



Industrial pilot projects for neutron and photon experiments at large scale research infrastructures

Stimulating collaboration around skills development and industrial utilisation of advanced Swedish and International experimental environments as those being developed at MAX IV and ESS in Lund.

A call for proposals within the programme “**Research infrastructure - utilisation and collaboration**”



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Contents

- 1 Summary.....3
- 2 What do we want to accomplish?5
- 3 To whom is this call directed?7
- 4 What do we fund?.....7
 - 4.1 Activities which you can seek funding for7
 - 4.2 On the use of large-scale research infrastructures9
 - 4.3 Eligible costs.....10
- 5 What size grant do we fund?10
- 6 Conditions for us to assess the proposal.....11
- 7 Assessment of proposals received12
 - 7.1 What do we assess?12
 - 7.2 How do we assess the proposals?13
- 8 Decisions and conditions13
 - 8.1 About our decisions13
 - 8.2 Terms and conditions for awarded grants.....13
- 9 How to apply14
- 10 Who can read the proposal?.....15
- Appendix. A short guide to research infrastructures16

Revision history

Date	Change
05-25-2018	p11: “Note that the project start date shall be 15-10-2018 or 26-11-2018, see schedule on p.3”



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1 Summary

Through co-funding of industrial needs-driven pilot projects, Vinnova wants to strengthen Swedish skills regarding how industry can use and benefit from large-scale research infrastructures for advanced neutron and photon-based techniques. This call for proposals allows experiments to be conducted at both Swedish and international facilities¹.

A project proposal should be based on the needs of at least one Swedish company which is also a participant of the project. This can be anything from the development or improvement of new materials, drugs or processes to the need to investigate why a construction has failed during use. The work in the project shall verify whether neutron and/or photon-based technologies are suitable options to meet that need. Planning and implementation of experiments, as well as interpreting the results, should be carried out in active collaboration with appropriate expertise. The project consortium shall therefore also include at least one Swedish participant organisation that assists with such expertise. The project may consist of complementary activities to existing development work, either within the company or by the company in collaboration with other parties.

Experimental access (beamtime) do not need to be formally approved by a research infrastructure when the proposal is submitted to Vinnova. However, the project consortium should be able to justify, in the proposal, that the experiment is judged to be technically feasible and that an infrastructure is willing to take on the commission.

A total budget of 15 million SEK is available for the call. Each pilot project can apply for maximum 500,000 SEK in grants for a project time of 12 months maximum. During the call for proposals period, proposals are collected together and assessed at two different occasions:

1. At the first occasion, proposals are assessed which have been submitted to Vinnova at the latest by:
Friday 31 August 2018 at 14:00
Decision date: 5 October 2018
Project start date: 15 October 2018
2. At the second occasion, proposals are assessed which have been submitted to Vinnova at the latest by:
Friday 12 October 2018 at 14:00
Decision date: 15 November 2018
Project start date: 26 November 2018

¹ Photon experiments can be performed at both synchrotron radiation facilities and facilities for free electron lasers (FELs).



CALL FOR PROPOSALS

4 (16)

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Link to call for proposals website:

<https://www.vinnova.se/e/forskningsinfrastruktur-/industriella-pilotprojekt-for-neutron-och-fotonexperiment/>

2 What do we want to accomplish?

Introduction

World-leading research increasingly requires access to advanced research infrastructures. In addition to contributing to excellent basic research, these infrastructures also enable cutting-edge applied research and innovative development work in industrial and public sectors.

Through the "Research infrastructure – utilisation and collaboration" programme, Vinnova wants to strengthen the Swedish innovation system by contributing to capacity building and increased understanding of how the use of advanced research infrastructures can respond to industrial and societal needs.

With this particular call for proposals we want to support industrial innovation work and encourage Swedish companies to better see the possibilities of advanced neutron- and photon experiments within their respective areas of application.

Background

The research facility MAX IV in Lund is presently Sweden's largest research infrastructure and one of the world's brightest source for synchrotron radiation. In close proximity, the European Spallation Source (ESS) is being built to become the world's strongest neutron source. This will give unique development opportunities within a wide range of research areas, such as life sciences and materials science - and all the important industrial and societal applications that rely on the characteristics and performance of different materials.

Neutrons and photons interact in different ways with a material. Therefore, both comparable and complementary analyses are made possible. For example, you can study how different materials and biological structures are constructed, map the chemical states of materials, or follow different types of processes in real time and in realistic experimental environments. The techniques allow for an extensive portfolio of analytical possibilities based on, for example, scattering, diffraction, crystallography, spectroscopy and various forms of imaging in 2D and 3D. Neutrons stand out by being able to distinguish light elements, such as hydrogen and lithium, which are of great relevance for, among other things, battery and energy storage applications. Since neutrons are susceptible to isotopes, deuterium can be used as a marker for the study of, for example, biological materials. You can also study issues related to magnetic properties and superconductivity. Because neutrons penetrate deep into the materials, the technology is also suitable for non-destructive analysis to find hidden defects and internal stresses, even inside large, compact materials or components. Photons have a shallower penetration depth and are therefore well suited for surface analyses and for

experiments using thinner samples. The strong light from a synchrotron facility allows measurements with high spatial and/or time resolution which may, for example, be used to follow rapid chemical and biological processes in real time. Considering certain variations between different synchrotron facilities, experiments can be conducted using a broad wavelength spectrum, for instance hard and soft X-ray radiation, ultraviolet light and infrared light.

Provided that an intended experimental environment is in place, both neutron and photon-based technologies can be used for experiments in relevant environments for different applications, for example at extreme temperatures and high pressures, in gases and liquids, or under mechanical load. The possibility of in-situ analyses under manufacturing and operating conditions (in operando) opens for ground-breaking development opportunities for many industrial applications.

The performance of MAX IV already offers opportunities to design experiments in completely new ways – and the same will apply to ESS. In addition to industry relevant experiments, even more user applications and societal challenges could benefit from the technologies. Compared to other European synchrotron facilities, the potential of MAX IV is particularly competitive for experiments that depend on high brilliance and coherence, which opens for new opportunities regarding for example imaging of unstructured materials within materials research and life sciences.

The research infrastructures in Lund are still under construction, and even after full completion, MAX IV and ESS will not be able to offer all types of experiments. International facilities will thus be needed as a complement also in the future. This call for proposals therefore also funds experiments at international large-scale research infrastructures for neutron and photon based techniques² outside Sweden.

This funding offer is the first of its kind for Vinnova. Therefore, we will develop it, based on experiences and outcomes from this call. During 2019, similar funding opportunities are planned, but these may then have been modified compared to the present call for proposals.

Projects that are granted funding from Vinnova are expected to contribute to gender equality by giving both women and men an equal opportunity to benefit from the grant, to have influence over the project and to participate actively in its implementation – but also that the results from the project contribute to increased gender equality.

² ESS is a spallation source, but experiments with other types of neutron sources are also permitted. MAX IV mainly uses synchrotron light, but also experiments at free electron laser (FEL) facilities are permitted.



3 To whom is this call directed?

This call for proposals is aimed at project consortia consisting of companies, research institutes, academia or other legal entities.

The project consortium shall consist of at least two project participants. Of these, at least one participant must be a Swedish registered company (or a company with an establishment or branch in Sweden) that experiences the problem that the project intends to solve. Additionally, at least one additional Swedish organisation shall be a participant in the proposal with a dedicated role to provide relevant expertise linked to the neutron or photon technology in question. This expertise can come from different kinds of organisations: from research organisations, from companies with relevant expertise, or from the research infrastructure where the experiments will be carried out.

In this call for proposals, non-Swedish organisations may only be actual participants in the project if they fund their own costs, and they cannot receive funding from Vinnova. Please note, that an international research infrastructure who is hired as a subcontractor is not to be counted as actual project participant.

4 What do we fund?

4.1 Activities which you can seek funding for

Vinnova wants to fund industrial needs-driven **pilot projects** that build expertise in how industrial research and development can benefit from advanced neutron- and photon technologies. Therefore, the concept on which the project is based must be motivated by the need of at least one Swedish registered company³, which is also a participant in the proposal. It also means that the project activities shall be carried out in active collaboration with at least one additional Swedish participant that contributes with relevant expertise. This shall include the necessary skills for the planning and implementation of the experiments, as well as handling the data collected and the interpretation of measured results. The expert is also expected to provide guidance on how the results can be developed after the project has been completed. This could, for example, be direct implementation - or assessment of the potential of conducting further work with the development of industrially relevant methods or experimental setups.

³ Or a company with an establishment or branch in Sweden.

A project goal should be to be able to determine the added value of this type of experiment for solving the company's problem. The pilot project can therefore consist of complementary activities to work that is already carried out within the company. It is thus possible to apply for a pilot project for the utilisation of neutron- and/or photon technologies linked to already ongoing activities, either conducted by the company itself or in conjunction with other parties⁴.

To justify the need for neutron or photon experiments, the proposal must clearly describe relevant preparatory work and, where applicable, any identified restrictions when using more established analytical techniques.

Each pilot project can apply for a maximum of 500,000 SEK in grants for a project time of 12 months maximum. The experiments are therefore expected to be based upon relatively well-established methods at the research infrastructure, where only minor methodological or technological adaptation is needed to use the chosen experimental station (also called beamline or instrument).

Examples of approved project activities include:

- Methodology and design of experiments, including minor but necessary adaptation of the relevant experimental environments/setup
- Sample production and sample preparation
- Implementation of experiments/measurements
- Analysis, treatment and interpretation of measured results/data, including comparisons with existing results from more established analytical techniques or modelling
- Dissemination of results
- Planning for how the results can be developed after the project

Please note that the complementary experiments with more established analytical equipment, or modelling, are only approved project activities if they can be justified as necessary for sample preparation, sample characterisation, interpretation of results or experimental design. Evaluation of complementary technologies should instead have been carried out already as part of the preparatory work that justifies the project proposal.

It is important that the funded projects can be showcased and inspire others. Therefore, an accessible summary with the purpose, choice of methodology, stakeholder interaction and overall project results should be made available for free dissemination in connection with the project's final reporting to Vinnova.

⁴ If the project activities are complementary to an existing innovation project, the corresponding activities cannot already have been granted other funding. An existing project plan can thus not be supplemented in order to reallocate already existing projects resources.

4.2 On the use of large-scale research infrastructures

An organisation that wishes to perform neutron- or photon experiments in a large-scale research infrastructure needs to be actively approved access by the infrastructure itself. The largest proportion of access (also called experimental time or beam time) is granted based on scientific excellence through a peer review process. Many large-scale research facilities also provide access for experiments that the stakeholders themselves pay for, so-called proprietary access (or non-peer reviewed access), and sometimes also in the form of direct collaborations on method development together with the facility⁵.

In this call for proposals, all the above types of availability (access models) are allowed.

All eligible costs arising at an international research infrastructure in connection with sample preparation, method adjustment, measurement and interpretation of results is admitted as “costs of consultants” (konsultkostnad) of any of the participants.

Access (experimental time) does **not** need to be formally approved or fixed in time when the proposal is submitted to Vinnova. However, the project consortium should be able to describe in the proposal how the experiment is intended to be carried out at a specific research infrastructure, and that the proposed experiment is technically feasible. Therefore, the project consortium needs to have an idea of the type of experimental station they wish to use. They should also state the estimated amount of experimental- and human resources that are expected to be needed from this research infrastructure, and that it is assessed to be feasible to carry out the experiment could within a reasonable period of time if Vinnova decides to fund the proposal.

For a research infrastructure to take on a task and approve access, they may first require that a technical feasibility study of a desired experiment has been performed⁶. They may also want to ensure that sample handling will be safe. For the purpose of completing the proposal, we therefore recommend an **early dialogue** with the user office of the identified facility. This dialogue must be conducted by the applicants themselves. The Appendix provides a number of suggestions on where more information can be obtained concerning the capacity and availability of various international facilities.

⁵ Please note that Vinnova's funding conditions that certain information be made available for free publication after the end of the project, regardless of whether the "access model" used allows confidentiality by the research infrastructure itself.

⁶ This works in different ways at different research infrastructures, but can in some cases be free of charge.



Date
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If a proposal for experimental time has already been approved by a research infrastructure, even before this call opened, such a confirmation constitute a strong verification of the feasibility of the project and can be attached to the proposal. Please note, however, that the project activities must not be already started or funded by government funding.

4.3 Eligible costs

Vinnova's funding is through grants and is subject to certain regulations. These regulations control, among other things, the types of costs of the project partners that may be covered by grants. Eligible costs are shown in the "Vinnova's general terms and conditions for grants"⁷ and are described in more detail in the "Vinnova Guide to Terms and conditions for eligible costs"⁸.

The types of project activities approved in this call shall be covered by **Industrial research** (Industriell forskning) in the rules on state aid for research, development and innovation. A description can be found in the "Vinnova Table of aid levels for state aid"⁹.

Please note that international research infrastructures may be used as subcontractors to the extent specified in the project description, and that the eligible costs shall be accounted for as consultancy costs for any of the project partners.

To meet the purpose of active and mutual knowledge transfer, we encourage representatives from several project participants to take part in the implementation of project activities, including experiments in the research infrastructure. Travel expenses shall be reasonable and appropriate.

5 What size grant do we fund?

A total of 15 million SEK is available for the call.

A maximum of 500,000 SEK can be applied for per project proposal.

⁷ Current terms and conditions can be found on our website, along with help to understand and meet the terms: <https://www.vinnova.se/en/apply-for-funding/rules-for-our-funding/terms-and-conditions-for-our-funding/>

⁸ See Sections 4.1 – 4.5 of the <https://www.vinnova.se/globalassets/dokument/guide-till-vinnovas-villkor-om-stodberattigande-kostnader-2017-04-21-master.pdf> (in Swedish only)

⁹ See s.8 in [vinnova.se/globalassets/huvudsajt/sok-finansiering/dokument/stodnivaer-statligt-stod.pdf](https://www.vinnova.se/globalassets/huvudsajt/sok-finansiering/dokument/stodnivaer-statligt-stod.pdf) (in Swedish only)

Grants to organisations carrying out economic activities (hereinafter "companies") are subject to state aid rules. Therefore, the amount that a company seeks in grants can only represent a certain proportion of its total eligible cost.

For this call, companies can apply for the following share in support from Vinnova, depending on the size of the company¹⁰:

Large: 50 percent
Medium: 60 percent
Small: 70 percent

This call also permits, by means of eligible certificate, aid to undertakings under the de minimis regulation (also known as 'negligible aid')¹¹.

Each project participant is responsible for ensuring that the grant received does not exceed the level of aid permitted under state aid rules.

6 Conditions for us to assess the proposal

Vinnova will only assess proposals that meet the following formal requirements:

- ✓ The project activities have not started before the proposal is submitted. (However, the dialogue with research infrastructures that we believe will be required to finalise the proposal is permitted)
- ✓ All project participants are legal entities.
- ✓ The participants seeking grants are either registered in Sweden or have a branch or establishment in Sweden.
- ✓ The project consortium consists of at least two participants, of which at least one is a company which is registered in Sweden or has an establishment or branch in Sweden¹², and at least one is a different Swedish organisation.
- ✓ The project manager (projektledare) is employed by a company that is a participant in the project.
(The coordinator of the project may be a different organisation from the one the project manager is employed at.)
- ✓ A maximum of 500,000 SEK is applied for.
- ✓ The project time is no longer than 12 months. (Note that the project start date shall be 15-10-2018 or 26-11-2018, see schedule on p.3)
- ✓ The proposal follows the instructions in section 9 and contains all the required appendices requested there.

¹⁰ For the current definition of small and medium sized companies see:

<http://ec.europa.eu/DocsRoom/documents/15582/attachments/1/translations>

¹¹ For more information on de minimis aid, as well as the download of the mandatory certificate, see: <https://www.vinnova.se/sok-finansiering/regler-for-finansiering/statligt-stod/>

¹² Incorporated research institutes are not considered as companies in this context.

7 Assessment of proposals received

7.1 What do we assess?

It is only the written content of the submitted proposal that will be assessed. What is assessed is the degree to which project proposals meet the three main criteria of Potential, Feasibility and Participants.

The points below indicate what contributes positively to the assessment. In the event of a competitive situation, account is taken of the breadth of the project portfolio in terms of scope and need-owning companies.

Potential

- It is clear how the project activities are in line with the purpose of the call for proposals and meet the needs of at least one Swedish company that is a project participant.
- The project consortium's background work in this area is described and it is clear what the added value of neutron- or photon experiments in a large-scale research infrastructure is expected to bring beyond what can be achieved with more established analytical techniques.
- It is clear that the project is implemented in active collaboration, with mutual knowledge transfer, between need-owning companies and parties that provide technical expertise linked to neutron- and photon experiments.
- The project results have the potential to contribute to economic, environmental and socially sustainable societal development.

Feasibility

- The project consortium describes in a credible way that the desired experiments are technically feasible at a research infrastructure that is also considered to be willing to take on the commission.
- The project activities and schedules are reasonable with respect to what is to be done and the available resources, and risks are managed in an appropriate and credible manner.

Participants

- The project consortium is appropriately composed with regard to project goals and implementation, e.g. skills and time commitment of project management and key personnel.
- The project proposal clarifies collaboration as well as knowledge- and technology transfer within the project consortium.
- The gender distribution in the implementation is well balanced, including commitment and influence. A possible imbalance is explained in a credible and specific way for the project proposal.

7.2 How do we assess the proposals?

The proposals that meet the formal requirements will be assessed according to the assessment criteria by a group of specially chosen experts appointed by Vinnova. This results in a recommendation for funding to Vinnova. Experts at Vinnova also participate in the assessment process.

Vinnova decides which projects are to be financed taking into account the assessors recommendation as well as using a portfolio perspective. Proposals that do not meet formal requirements will be rejected without further justification.

8 Decisions and conditions

8.1 About our decisions

The granted amount to each participant in the project is stated in the grant decision. Vinnova's grants is awarded with support from the rules on state aid for research, development and innovation, stated in SFS 2015:208, or with support from the de minimis regulation, EU no 1407/201 (also known as negligible aid). The aid foundation is set out in the grant decision and also governs the eligibility of costs.

Vinnova's decision to grant or refuse a proposal cannot be appealed.

8.2 Terms and conditions for awarded grants

Vinnova's general conditions for grants apply to the awarded grants¹³. These conditions include rules on project agreements, prerequisites for payment, follow-up, reporting and utilisation of results.

The following special conditions apply to the grants awarded in this call:

1. The following conditions replace § 1.4 of the general conditions: The project partners shall enter into a Project Agreement. The Project Agreement shall include the Participants' mutual commitments, conditions concerning rights to foreground and background information (see § 7.2) and other issues of significance to the cooperation. The content of the Project Agreement shall be consistent with Vinnova's terms and conditions. The project agreement must be prepared before the final report is submitted to Vinnova.

¹³ Current terms and conditions can be found on our website, along with help to understand and meet the terms: <https://www.vinnova.se/sok-finansiering/regler-for-finansiering/allmanna-villkor/>



Date
07-05-2018
Revised by
25-05-2018

Journal number
2018-02076

2. In connection with the final report to Vinnova, an easily accessible summary of the purpose, choice of method and experimental environment, participant collaboration and overall outcome will also be made available for free publication and dissemination. A template in PowerPoint format is distributed by Vinnova.

Additional special conditions may be decided for individual projects.

If you do not comply with Vinnova's terms, you may be liable to repay the grant. This is also true if you have been granted an incorrect or excessive amount of funds.

9 How to apply

To apply for a grant, you fill in a special Web-based form in Vinnova's eServices portal (Intresseportalen). You will also upload the following mandatory attachments, according to the templates that are downloaded from the Web page of the call for proposals¹⁴. The proposal must be written with twelve (12) point black text.

Please note that the proposal will be assessed by both Swedish and international evaluators. Therefore, our strong recommendation is that the proposal **is written in English**. If the proposal is written in Swedish it will be translated without your co-operation.

Obligatory appendices:

- **Project description**
The description may consist of maximum five (5) A4 pages.
- **CV - Appendix**
Shall include relevant information for project managers and all key personnel in the consortium, including participants in consultant roles.
- **Letter of Intent**
Shall be attached from at least one company amongst the project partners and shall be able to justify an interest and need in accordance with the purpose of the call. It shall be signed by a person qualified to sign contracts for research- and innovation projects on behalf of the organisations concerned. Signed declarations of intent are scanned and uploaded.

¹⁴You can find the templates for the attachments on <https://www.vinnova.se/e/forskningsinfrastruktur-/industriella-pilotprojekt-for-neutron-och-fotonexperiment/>



CALL FOR PROPOSALS

15 (16)

Date

07-05-2018

Journal number

2018-02076

Revised by

25-05-2018

In the cases where an organisation seeks support according to the de minimis regulation, the mandatory certificate for this shall be attached as an additional appendix ('övrig bilaga').

In the case experimental time has already been approved at a specific research infrastructure, such a confirmation or corresponding supporting document may be attached to the proposal as a further appendix.

When the proposal period has expired, any complementary of the proposal can only be made at the request of Vinnova.

10 Who can read the proposal?

The proposal can be read by Vinnova's staff and by Vinnova's external evaluators appointed for the call. They all work under the obligation of professional secrecy.

Proposals submitted to Vinnova become public documents, but Vinnova does not disclose information about the individual's business or operational conditions, inventions and research results if it can be assumed that any individual suffers damage if the information is divulged.



Date
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2018-02076

Appendix. A short guide to research infrastructures

A comprehensive portfolio of advanced experiments with neutrons and photons is permitted at international large-scale research infrastructures. Detailed information on the capacity and availability of individual international facilities is provided through their respective websites. Most also have user offices that offer special support for industry (industrial user office ed.) and can answer if one of their experimental stations (beamlines) is suitable for what is desired.

The Swedish synchrotron facility MAX IV is in operation since 2017 and is currently conducting experiments at three different experimental stations (beamlines). These are particularly dedicated to applications concerning structural biology (BioMAX), spectroscopy (HIPPIE), and nanotechnology (NanoMAX). For more information, see <https://www.maxiv.lu.se/industry/>

Through the Swedish Research Council (Vetenskapsrådet), Sweden also finances the experimental station "SMS P21.2 Diffraction & Imaging" at the synchrotron Petra III in Hamburg (administered by Linköping University and KTH). Petra III complements MAX IV particularly well at higher energy levels. Sweden also co-finances experimental stations at two European neutron facilities; the reflectometer "Super ADAM" at ILL in Grenoble (administered by Uppsala University) and the powder diffractometers Polaris and HRPD at ISIS in Oxford (administered by Chalmers University of Technology).

There are a number of collaborative initiatives between European research infrastructures, whose websites convey both basic knowledge and links to useful individual sites. See for example the collaborative platform "The European Analytical Research Infrastructures Village" (www.eariv.eu)

Regarding neutron sources, the website for EU projects SINE2020 gives additional information on the possibilities, performance and availability for industry of several European facilities, see <https://sine2020.eu/>

Regarding photon sources, additional information is provided on both European synchrotron facilities and free electron laser (FEL) facilities via the websites of the EU Project CALIPSOplus (<http://www.calipsoplus.eu>), as well as the collaboration platform LEAPS (<https://www.leaps-initiative.eu/consortium/>). The initiative Lightsources.org also collects several overseas facilities (<https://lightsources.org/lightsources-of-the-world/>).

Please note that the above links are only examples and guidance, and that the offer of the call is not limited to the research infrastructures involved in these collaboration initiatives. Several overseas research infrastructures also offer relevant and unique opportunities for industrial proposals, for example in Japan, USA, Canada, Australia and Brazil.