4 – CO_2 Utilization

We are interested in novel project ideas within CO_2 Utilization for non-fuel applications. Examples of potential themes and areas are given in Table 4.

Table 4: Example themes and possible topics for workstream 4

Example themes	Possible topics

Utilization of CO_2 in captured form	Energy and materials, including mineralogic storage of CO_2 in materials
Chemical or biological processing of CO_2 into materials	New materials Feedstock chemicals

Workstream 5, society and systems analyses (SSA)

We are interested in novel project ideas within Society and Systems Analysis. Projects addressing Society and Systems Analysis are received in two formats:

1: As an integrated part of projects in workstreams 1-4, amounting to at least 10% of the total project budget
2: Stand-alone projects

If the INNO-CCUS Board of Directors considers it beneficial for the partnership to consolidate SSA elements in different projects across workstreams 1-4, such consolidation will take place as part of the negotiation of the grant agreement.

Examples of potential themes and areas are given in Table 5.

Table 5: Example themes and possible topics for workstream 5

Example themes	Possible topics
Value chain aspects	System coupling and integration Cost-effectiveness Life cycle analysis Technology synergies Surrounding frame conditions
Systems analysis of biological CCUS	Land use and land availability Biodiversity Carbon pricing Environmental and ecological co-benefits of marine and terrestrial carbon storage
The consumer side of CCUS	Demand for CCUS-generated goods
Stakeholder and public dialogue on CCUS	Best practices Model development Public acceptance
Strategic planning and area development	New approaches to local co-creation Circularity and resource efficiency
Assessments of the long-term potential of CO_2 resources	Energy infrastructure and energy system transition Area use Industrial development Consumer aspects Societal development

3. Who can apply?

Innovation Fund Denmark has granted 201.650.000 DKK to the INNO-CCUS Partnership for pool 1 and pool 2 projects and partnership development. Pool 2 constitutes DKK 80 million and will be

allocated to projects among current Partnership Participants[1]. Organizations, that are not INNO-CCUS Partnership Participants, can participate in project applications. Prior to the final project grant agreement, any new organizations must join the partnership via an accession agreement to the INNO-CCUS Investment Agreement and Partnership Agreement.

It is a condition for any project grant agreement that new organizations included in a project application must be approved by Innovation Fund Denmark and accede to the terms of the INNO-CCUS Investment Agreement and Partnership Agreement prior to such grant.

4. What can be applied for?

Co-financing of salaries and other expenses that are directly linked to the implementation of the project. Details are described in the Innovation Fund Denmark Guidelines for Innomission partnerships, which are found here.[2]

5. What are the overall criteria?

All projects must:

- Have an integrated element constituting at least 10% of the total budget, addressing the project-relevant topics within Society and Systems Analysis
- Include collaboration between academia and industry
- Have a secured co-financing of at least 27%
- Specifically address one or more of INNO-CCUS' partnership goals in the investment agreement (the summarized goals are available for download here)
- The project must start at least at TRL 3 and reach a maximum of TRL 7 in the project period.
- All project participants must actively participate in the INNO-CCUS partnership via activities such as workshops, conferences, and more.

The project can last a minimum of 1 year and must be finalized by May 31, 2027.

6. How much can be applied for?

DKK 80 million will be distributed for projects across workstreams 1-5 after the model described in the call text point 2. This distribution of funds is conditioned by sufficient quality in relation to the criteria within the field of applications.

The maximum investment per project is DKK 10 million.
The minimum investment per project is DKK 3 million.

The investment sum must be co-financed with at least 27% by the Project partners. Detailed information about co-financing is described in the guidelines, which are available for download here.

The INNO-CCUS partnership does not accept applications where a successful outcome is dependent

[1] INNO-CCUS currently has 58 Partnership Participants (comprising all partners and contributors)
[2] Please note, that the Innomissions are regulated under the 2019 Innomissions and Grand Solution guidelines, while the evaluation criteria for INNO-CCUS pool 2 aligns with the Innovation Fund Denmark 2022 Grand Solution guidelines

on receiving additional funding for further research and development (e.g. projects that involve financing in multiple phases).

7. Important dates

- Call is announced: January 6, 2023
- E-grant opens: During February 2023
- Deadline for application: 12:00 PM on March 21, 2023
- Expected response: Ultimo June 2023
- Expected project launch: Q4 2023

8. Evaluation criteria

All applications will be evaluated on

1: Quality of the idea – the quality of the research and innovation

2: Impact – value creation during and after the project

3: Quality of execution – efficiency in the project execution and the implementation of the results

4: Strategic fit to the INNO-CCUS partnership – qualitative assessment concerning the INNO-CCUS partnership goals

A detailed description of these criteria is found can be downloaded here.
Criteria 1-3 are evaluated by international peers from the EUREKA expert database. The panel scores all project applications within the 3 criteria. Criteria 4 is evaluated by the Partnership Board of Directors.
The applications with the highest overall scores, amounting 2-3x the budget for pool 2, will be identified based on the evaluations by international peers. These applications will be qualitatively evaluated by the INNO-CCUS Board of Directors regarding the strategic fit to the INNO-CCUS partnership goals. A summary of the goals can be downloaded here.

9. Evaluation process

Applications to INNO-CCUS – pool 2 must be submitted via e-grant.dk, the Innovation Fund Denmark application portal. The call opens in e-grant during February 2023. Please note that applicants will receive a receipt for submitting the application.

The INNO-CCUS secretariat screens applications for formal requirements. Any applications, which don't meet the formal requirements or deadlines are rejected without substantive consideration, see Guidelines for Grand Solution and Innomission partnerships 6.6.

Project applications are evaluated according to the following procedure:

- Criteria 1-3: A scientific/technical assessment by an international panel from the EUREKA expert database

- A consultation process for external reviews is conducted. The deadline for a consultation response is 2 weeks.

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- Criteria 4: Projects with the highest total score from the international peers, corresponding to an applied grant budget of up to three times the grant budget in pool 2, will be evaluated by the INNO-CCUS Board of Directors.

- The Board of Directors will evaluate the proposals regarding the strategic fit to the INNO-CCUS partnership goals, which are correlated to the INNO-CCUS roadmap.

Based on an overall assessment consisting of strategic fit and scientific/technical assessments, external peer reviews and any comments from the consultation process, the INNO-CCUS Board of Directors decides which projects to invite to negotiations for an investment agreement. Please note that while the peer reviewers solely make a scientific/technical assessment of the applications, INNO-CCUS also consider elements such as the strategic importance of the project, portfolio considerations and its value creation.

The Partnership Board of Directors will seek approval for the decision by the IFD Board of Directors. IFD Board of Directors does not have a say in the project selection but will approve the process documented by the Partnership secretariat. The process described in the calltext has been pre-approved by the IFD Board of Directors.

After the final decision from INNO-CCUS Board of Directors, and the final process approval by IFD Board of Directors, applicants are notified of the decision via e-mail from the INNO-CCUS secretariat.

After an application has been approved, the application will enter investment negotiations. In the cases where the project has participation from organizations that are not already Partnership Participants, these organizations must enter the INNO-CCUS Investment Agreement and Partnership Agreement via an Accession agreement prior to finalizing the project grant agreement.

The members of the Board of Directors can be found here. Applicants are asked to indicate whether they see a conflict of interest with any of the Board Members. The Pool 2 process document, available for download here, describes how conflicts of interest are handled during the evaluation process.

E-grant has prepared a FAQ that can be accessed here.

It is expected that the applicants will receive either an invitation for investment negotiations or a rejection of the application by end of June 2023, after which the investment negotiations can be initiated with an expected project start in Q4 2023.

10. Guidance and documents

Pool 2 calltext
Pool 2 process
Application template
Application template guideline
Budget template
Gantt template
INNO-CCUS partnership goals
Assessment criteria
Guidelines

Terms and Conditions
TRL scale

All documents can be downloaded here.

11. Contact info

For questions, please get in touch with the INNO-CCUS secretariat at info@inno-ccus.com.