

Industrial pilot projects for the utilisation of neutron and photon- based techniques at large-scale research infrastructures – 2020

A call for proposals within Vinnovas program “Research infrastructure - utilisation and collaboration” for collaboration around skills development and industrial utilisation of large-scale research infrastructures as MAX IV and ESS.

Contents

1	Summary	3
2	What we want to accomplish?	5
3	To whom is this call for proposals directed?	6
4	What do we fund?	7
4.1	Activities which you can seek funding for	7
4.2	Eligible costs	10
5	What size grant do we fund?	11
6	Conditions for us to assess the proposal	12
7	Assessment of proposals received	12
7.1	What do we assess?	12
7.2	How do we assess the proposals?	13
8	Decisions and conditions	14
8.1	About our decisions	14
8.2	Terms and conditions for awarded grants	14
9	How to apply	14
10	Who can read the proposal?	15
	Appendix. Guide to large-scale research infrastructures	16

If there are any uncertainties, please refer to the Swedish text.

Revision history

Date	Change

1 Summary

Through the funding offer, Vinnova wants to contribute to capacity building and increased understanding of how large-scale research infrastructures for neutron and photon-based techniques can respond to industrial and societal needs. This can be the development or improvement of new materials, drugs or industrial processes, as well as the need to investigate why a construction has failed.

The project proposal shall be based on the development needs of at least one Swedish company which is also a project participant. The work in the project shall aim to verify whether neutron or photon-based technologies are suitable options to meet the challenge or development need of the company. It should also create an additional value compared to what can be achieved using analytical techniques accessible at ordinary laboratory environments.

This requires expert competence within neutron or photon-based technologies. The project consortium shall therefore also include at least one additional Swedish participant organization that ensures expertise regarding the technique of choice.

The call for proposals allows experiments at MAX IV as well as at international large-scale research infrastructures for neutron and photon-based techniques. All types of access for experimental/beam time are allowed and beam time is an eligible cost.

Up to SEK 10 million is available for projects addressing two different sub-offers:

A) Preparatory project

Each project proposal can apply for a maximum grant of SEK 200.000.

The maximum project period length is five (5) months.

The proposal shall be based on a hypothesis regarding how photon or neutron-based technologies can meet the needs of the company. The focus can be a broader mapping of analysis opportunities to meet an identified challenge for the company. It can also be a planning study that addresses feasibility issues for preparing a specific experiment.

B) Pilot experiment

Each project proposal can apply for a maximum grant of SEK 500.000.

The maximum project period length is 18 months.

The intended project should include an experiment at an already identified experimental station for neutron- or photon-based techniques, as well as adequate results analysis and planning for how the results can be utilized after the project.

Please note that the project activities should aim to adopt new technologies for at least one actively participating company. The offer is therefore not intended for

Date

25-03-2020

Revised by

Journal number

2020-00869

further or modified experiments to investigate materials /properties with similar techniques for which the company has received previous funding from Vinnova.

Important dates:

- Proposals should be submitted to Vinnova by **10 September 2020 at 14:00**
- Decision date: 12 November 2020
- Project start date: 16 November 2020

Contact Details:

Questions on the contents:

Maria Öhman, Call responsible project manager
maria.ohman@vinnova.se

Administrative questions:

Marie Wikström
08-473 3179
marie.wikstrom@vinnova.se

Contact regarding the eService's portal (Intressentportalen)

Vinnova's IT-support
08-473 32 99
helpdesk@vinnova.se

Link to call for proposals website:

<https://www.vinnova.se/en/calls-for-proposals/research-infrastructure-utilisation-and-collaboration/industrial-pilot-projects-for-2020-00869/>

2 What we want to accomplish?

World-leading research and development increasingly requires access to advanced large-scale research infrastructures. The MAX IV laboratory in Lund is one of the world's brightest source for synchrotron radiation and the European Spallation Source (ESS) will become the world's strongest neutron source. In addition to contributing to excellent basic research, these infrastructures also enable cutting-edge applied research and innovative development work.

Vinnova wants to strengthen the Swedish innovation system by contributing to capacity building and increased understanding of how the use of these unique experimental environments can respond to industrial and societal needs. This can be anything from the development or improvement of new materials, drugs or industrial processes to the need to investigate why a construction has failed.

Neutrons and photons interact in different ways with a material. Therefore, both comparable and complementary analyses are made possible. In all, the techniques allow for an extensive portfolio of analytical possibilities based on e.g. diffraction, spectroscopy and various forms of imaging in 2D and 3D. For example, it is possible to study how different materials and biological structures are constructed and to map the chemical states of materials. Provided that an intended experimental environment is in place, the techniques 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.

Even after completion, MAX IV and ESS will not be able to offer all types of experiments. International facilities will thus be important complements also in the future. This call for proposals therefore also funds experiments at large-scale research infrastructures for neutron and photon-based techniques¹ outside Sweden. The Appendix of this document provides a few suggestions on where more information can be obtained concerning the capacity and availability of MAX IV and various international facilities.

Vinnova is tasked with promoting sustainable growth by increasing the innovation capacity. Through our efforts, we strengthen the capacity to achieve the goals for sustainable development in Agenda 2030² and contribute to the global commitment. Since gender equality is a prerequisite for sustainable growth, this must permeate the work with all sustainability goals³.

¹ ESS is a spallation source, but experiments with other types of neutron sources are also permitted. MAX IV mainly uses synchrotron light, but experiments are also allowed at facilities for photon-based free electron laser, XFEL.

² Read more (in Swedish only): <https://www.vinnova.se/m/agenda-2030/>

³ Read more about what our work for equality innovation means for you who apply for grants from us (in Swedish only): <https://www.vinnova.se/m/jamstalld-innovation/>

3 To whom is this call for proposals directed?

This call for proposals is aimed at companies in collaboration with other companies, academia, research institutes, or other legal entities.

The project consortium shall consist of at least two project participants.

At least one project participant must be a Swedish-registered company (or the Swedish establishment or branch of a company) who owns the problem or development need that the project addresses.

At least one additional Swedish project participant should ensure expertise regarding the neutron or photon-based technology addressed and its relevance for the application.

In this call for proposals, only Swedish organizations can receive funding from Vinnova. Swedish organizations also mean foreign organizations that have a branch or establishment in Sweden. However, the costs in the project must be attributable to the activities of that branch or establishment.

A non-Swedish organization can be a project partner if it finances its own costs in the project.

4 What do we fund?

4.1 Activities which you can seek funding for

The following applies to all project proposals:

- The concept on which the project proposal is based must be motivated by the development need of the company/companies⁴.
- One project goal shall be to show added values with neutron and/or photon-based techniques for the company that cannot be achieved by analysis techniques available in ordinary laboratory environments.
- The project activities shall be carried out by needs owning company with support from at least one additional Swedish project participant that ensures necessary skills with respect to the neutron or photon-based technology/ies addressed.
- Experiments with analytical techniques available in ordinary laboratory environments or modelling are already expected to be completed, and are only approved as project activities if sample characterisation can be motivated as necessary for interpretation of results or experimental design for the planned experiment.
- It is important that the pilot projects granted funding can be displayed and inspire others. In connection with final reporting to Vinnova, a description of the purpose, participating actors and overall project results must therefore be enclosed for free publication and dissemination (see section 8.2.).

The project can consist of complementary activities to work that is already carried out within the company or by the company in collaboration with other⁵. Project consortia who intend to carry out project activities in direct collaboration with

⁴ Please note that solely enhancing the skills within a company does not constitute an enough need in this context. Participation to mainly coordinate and administer project management is also not allowed.

⁵ If the project activities are complementary to an existing innovation project, the corresponding activities cannot already have been granted other funding. An existing project can thus not be supplemented in order to reallocate already existing projects resources.

staff at an organization that is not a project participant is expected to enclose a letter of support from the organization that confirms that allocation of resources⁶.

In addition to the above, the following applies to the respective sub-offer A and B:

A) Preparatory project

- Each project proposal can apply for a maximum grant of SEK 200.000 for a project period of maximum five (5) months.
- The proposal should describe limitations of more established techniques, as well as a hypothesis regarding how one or more photon or neutron-based technology is expected to be able to meet the challenge.
- The focus can be a broader mapping of opportunities for different application areas within the company, or a narrower planning study that also can address feasibility issues related to a specific experiment.
- The project partner who participates as the expert shall be able to guide the company regarding relevant photos or neutron-based techniques.
- The following types of project activities constitute eligible costs:
 - o Identification and mapping of available techniques and methods, as well as relevant experimental stations at specific large-scale research infrastructures.
 - o Method selection, planning of experiments, and dialogue with for instance staff at individual experimental stations.
 - o Development activities linked to ensuring the relevant experimental environment or improved software for handling or visualizing the expected data.
 - o A technical feasibility study on site at a specific experimental station may be included provided that its availability can be confirmed by a responsible person at the facility.

A well-executed project is expected to constitute a basis for a later proposal for a Pilot experiment.

⁶ For instance, the collaboration with a research infrastructure or synergies with already ongoing projects funded in other ways.

B) Pilot experiment

- Each project proposal can apply for a maximum grant of SEK 500.000 for a project period of maximum 18 months.
- The intended project shall include an experiment at a large-scale research infrastructure for neutron- or photon-based techniques, which is carried out by the project partners. It shall also include enough data analysis to enable conclusions about the added value of the experiment.
- The expert support regarding the photon- or neutron-based technology addressed shall ensure competence for planning and conducting the experiment, as well as handling data analysis and result interpretation together with the company.
- To justify the need for the experiment, the proposal must clearly describe relevant preliminary work as well as already identified limitations with analysis techniques available in a regular laboratory environment. It should also be clear which experimental station is intended in the first place.
- In order to meet the purpose of the call for proposals, it is expected that representatives from need-owning company/ies intend to participate in the implementation of the experiments at the research infrastructure.
- Also, the following types of project activities constitutes eligible costs:
 - o Planning and design of experiments, including adaptation of relevant experimental environment.
 - o Sample preparation/manufacturing and necessary sample characterization directly linked to the neutron / synchrotron experiment to be performed.
 - o Comparisons with already existing results from more established analytical techniques or modelling.

Please note that the project activities should aim to adopt new technologies for at least one actively participating company. Thus, after a granted Pilot experiment no additional funding can be sought to further investigate materials/properties through additional or modified experiments using corresponding techniques.

In order to perform neutron or photon experiments at a large-scale research infrastructure, access needs to be **approved by the infrastructure itself**. This is called experimental time (or beam time) and is primarily granted in open calls for

proposals based on scientific excellence (a peer review process). The research infrastructures call for proposals for experimental time are often carried out about every six months and a granted experiment can be scheduled several months later. These experiments are performed free of charge, but results need to be published. Many large-scale research facilities also provide experimental time that is paid by the users themselves, so-called proprietary access (or non-peer reviewed access). This does not require publication of results and the scheduling is often done faster. **This call for proposals from Vinnova** allows all types of experimental time, at MAX IV as well as at any international large-scale research infrastructure for neutron- or photon-based techniques⁷.

Experimental time does not need to be formally approved or fixed in time by a research infrastructure when the proposal is submitted to Vinnova. However, the project consortium shall be able to motivate in the proposal how the experiment is expected to be technically feasible and possible to implement in time.

Project consortia **that intend to seek access through open calls** of a research infrastructure is therefore expected to describe what measures can be taken to enable implementation of the project if no free access is granted at the experimental station intended.

Also note that different rules may apply to **paid experiment time** at different facilities⁸. Proposers who intend to use paid beam time are therefore expected to refer to a completed dialogue with a named research infrastructure that confirms that the planned arrangement is feasible if the proposal is granted funding from Vinnova, and that the experimental station of choice is possible to schedule during the project period.

4.2 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. The types of project activities approved in this call shall be covered by **Industrial research** (sub-calls A and B) or **Feasibility study** (sub-call A only).

⁷ 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.

⁸ This can apply to upcoming increase of costs, or if an experimental station allows for paid beamtime at all, or if the facility has certain requirements regarding which type of organization that is invoiced. There may also be different regulations regarding IPR issues that should be clarified before the facility is considered a possible resource in the proposal.

Eligible costs are shown in the “Vinnova's general terms and conditions for grants”⁹ and are described in more detail in the “Vinnova Guide to Terms and conditions for eligible costs”¹⁰.

Costs for subcontractors/consultants may only be used to the extent specified in the project description. For instance, eligible costs that occur at an international research infrastructure can be accounted for as consultancy costs for a project participant.

Travel expenses shall be reasonable and appropriate.

No project activities may be started before the project start date.

5 What size grant do we fund?

There is no overall requirement for own funding for the project.

However, if an organisation/project participant that carries out economic activities (hereinafter "companies") intend to **seek grant** from Vinnova, the state aid rules limits this to a certain proportion of the company's total eligible cost in the project.

For this call for proposals, companies of different size can apply for the following share in support from Vinnova¹¹:

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

The remaining costs must be financed by the company itself.

By means of eligible certificate, this call for proposals also permits funding in agreement with the De Minimis regulation (also known as ‘negligible aid’)¹².

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

⁹ 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/>

¹⁰ See <https://www.vinnova.se/globalassets/dokument/guide-till-vinnovas-villkor-om-stodberattigande-kostnader-2017-04-21-master.pdf> (in Swedish only).

¹¹ For the current definition of small and medium sized companies see: <http://ec.europa.eu/DocsRoom/documents/15582/attachments/1/translations>

¹² For more information on De Minimis aid, as well as the download of the mandatory certificate, see: <https://www.vinnova.se/en/apply-for-funding/rules-for-our-funding/state-aid-to-companies/>

6 Conditions for us to assess the proposal

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

- ✓ All project participants are legal entities.
- ✓ All project participants that seek grants from Vinnova are Swedish¹³ organizations.
- ✓ The project consortium consists of at least two project participants, of which at least one is a Swedish company¹⁴ and at least one different Swedish organization intended as expertise in the photon/neutron-based technology addressed.
- ✓ The proposal follows the instructions in section 9 and contains all the mandatory attachments requested there.
- ✓ Needs owning company/ies confirm, in the intended box of the project description, whether funding has been granted in a corresponding previous call for proposals from Vinnova¹⁵. If so, this is also described in the project description.

7 Assessment of proposals received

7.1 What do we assess?

Only the written content of the submitted proposal will be assessed (no links or other references). What is assessed is to which degree the project proposals meet each of the three main criteria of Potential, Feasibility and Participants. The bulleted list below indicates what contributes positively to the assessment.

Potential

- It is clear how the project activities are in line with the purpose of the call for proposals and the sub-offer addressed, according to chapter 4.1.
- Background work of relevance is described, and it is clear which added value that is expected from the neutron or photon-based experiment at a large-scale research infrastructure beyond what can be achieved with techniques that are available at ordinary laboratories.
- The project proposal clarifies collaboration and knowledge transfer within the project consortium and the project results have potential to contribute to financial, environmental and socially sustainable societal development.

¹³ Swedish organizations also mean foreign organizations that have a branch or an office in Sweden.

However, the costs in the project must be attributable to the activities of the branch or the establishment.

¹⁴ In this context, the term "company" does not apply to incorporated research institutes, or companies that do not themselves own the development needs that the project intends to meet.

¹⁵ For questions regarding this, please contact Vinnova's responsible program manager.

Feasibility

- The project activities and time schedule are reasonable with respect to the available resources. Relevant risks associated with the project implementation are managed in an appropriate and credible manner.
- For sub-offer B:
The project consortium motivates in a credible way that the desired experiments are technically feasible and possible to implement in time at a relevant experimental station.

Participants

- It is clearly stated that an actively participating company does not already have its own experience of the technique addressed.
- The project consortium is appropriately composed with respect to project goals and implementation. A possible imbalance in gender distribution, including commitment and influence, is explained in a credible and specific way.
- For sub-offer B:
The need-owning company participates actively in the work packages that address the use of large-scale research infrastructure.
-

7.2 How do we assess the proposals?

The proposals that meet the formal requirements (see section 6) will be assessed according to the assessment criteria by specially chosen external assessors appointed by Vinnova. This results in a recommendation for funding to Vinnova.

Proposals that do not meet the formal requirements will be rejected without further justification.

Vinnova's decision on funding will be based on the external assessors' recommendation, and Vinnova will also apply a portfolio perspective. This means that within the available budget, Vinnova will prioritise recommended proposals that address application areas where we so far have funded fewer projects¹⁶, or that address techniques that have been used to a lesser extent. We also intend to prioritise project proposals from need-owning companies that have not already received funding through the program.

¹⁶ A list of already funded pilot experiments in various fields of application can be found here: <https://www.vinnova.se/en/m/large-scale-research-infrastructures/industrial-utilisation-MAX-IV-and-ESS/>

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 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 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 grants¹⁷. 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. In connection with final reporting to Vinnova, an easily accessible one-page description of the purpose, participating actors and overall description of sample/materials selection, experimental station/methods and project results must be enclosed for open publication and dissemination. A representative from the company must also be mentioned as a contact person. A template for this 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 funding, you fill in the web-based form in Vinnova's eService's portal (Intressentportal). You also have to upload the following mandatory attachments, **according to templates** downloaded from the web page of the call for proposals¹⁸.

The documents must be written with twelve (12) point normal black text.

¹⁷ 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/>

¹⁸ Here you find templates for the mandatory attachments: <https://www.vinnova.se/en/calls-for-proposals/research-infrastructure-utilisation-and-collaboration/industrial-pilot-projects-for-2020-00869/>

Please note that the proposal will be assessed by both Swedish and non-Swedish speaking evaluators. **Our strong recommendation is therefore that the proposal is written in English.** If the proposal is written in Swedish it will be translated without your co-operation.

Mandatory attachments:

- **Project description:** May consist of maximum:
For sub-call A: Three (3) A4 pages.
For sub-call B: Five (5) A4 pages.
- **CV – Appendix:** Shall include relevant information regarding key persons from all project participants and, when relevant, also include resources in consultant roles.
- **Letter of Intent:** Shall be attached from at least one company amongst the project participants and shall motivate the development need in accordance with the purpose of the funding offer. It shall be signed by a person qualified to sign contracts for research- and innovation projects on behalf of the organisations concerned.

If resources that are not to report costs to Vinnova intend to participate in the project, then this resource allocation is expected to be substantiated by that organisation as **Övrig bilaga** (eng. Additional Appendix).

If an organisation intends to seek support according to the “de Minimis regulation”, the mandatory certificate for this shall be attached as **Övrig bilaga** (eng. Additional Appendix).

No additional material may be attached to the proposal as “Övrig bilaga”.

Proposals must be submitted to Vinnova through the eService’s portal (Intressentportalen) at latest 10 September 2020 at 14:00.

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?

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.

Appendix. Guide to large-scale research infrastructures

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.

Detailed information on the capacity and availability of individual facilities can be provided through their respective websites. There are also a few collaborative initiatives between European research infrastructures, whose websites convey both basic knowledge and links to useful individual sites. Regarding synchrotrons and XFELs, information is provided for instance on the European platform WayForLight (<http://www.wayforlight.eu/en/>) and the initiative Lightsources.org also collects several overseas facilities (<https://lightsources.org/lightsources-of-the-world/>). Regarding neutron sources, the corresponding information is presented at Neutronsources.org (<https://neutronsources.org/neutron-centres/>).

In all, a comprehensive portfolio of advanced experiments is permitted at MAX IV and the international large-scale research infrastructures for photon and neutron-based technologies. Detailed information on the capacity and availability of individual facilities can be provided through their respective websites. Most also have user offices that offer special support for industry and can answer if any of their experimental stations and instruments is suitable for what is desired.

Today, Swedish MAX IV offers experimental possibilities at several beamlines: BioMAX (macromolecular crystallography), HIPPIE (ambient pressure x-ray photoemission spectroscopy), NanoMAX (hard x-ray nano-diffraction and imaging), FinEstBeAMS (photoemission in gas-phase and photoluminescence spectroscopy), Balder (hard x-ray absorption), Bloch (angle-resolved photoemission spectroscopy), MAXPEEM (photoelectron microscopy) and Veritas (open port branch). The potential of MAX IV is particularly large for

Date

25-03-2020

Journal number

2020-00869

Revised by

experiments that depend on high brilliance and coherence during analysis. This opens for new opportunities regarding e.g. imaging of unstructured materials within materials research and life sciences. For more information regarding the capacity and performance of MAX IV, see <https://www.maxiv.lu.se/users/>

Through the Swedish Research Council, Sweden also finances the experimental station "Swedish materials science beamline (SMS P21.2 Diffraction & Imaging) at the German synchrotron Petra III¹⁹ at DESY in Hamburg. SMS P21 operates at photon energies that complements what is possible to perform at MAX IV and is dedicated to diffraction and imaging (P21.2) as well as wide-angle diffraction (P21.2). SMS P21 is administered by KTH, Linköping University and DESY through the centrum CeXS²⁰. The agreement with DESY also include some priority access for Swedish users at all beamlines at Petra III that are administrated by DESY themselves.

The Swedish Research Council also finances Swedish membership in the European synchrotron ESRF²¹ in France, which will open for users again in the autumn of 2020. The Swedish Research Council also finances Swedish membership in the ILL neutron source²² in Grenoble, France. At ILL they also co-finances the reflectometer "Super ADAM", which is administered by Uppsala University²³. The Swedish Research Council also contributes to operating costs of the neutron source ISIS²⁴ in England.

¹⁹ Petra III at Deutsches Elektronen-Synchrotron (DESY) Hamburg, Tyskland

²⁰ Read more at <https://www.cexs.kth.se/sv>

²¹ European Synchrotron Radiation Facility (ESRF), Grenoble, Frankrike.

²² Institut Laue-Langevin (ILL), Grenoble, Frankrike

²³ Se <https://www.physics.uu.se/research/materials-physics+/super-adam/>

²⁴ ISIS Neutron and Muon Source (ISIS) Oxford, England.