UPPSALA UNIVERSITET

Quality and Renewal (KoF24)
Faculty of Science and Technology
Research Program Self-Evaluation

Research Program:	Applied Nuclear Physics
Department:	Department of Physics and Astronomy
Section:	Physics
Program Responsible Professor:	Stephan Pomp

Goals:

- Maintain and strengthen our **research quality**
  - Through program and department self-reflection on strengths and weaknesses
  - Through developing program and department priorities for the next 5 years
  - Through internal and external feedback on our performance and plans
- Strengthen our **collegial culture**
  - By involving all research staff in the process and ensuring everyone is aware of the results
  - By being respectful of everyone's time at the faculty, department, and program levels
  - By communicating clearly as to why we are doing this and how we expect everyone to contribute
- Improve our **internal understanding**
  - By collecting information on the different ways programs and departments are funded and operate
  - By collecting explanations of why we work that way and how it supports our research
- Improve our **resource usage**
  - By generating bottom-up prioritized research plans at the program, department, section, and faculty-levels
  - By allocating and re-allocating resources based our priorities and the potential to significantly improve research
  - By identifying opportunities for intra- and inter-program/department/section collaboration and re-organization

1 General Information

1.1 Process for creating this self-evaluation

Motivation: To emphasize that this is to be a collegial process and that all members of the program should be included.

All research groups at the program provided input. The content was discussed during meetings.
Main contributors: Program professor, division head, group leaders, coordinator for education.
Categories: Prof, ULs, researchers.

1.2 Core of the research program

Motivation: To understand the essence of the program so that its plans and activities can be better understood in that context.

The program works in the field of nuclear science and aims at bridging the gap between fundamental research and applications in nuclear technology. Our research ranges from, e.g., studies of nuclear fission and methods of nuclear data evaluation, to research in fusion, nuclear safeguards and disarmament.

1.3 Personnel (data provided centrally)

Motivation: To understand the program's personnel distribution by career stage and gender. This data shows the number of FTEs (full-time equivalent) employees in each category.

	Faculty FTEs				**Non-Faculty FTEs**					
	Professor	**Associate (UL)**	**Assistant (BUL)**	**Total**	**PhD**	**Postdoc**	**Researcher**	**Other Research**	**Other**	**Total**
Female		2.0		2.0	3.3	0.6	0.3			4.1
Male	2.8	3.2	0.2	6.2	9.7	0.7	12.3	1.0		23.6

1.4 Finances

1.4.1 Overall research funding in MSEK (data provided centrally)

Motivation: To understand how a program is funded across the main sources of income. This data shows the long-term internal funding (FFF+SFO) vs. external (grant) research funding.

	FFF+SFO Internal Research	**Other Internal Research**	**Total Internal Research**	**External Research**	**Total Research**	**External Research %**
2023	5.4	3.0	8.4	23.1	31.5	73%
2022	5.3	2.5	7.8	22.6	30.4	74%
Average	5.3	2.8	8.1	22.9	31.0	74%

1.4.2 Other internal research funding

The program is partner within the Alva Myrdal Centre for Nuclear Disarmament (AMC) at Uppsala University. The funding comes from the Swedish government via the Department of Peace and Conflict Research and is used for studies of technical aspects of nuclear disarmament.

1.4.3 Basic funding expectations and policy for using internal resources

Motivation: To understand how programs use their internal resources to support members and activities.

The program is organized around three research groups plus AMC (with its own direct funding).
FFF and studiestöd are distributed to the groups by size of the groups.
Each group is headed by a leader and the group decides on research priorities and takes responsibility to share available funding according to needs.
PAP, FUAP and division head get part of their salary from FFF.

1.4.4 Use of internal research funds in MSEK (data provided centrally)

Motivation: To understand how the program is using internal research funding.

	Faculty Salary	**Non-Faculty Salary**	**Other Personnel Costs**	**Premises**	**Equipment Depreciation**	**Overhead**	**Running Costs**	**Total**
2023	1.4 (15%)	3.6 (38%)	0.2 (2%)	1 (10%)	0.1 (1%)	1.8 (19%)	1.4 (15%)	9.4
2022	2 (18%)	4.1 (37%)	0.1 (1%)	1.4 (12%)	0.1 (1%)	2 (18%)	1.4 (13%)	11.1
Average	1.7 (17%)	3.9 (38%)	0.2 (2%)	1.2 (11%)	0.1 (1%)	1.9 (18%)	1.4 (14%)	10.3

1.4.5 Personnel funding (data provided centrally)

Motivation: To understand how funding is used across different employment categories and genders. This data shows how staff are funded on average across internal and external research funding as well as teaching.

	Female			Male		
	Internal	**External**	**Teaching**	**Internal**	**External**	**Teaching**
Professor				44%	15%	40%
Associate (UL)	36%	28%	35%	11%	22%	67%
Assistant (BUL)				100%	0%	0%
PhD	35%	52%	14%	19%	46%	34%
Postdoc	95%	5%	0%	44%	53%	3%
Researcher	20%	80%	0%	10%	55%	35%

1.4.6 Major infrastructure usage

Motivation: To understand what important infrastructure is being used and how much it costs and to support the faculty's ongoing work on developing an infrastructure policy

Infrastructure	**Sharing**	**Location**	**Approximate Yearly Cost (MSEK)**
Joint European Torus (JET, UK)	International	UK	UKAEA
Mega Ampere Spherical Tokamak (MAST, UK)	International	UK	UKAEA
JYFL Accelerator Laboratory, University of Jyväskylä (Finland)	International	Finland	Uni Jyväskylä
GANIL (France)	International	France	CEA/CNRS
Central storage for spent nuclear fuel (CLAB, Sweden)	National	Sweden	SKB

1.5 Other important comments

Motivation: To bring important and special issues to the view of the panel and department.

The program consisted until 2023 of the research groups mentioned here, plus ion physics. We are restructuring and ion physics has recently moved to the material physics program. The base data such as personnel and funding are from the previous period and include ion physics.

2 Follow up on goals set in the last evaluation

2.1 Reflections on accomplishments and setting goals this time

Motivation: Try to learn from what we did last time to be able to set more effective goals this time.

Successful developments include e.g. fission studies at IGISOL, n_TOF, and JRC-Geel, fusion at JET and a contract for design of an ITER spectrometer, and employing machine learning techniques in nuclear data evaluation and safeguards. Facility development (NESSA) proved to be harder (goal not yet achieved). The goal of making our research visible in the surrounding society has been met through the successful new developments leading up to the establishment of two new national competence centers - AMC where TK is a co-founder, and the nuclear competence center ANItA where TK is responsible for the leadership and management. The program is also currently restructuring via the move of ion physics to material physics.

3 Area 1: Research Quality (evaluation of outcomes and processes)

3.1 Main research areas

Motivation: To understand the program's research heterogeneity and how the program sees its own research profile and to help in assigning panel members.

Main Research Areas		% of program	FTE Faculty	Type
1	Nuclear reactions studies and nuclear data evaluation methodology	30	2	Mixed
2	Fusion neutron diagnostics	25	1.5	Mixed
3	Nuclear fuel cycle, safeguards and non-proliferation	30	2	Applied
4	Technical aspects of nuclear disarmament	15	1	Applied

3.2 Research Activities

Motivation: Provide a more detailed view of the key research directions in the program.

Applied nuclear physics builds nuclear physics knowledge and links it to applications.
In experimental nuclear physics, we study the fission process and light-ion production. We address, e.g., energy sharing and angular momentum generation in fission (relevant e.g. for neutron multiplicities and decay heat calculations) and competing reaction mechanisms in neutron-induced light-ion production (relevant for materials damage). The experimental data are used to improve nuclear model codes (TALYS and GEF) that are used in nuclear data evaluation. We refine nuclear data evaluation methodologies and their application, particularly emphasizing the development of reproducible pipelines aided by Machine Learning tools. This aims to enhance the accuracy of nuclear data and ensure well-founded uncertainties.
We perform research in nuclear fusion via development and exploitation of neutron diagnostics for fusion experiments. Neutrons are produced in all fusion reactions of interest and by measuring the neutron emission profile and energy spectrum it is possible to infer key properties of the fusion fuel, e.g. temperature, isotope mixture and the response to various heating scenarios.
Existing and future nuclear energy systems, and their associated nuclear fuel cycles, give rise to many interrelated research topics in the research program. Of particular interest is research on approaches, measurement and analysis methodologies, and instrument developments. This research finds applications in a range of different fields such as management of nuclear material and nuclear fuel, nuclear safeguards, and nuclear fuel performance assessments.
We work on technical verification of nuclear disarmament in the newly inaugurated Alva Myrdal Centre on nuclear disarmament, a cross-disciplinary centre based at Uppsala university. We develop methods for verification of the nuclear test ban, instruments for verification of key steps in the dismantlement life cycle of nuclear weapons and nuclear archaeology for verification of historical production of fissile material.
We work at leading national (CLAB, TANDEM) and international (JRC, IGISOL, GANIL, JET, MAST, GSI, CERN) research facilities and in international collaborations and organizations (IAEA, EUROfusion, ESARDA).

3.3 Research Results

3.3.1 Contributions to the field

Motivation: Identify the results the program is most proud of and provide the program's perspective on how important they are. This allows the panel to see how the program sees itself and provide feedback to help the program better understand how it is viewed internationally.

- Contribution to the recent fusion energy records at JET, through the long-term effort of designing, building and utilizing neutron spectrometers and neutron profile monitors for diagnosing fusion plasma fuel ions at the JET and MAST fusion facilities. Thereby contributing to the development of steady-state, high-performance fusion plasma scenarios.
- Pioneering the use of nuclear mass measurement techniques for research in fission dynamics.
- Development of new calibration methodology within advance fuel performance modeling to improve security of supply of nuclear fuel for Russian-designed pressurized water reactors operating in the EU and Ukraine.
- Leading the academic developments of machine learning techniques in the nuclear safeguards field.
- Speeding up developments of novel nuclear fuel through development of new fuel diagnostics techniques.

3.3.2 Bibliometrics for 2017-2021/2022 (data provided centrally)

Motivation: Provide an overview of how the program is performing that is reasonably comparable to other programs and departments. (See the Base Data definitions file for the meaning of each statistic.)

	Type of Indicator	2017-2022
Number of publications, full publication set (full / fractional counts)	**Quantity**	959 / 362
Proportion of publication fractions at the Norwegian model level 2 (%)	**Impact**	5%
		2017-2021
Coverage (fractionalized): Proportion of publications from DiVA included in citation statistics, weighted by fractional counts	**Coverage**	26%
Mean normalized number of citations per publication (MNCS)	**Impact**	1.12
Proportion of frequently cited publications (top 10%) (PP(top 10%))	**Impact**	12%

3.3.3 Most frequent publishing channels (raw data provided centrally)

Motivation: To see where the program is most frequently publishing.

Channel	Number	% of Total Publications
NUCLEAR FUSION	125	33 %
FUSION ENGINEERING AND DESIGN	53	14 %
PLASMA PHYSICS AND CONTROLLED FUSION	35	9 %
JOURNAL OF INSTRUMENTATION	25	7 %
INTERNATIONAL CONFERENCE ON NUCLEAR DATA FOR SCIENCE AND TECHNOLOGY (ND)	24	7 %
REVIEW OF SCIENTIFIC INSTRUMENTS	18	5 %
NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH SECTION A	12	3 %
ANNALS OF NUCLEAR ENERGY	11	3 %
EUROPEAN PHYSICAL JOURNAL A	8	2 %
ESARDA BULLETIN	8	2 %

3.3.4 Most important publishing channels

Motivation: Enable the program to indicate what publishing channels they see as most important and how much they publish in them for panel feedback.

Channel	Number	% of Total Publications	Lead-author	Lead-author % of Total
PHYSICAL REVIEW LETTERS	1	1/380 = 0.3 %	0	0 %
NUCLEAR FUSION	125	33 %	7	6 %
PHYSICAL REVIEW C	4	1 %	4	100 %
EUROPEAN PHYSICAL JOURNAL A	8	2 %	8	100 %
PLASMA PHYSICS ANDCONTROLLED FUSION	35	9 %	3	14 %
REVIEW OF SCIENTIFIC INSTRUMENTS	18	5 %	5	28 %
NUCLEAR INSTRUMENTS AND METHODS IN PHYS. RES. A	12	3 %	10	83 %
JOURNAL OF INSTRUMENTATION	25	7 %	5	20 %
FUSION ENGINEERING AND DESIGN	53	14 %	4	8 %
ANNALS OF NUCLEAR ENERGY	11	3 %	9	82 %

3.3.5 Publishing impact on the field

The number of publications listed in 3.3.2 is misleading, since the ion physics group is moving to material physics and since many publications from e.g. the program in nuclear physics are included. A more reasonable estimate is about 380 publications. These are in for the program relevant journals but also include a large number of papers from the JET and MAST collaborations. The selections in 3.3.3 and 3.3.4 (roughly sorted by impact factor) provide more relevant data for the program (excluding ion physics).
The percentage given in the right-most column is "Lead author" per "Number" in the publication channel.

3.3.6 Participation, recognition, and leadership in the field

Applied nuclear physics is part of several national and international collaborations and works at world leading facilities (JET, MAST, etc). We are partner in several European projects, e.g., SANDA, EUROfusion, ARIEL, EURAD (WP leader), APIS (WP leader), and participate in OECD-NEA and IAEA activities (CRP, JEFF, WPEC …). AMC (WP leader), ANItA (leader), ESARDA (steering committee), etc. Teaching in international summer schools (e.g. at ICTP Trieste). Program advisory committee work for leading conferences in the field (ND, NEUDOS, EuNPC…). Worth noting is that the relative low faculty funding limits participation in unfunded scientific citizenship activities. But, the program is well anchored in the international community.

3.4 Synergies within the research program

Motivation: Identify how the program's diversity supports its research.

1	**Type of synergy**	Creating and maintaining competence in advanced simulation tools MCNP, Serpent, Geant4, FLUKA, etc …
	Specific collaboration	Joint PhD course: Modelling and Simulation of Particle Transport.
2	**Type of synergy**	Addressing challenges in nuclear technology
	Specific collaboration	ANItA involves researchers from several groups and includes joint PhD and postdoc projects.
3	**Type of synergy**	Competence in gamma and neutron detection techniques
	Specific collaboration	Development of neutron facilities and the gamma measurement lab UGGLA used in analysis of environmental samples, education and eventually together with NESSA.

3.5 Synergies across research fields

Motivation: Identify current activities that are broader than the research programs to promote broader research initiatives and understand what is done across Uppsala vs. externally.

1	**University and Field**	Uppsala University (Materials Theory, Industrial Engineering, and Dept. of Business Studies), KTH and Chalmers, Interdisciplinary
	Type of synergy	Provide knowledge across several fields for developing and implementing new nuclear technology
	Specific collaboration	ANItA (Academic-industrial Nuclear technology Initiative to Achieve a sustainable energy future)
2	**University and Field**	Chalmers and KTH; Fusion energy research
	Type of synergy	Common VR infrastructure grants for the coordination and optimization of the Swedish fusion research activities, in particular within the EUROfusion consortium
	Specific collaboration	EUROfusion
3	**University and Field**	University of Jyväskylä Fission studies at IGISOL
	Type of synergy	Linking applied nuclear physics studies to fundamental nuclear physics
	Specific collaboration	Measurements at IGISOL, data analysis of isomeric yields, development of the facility to include using neutron-induced fission

3.5.1 Reflections on synergies across research fields

Motivation: Understand how the program views its synergies across research fields.

The program is partner in several international collaborations and actively both seeks input from and provides input to neighboring research areas and applications. Example on the national level is the Swedish Centre for Nuclear Technology (SKC) linking UU to academia (Chalmers, KTH), the Swedish regulator (SSM) and industry (Vattenfall, Westinghouse). Examples of our interest for cross-disciplinary work are found in AMC and our contributions to studies in radioecology (e.g. Swedish Agricultural Univ., Geology). Such collaborations provide funding but are also sometimes investments to test new lines of research. It is important for us to make our work relevant and to put it into a wider national and international context.

3.6 Reflections on ensuring good research ethics

Motivation: Understand how the university's priority for ensuring good research ethics is addressed.

Frequent informal discussions about research ethics (publications, authorship, plagiarism, good and bad science). We take part in education activities promoting ethical and good science (First cycle course on Experimental methodology, Second cycle course "Good and Bad Science", PhD introduction course).

3.7 Reflections on creating and ensuring research freedom

Motivation: Understand how the university's priority for ensuring research freedom is addressed.

The program is heavily dependent om external funding from industry and the nuclear regulator. A stronger faculty funding would promote research freedom. For external funding, it is important that contracts regard "bidragsforskning" and not contract research.

3.8 Reflections on research program size

Motivation: A reasonable number of faculty members is required for research programs to achieve their purpose of providing a collegial environment that can develop and support diverse ideas and knowledge around a shared core research direction. For research programs with very few faculty, or very many, it is important to reflect on how this can be achieved.

In 2023 the program comprised 11 faculty with approx. 8.4 FTE. By End of 2024 this will be about 8.7 FTE (1.2 Prof, 7.5 lecturer). In 2020, we had 5 professors in the program. We need to hire on the professor level and promote staff.

3.9 Top external funding sources (data provided centrally)

Motivation: To see the amount spent on each financier during the year.

Funding Agency	2022	Funding Agency	2023
Swedish Research Council (VR)	10.0	Swedish Research Council (VR)	8.8
Swedish Radiation Safety Authority	4.4	Swedish Radiation Safety Authority	3.2
Other private companies (Swedish)	2.8	Other private companies (Swedish)	3.2
Royal Institute of Technology (KTH)	1.6	Royal Institute of Technology (KTH)	2.3
Swedish Foundation for Strategic Research (SSF)	1.1	Swedish Foundation for Strategic Research (SSF)	1.2
Other non-profit (within the EU)	1.1	Statliga bolag	0.9
Chalmers Tekniska Högskola AB	0.3	Other non-profit (within the EU)	0.7
EU Commission (Other)	0.3	Other private foundations	0.5
Olle Engkvist Foundation	0.3	Olle Engkvist Foundation	0.3
Tillväxtverket	0.2	Uppsala University Foundations Management	0.1

3.10 External funding sources

Motivation: This list complements the top external funding sources by providing consistent data for significant (>3M SEK) basic science grants available to all programs and by identifying the number of PIs vs. the total amount of funding. This is important as the absolute amount of money available to different fields varies enormously.

Grant	Number of awards to PIs in the program
Basic science grants (available to all fields in the faculty)	
ERC-StG, ERC-CoG, ERC-AdG, ERC-SyG	
KAW Project	
KAW Scholar	
WAF/WAFx	
VR Project	4
VR Starting	2
Other grants (may include field-specific grants and Co-PIs)	
Swedish Radiation Protection Authority (SSM)	4
Swedish Center for Nuclear Technology	1
Energy Authority	1
Stiftelsen för Strategisk Forskning (SSF)	1
European Commission	1

3.11 Reflections on external funding

Motivation: Connect how the program works with external funding to the achieved funding results.

Challenges: most projects need co-funding; examples are VR projects, EUROfusion, SANDA, etc
According to point 1.4: about 74% external funding for research.
Since a very significant fraction (about 30%) of the internal funding is dedicated to AMC (listed as "other internal funding") and a significant fraction is moving with ion physics to material physics, the external funding from 2025 for non-AMC research will be well above 80%.

3.12 Reflections on what is working well

Motivation: Require programs to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

The program has been very successful with the recent establishment of the national competence centre ANItA and the nuclear disarmament centre AMC. Both result from strategic considerations to create and establish long-term collaborations with external partners inside and outside of Sweden, and from the development of unique research expertise in the field of applied nuclear physics.
We have also been very successful attracting external funding from national and international funders, which is also linked to our specialized competence and networking.
An important part and successful part of our work is within contract education, and the bachelor program in nuclear engineering. Both these educational activities are supported by nuclear industry.

3.13 Reflections on what needs to be improved

Motivation: Require programs to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

Over the past decades, the program has been very successful in attracting external funding. This provided the opportunity to build a research and education portfolio that is internationally competitive and necessary for national competence. However, this leads to vulnerability due to funding fluctuations. In addition, the funding structure leads to a relatively large number of projects running only a few years, with own economy, co-funding and reporting requirements, which puts additional stress on staff and internal support.
It is thus of key importance for the program to achieve more stable long term funding conditions and an adequate balance between internal and external funding.

4 Area 2: Career Paths (evaluation of processes)

4.1 Career stage distribution implications and plans for the next 5 years

Motivation: Provide perspective on the current status and future changes in personnel in the program.

Due to retiring, moving to another university, and restructuring of the program, we went from 5 professors in 2020, to only 1.2 professors by the end of 2024. In addition, we lost on senior lecturer. During the same period, we managed to fill 2 new lecturer positions and an additional one is currently being filled.
While it is possible that some lectures will be promoted to professor during the next 5 years, it is important for us to make further recruitments on the senior level, including a high-level recruitment.
This plan and the need for faculty support is discussed and developed in part 10 of this document.

4.2 Reflections on the process for identifying recruitment needs and focusing areas

Motivation: Explain how recruitments are currently motivated and decided

Decisions on recruiting on the faculty level are made by IFA. The programs identify a need and proposes it to IFAs strategy group, which may eventually support starting the recruitment process. An ongoing recruitment was initiated due to the unfortunate passing of a senior colleague. In this case, a need of a Swedish-speaking teacher is important. The group leaders and the division head, with input from the department's strategy group, defined the hiring profile. The research profile of the successful candidate is supposed to meet any of the program's research groups. The faculties' recruitment committee with input from external advisors and IFA will evaluate and select the candidate.

4.2.1 Initiatives to recruit and retain top researchers/teachers

Motivation: Provide details as to what efforts are made to recruit and retain the best staff.

For teaching positions, the faculty sets the general criteria. Depending on needs in the program, competences and track record in a specified research area, collaboration with industry, or teaching may be given extra weight. This is discussed among professors, group leaders and the division head. In the above example, a group of external advisors (Lund University, Chalmers) helped identify potential candidates who were contacted and encouraged to apply. Positions are announced using several channels. Gender and equal opportunities are handled at the department and faculty levels. We support internal staff to be competitive in recruitment processes.

4.3 Career support

4.3.1 Career support activities for non-tenure-track staff (beyond standard employee dialogs)

Motivation: Provide details as to how the program works with career development for non-tenured staff and encourage the program to reflect on whether it is providing the right type and amount of support.

Support for pedagogical development is given via participation in teaching activities on various levels, including course responsibility and support for taking pedagogical courses.
Researchers are also often part of the team of supervisors for PhD candidates and are sometimes also taking the role of main supervisors which we consider a very strong career and personal development support.
We actively encourage qualified candidates to apply for docent.

4.3.2 Career support activities for tenure-track staff (beyond standard employee dialogs)

Motivation: Provide details as to how the program works with career development for tenure-track staff and encourage the program to reflect on whether it is providing the right type and amount of support.

There is currently no tenure-track staff in the program.

4.3.3 Career support activities for tenured staff (beyond standard employee dialogs)

Motivation: Provide details as to how the program works with career development for tenured staff and encourage the program to reflect on whether it is providing the right type and amount of support.

The career support for tenured staff concerning pedagogical development and to become docent are similar to non-tenured staff.
Support towards becoming distinguished teacher is provided within IFA and the faculty.
There is no formal process within the program for career support towards promotion.

4.4 Reflections on what is working well

Motivation: Require programs to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

During the last 5 years, two researchers managed to compete successfully for positions as lecturers.
We have a strong tradition in teaching on all levels and actively support all staff to participate in teaching activities. We consider this an important part of personal and professional development.
We also think that PhD supervision by a main supervisor and several co-supervisors is beneficial for both the student and the involved supervisors.

4.5 Reflections on what needs to be improved

Motivation: Require programs to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

The program currently undergoes substantial staff changes (retirement, program restructuring, moving to positions in industry and authority). An important goal for the next five years is to create employment conditions and to perform a successful, high-level recruitment. Given the current faculty funding it will be difficult to offer attractive conditions. Another challenge is the general difficulty to provide employment conditions (focus on only a few tasks, salary etc) that are competitive with what is offered by industry and several other authorities (SSM, FOI). Furthermore, we have several experienced researchers that well fulfil the qualifications for a teaching position with only few available teaching positions and there is no option to advance and become, e.g., “senior researcher”. These factors also contributes to loss of valuable staff.
For early stage researcher there is currently a too tight time-limit to be eligible for tenure-track positions (five years after PhD; might now change back to the earlier limit of seven years which is a step in the right direction).

5 Area 3: Collaboration and Outreach (evaluation of processes)

5.1 Specific collaboration and outreach examples

Motivation: Provide a list of specific examples of collaboration and outreach activities to motivate the self-reflection below and to serve as a source of examples for others.

1	**Example and connection**	Nuclear sector – Industry, regulators, and international organizations (e.g. Westinghouse, Vattenfall AB, SSM, IAEA, OECD-NEA)
	Value to the program	Real world applications, access to industry-specific resources such as industry-specific computer codes and industry facilities, opportunities for technology transfer, funding
	Value to the partner	Access to academic expertise, competence development and supply, technology transfer, competence buildup through education and research
2	**Example and connection**	Alva Myrdal Centre on nuclear disarmament Cross-disciplinary research within UU and e.g. SIPRI, FOI, UI, …
	Value to the program	Providing relevant competence to an important real world application, societal relevant, cross-disciplinary collaboration, funding
	Value to the partner	Access to competence in technical aspects of nuclear disarmament
3	**Example and connection**	Public outreach: participation in e.g. SciFEST, 13 x 13 lecture series, lectures in the massive open online “Klimat och fysik - för nyfikna 2024” (Climate and physics)
	Value to the program	Informing the general public about our research; attracting interest to join the field; giving staff opportunities to train presenting difficult topics to a lay audience
	Value to the partner	Public: Gaining insight into scientific questions University: visibility in the public debate

5.1.1 Reflections on overall aims and strategies for collaboration and outreach

Motivation: Understand what we need to create and maintain collaboration and outreach

Sustaining and continued development of ANItA is an important strategy for the program.
We are in constant touch with partners (including academia) via organizations and networks such as Swedish Nuclear Technology Center (SKC) and Swedish Academic Initiative on Nuclear Technology Research (SAINT).
An important factor for collaboration is securing and enlarging competence in nuclear sciences, which we also provide via education on all levels, including contract education.
Access to local (detector labs) and national infrastructure (CLAB) is of high importance.

5.2 Support for outreach and collaboration

Motivation: Understand what support the program has for outreach and collaboration.

Collaboration with industry and authority is an integral part of research and education activities in the program. We support and encourage collaboration e.g. via the channels described above.
Outreach: Informal, no dedicated support.

5.3 Reflections on what is working well

Motivation: Require programs to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

We have a range of collaborative research projects with industry and authority. Examples are the recently started competence centre Academic-industrial Nuclear technology Initiative to Achieve a sustainable energy future (ANItA), and the work package on technical aspects of nuclear disarmament within the Alva Myrdal Centre (AMC). We also have long-standing collaborations within the Swedish Centre for Nuclear Technology (SKC) and with the Swedish Radiation Safety Authority (SSM). These collaborations are successful and will continue for several more years.
We also have a strong tradition in outreach activities. Many colleagues feel the need and joy to contribute to the public science fair SciFest (jointly organized by UU and SLU), lecture series and courses like “13x13” and “Klimat och fysik - för nyfikna 2024”, and Podcasts, as well as in the public debate on energy via debate articles and letters to the editor in newspapers.
We are rather satisfied with these and feel that our research and education gives added value to society.

5.4 Reflections on what needs to be improved

Motivation: Require programs to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

As is obvious from what was mentioned in this document so far, collaboration with industry and authority is a key aspect of the program and we are thus constantly looking for areas of improvement.
With the recently started work in ANItA and AMC, our focus must be on maintaining and consolidating these activities.

6 Area 4: Connection between Research and Teaching (evaluation of processes)

6.1 Main teaching areas

Motivation: To show what subjects the program primarily teaches in.

Teaching program, course package, or contract/continuing education	Level	Courses Taught	Managed
Civ. Eng. Teknisk Fysik (F):			
Technical Thermodynamics 1FA527,	Basic		Yes
Nuclear physics 1FA346,	Advanced		No
Energifysik I 1FA404,	Basic		Yes
Energifysik II med kärnkraft 1FA403,	Advanced		Yes
Modellering och simulering av partikeltransport 1FA451,	Advanced		Yes
Vågor och optik 1FA522,	Basic		Yes
Acceleratorer och detektorer 1FA348,	Advanced		No
Projekt i tillämpad fysik 1FA492,	Advanced		Yes
Bachelor/Master program in physics:			
Nuclear physics 1FA346,	Advanced		No
Termodynamik 1FA517,	Basic		Yes
Examensarbete C i fysik (koordinator) 1FA599,	Basic		Yes
Energifysik II med kärnkraft 1FA403,	Advanced		Yes
Experimentell metodik för fysik I 1FA608,	Basic		Yes
Modellering och simulering av partikeltransport 1FA451,	Advanced		Yes
Introduktion till kandidatprogrammet i fysik	Basic		Yes
Advanced Nuclear Physics	Advanced		No
Application-Oriented Deep Learning in physics	Advanced		No
Bachelor program in nuclear technology (KKI):			
Framtida nukleära energisystem 1FA428,	Basic		Yes
Examensarbete i kärnkraftteknik 1FA499,	Basic		Yes
Reaktorfysik 1FA421,	Basic		Yes
Kärnkraftdrift 1FA427,	Basic		Yes
Kärnkraftsäkerhet 1FA426,	Basic		Yes
Nukleär termohydraulik och ångturbinteknik 1FA422,	Basic		Yes
Introduktion till kärnkraft 1FA400,	Basic		Yes
Contract education			
Kärnkraftteknologi (Nuclear technology) H1, 8NF003	Basic		Yes
Fördjupad strålskyddsutbildning (Radiation protoection), FS1, 8NF008	Basic		Yes
Strålskydd repetition (Rad. prot. Repetition), FS2 (no academic credits)	Basic		Yes
Aktivitetsmätning med germaniumdetektor (no academic credits)	Basic		Yes
Tillämpad reaktorfysik (Applied reactorphysics), 8NF003 and 1FA452	Advanced		Yes

6.2 Infrastructure use in teaching

Motivation: To understand what infrastructure is being used in teaching and to support the faculty's ongoing work on developing an infrastructure policy

Infrastructure	Courses	Level	Students
Nuclear physics lab (house 8)	Nuclear physics 1FA346, Advanced Nuclear Physics	Adv.	35
Nuclear physics lab (house 6)	Project courses, Bachelor and diploma thesis work	Bas./Adv.	5
Ljubljana TRIGA reactor (Slovenia)	Reaktorfysik 1FA421	Basic	10
NESSA2.5 (house 1, basement)	Application-Oriented Deep Learning in Physics	Adv.	65
KSU reactor simulator, OKG and Studsvik	Contract education	Basic/Adv.	20

6.3 Specific teaching/research connections

Motivation: Provide a list of specific examples of teaching/research connections to motivate the self-reflection below and to serve as a source of examples for others.

1	**Example**	Ljubljana reactor physics lab
	Course Info	Reactor physics KKI program

	Value to teaching/ research	The laboratory serves to enhance the theoretical understanding covered in the course, encompassing topics like neutron multiplication factors, safety principles, and reactivity feedback, through practical experience in controlling and operating a nuclear reactor. Conducted at the TRIGA reactor in Ljubljana, students have the unique opportunity to personally manage reactor operations. This laboratory work lies at the heart of the program's research themes.
2	**Example**	Cross-section ratio measurements at the TANDEM lab
	Course Info	Accelerator and detector course
	Value to teaching/ research	Usage of a top-class national infrastructure in second and third cycle education offers students experience in accelerator physics and working with an experimental setup during a dedicated beamtime. Students use semiconductors, liquid scintillators for neutron detection and neutron/gamma separation and study reaction kinematics. Education in program relevant topics and attracts student to the field.
3	**Example**	Nuclear Physics lab and fission/fusion research
	Course Info	Nuclear Physics and Advanced Nuclear Physics
	Value to teaching/ research	In the nuclear physics laboratory, students gain hands-on experience in gamma-ray spectroscopy and the utilization of liquid scintillators and Germanium detectors. The lab delves into various nuclear physics phenomena, including photoelectric absorption, Compton scattering, radiation attenuation, particle energy losses, instrumentation, and data acquisition. Furthermore, our expertise in fission and fusion research is directly applied to the education of nuclear physics students.
4	**Example**	NESSA 2.5 (tagged neutron source)
	Course Info	Application-Oriented Deep Learning in Physics
	Value to teaching/ research	Pulse shape analysis (n/g in liquid scintillator). Comparison of neural network pulse shape discrimination with flight time based discrimination. Extremely valuable to have real (instead of simulated, as in most other cases) and hence non-perfect data to compare with.

6.3.1 Reflections on overall aims and strategies for connections

Motivation: Understand what we need to create and maintain connections

We consistently strive to integrate our primary research in experimental nuclear physics, data modeling, processing, into our educational programs. For example, we leverage our expertise in nuclear reactor research by integrating tailored hands-on laboratory exercises into undergraduate education. Additionally, our research in radiation detection informs various courses, enabling students to gain proficiency in utilizing nuclear instrumentation. We utilize our proficiency in modeling and simulations to educate students in reactor modeling and particle transport, enriching their understanding of complex phenomena.

6.4 Support for integrating teaching and research

Motivation: Explain what support there is for improving the research and teaching connection.

- All personal including PhD students is strongly encouraged to take the 5 weeks Academic Teacher Training Course offered by the University, and to participate in TUK (pedagogic conference within the faculty)
- Seminars on education and pedagogical projects (department teacher lunches or breakfast meetings) to discuss the link between education, educational research and scientific research.
- Formal and information discussions with director of studies and GU coordinators to look for new possible teaching opportunities and assessment of earlier course reports/evaluations.
- Evaluation of courses is also formally conducted via the department and education program committee.

6.5 Reflections on what is working well

Motivation: Require programs to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

We actively pursue numerous pedagogical development initiatives, showcasing our staff's commitment to pedagogical development. This includes e-learning implementation (e.g. prerecorded lectures with integrated quizzes), student engagement and activation by integrating problem-solving sessions into lectures, presentation techniques and peer instruction.
We prioritize student-centered instruction through innovative methods like flipped classrooms, problem-based learning, concept maps (Energy Physics), AI and Virtual reality (Nuclear Technology H1) and gamification (e.g. fission, neutron cycle).
We have been driving several pedagogical development projects support by the faculty (TUFF) and centrally from UU (PUDU, PUMA). One example is the successful development of a reactor physics lab together with Jožef Stefan-institute in Ljubljana allowing students in Uppsala to remotely steer a TRIGA reactor.
Several projects are published, e.g., EPJ Web of Conf 253, 10001 (2021) and Eur. J. Phys. 43 015701 (2022).

6.6 Reflections on what needs to be improved

Motivation: Require programs to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

• We need to develop a dedicated nuclear fission course, which will be given nationally to students from several Swedish universities. This will allow us to attract new talents into the research area. Such a course has long been missing.
• We need to incorporate the upcoming NESSA facility in our education. Since several neutron facilities have been shut-down, both in Sweden and Europe, we need to establish a new center for neutron research which will benefit our students and bridge the gap between research and basic education.

7 5-year Priorities

Motivation: Identifying Priorities encourages strategic analysis and medium-term planning within the program, and makes it easier for the department and panel to understand the programs' own assessments of their needs and opportunities. Requiring two of the Priorities to be able to be accomplished within the program and the department emphasizes the need to work locally as well as at the faculty level.

8 Priority 1 of 3: An activity that can be accomplished within the program

8.1 Description of the Priority

Department:	Department of physics and astronomy			
Program:	Applied Nuclear Physics			
Title:	NESSA – NEutron Source in uppsSAla			
Support:	**May require department support:**	Yes	**May require faculty support:**	No

8.1.1 Goal

Infrastructure to strengthen experimental activities and competence in neutron science and applications and support development of a platform for neutron research in Uppsala (HiCANS).

8.1.2 Expected meaningful research improvement

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

In the past two decades, neutron sources (research reactors and accelerator-based sources) have been closed in the Nordic countries. Examples are the OECD Halden reactor in Norway, R2 in Studsvik, and The Svedberg laboratory in Uppsala. An intense 14-MeV neutron source (design goal is to achieve an intensity of at least 10^10 n/s) like NESSA cannot replace a research reactor (which would need investments about a hundred times larger) but is a relatively low-budget facility opening for relevant activities such as:
- Development, characterization and calibration of current and novel neutron detectors.
- Investigate and test radiation effects on electronics and detectors in harsh radiation environments.
- Verifications of neutron transport modeling tools, and integral experiments.
- Education and training courses including hosting of international summer schools.

Last, not least the facility will be a part of the envisioned platform for neutron research (see chapter 9 of this document and the corresponding chapter by the program of material physics.)

8.1.3 Implementation plan

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

The activity is already ongoing and only the last, crucial part, the neutron generator, is still missing, since it turned out that the company that won the tender was unable to deliver according to contract.
Funding has been secured to hire a postdoc who, together with supervisor, at least one research and an research engineer will start a new tender and, after delivery, work on facility characterization. Delivery of the generator is likely at the earliest in 2026.
Meanwhile there are plans to transfer a 14-MeV neutron generator providing lower intensity (up to about 10^8 n/s), owned by the Swedish Nuclear Fuel and Waste Management Company (SKB) and currently installed at Lund university to Uppsala. This is expected to happen during 2024 and will allow for testing of the facility and performance of experiments not needing the highest neutron fluxes.

8.1.4 What previous accomplishments indicate a high likelihood of success?

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

On the plus side, we already have a bunker equipped for housing a neutron generator and developed a corresponding Safety Analysis Report for the Radiation Protection Authority (SSM) with a detailed description of the facility, shielding considerations, etc. We also have a previous tender that needs to be updated.
On the risk management side, we are still in search of a reliable provider for a suitable source, following complications with the previous contractor that turned out to be unable to deliver according to contract.

8.2 Current status of the area at Uppsala University

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

Currently, more than 50 researchers, in several departments at UU use neutrons in their research. While most use low energy neutrons, NESSA will provide both support and serves as stepping stone towards HiCANS.

8.2.1 Current and planned contributions to support the initiative

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

We already made substantial investments into NESSA over the past years, resulting in the completed bunker. Funding for a postdoc to work on the final steps has been secured. The department has also already provided financial support for, especially, the neutron generator via reserved infrastructure funds.

8.3 Strategic value

8.3.1 Strategic value of the area in the global context

Motivation: To ensure consideration of the larger context.

Access to neutrons is vital for several research areas and the lack of neutron sources is an obstacle for research in applied nuclear physics. NESSA will fit well into the planned platform for neutron research with a compact neutron source providing even higher intensity (HiCANS).

8.3.2 Strategic value of the area at the next level

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

Many of the research activities at the program use neutrons and a local neutron source benefits detector testing, education and training, synergy and test-bench with the proposed compact neutron source HiCANS. Opens for new collaborations and research activities with partners in academia and industry.

8.4 Contributions needed for success

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

Important are external funding (currently funding one postdoc; to be hired in 2024), in-kind contributions from research groups in the program, and usage of the previously secured support from IFA via the infrastructure funds.

8.4.1 Success indicators

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

Neutron source in place. User groups from outside the program use NESSA. NESSA used in externally funded research projects. Publications both on the facility and research projects using it.

8.4.2 First steps that can be taken today

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

Next step is hiring a postdoc (should start autumn 2024). Possible installation of a weak neutron source (transferred from Lund) and facility testing with that source.

9 Priority 2 of 3: An activity that <u>may require department support</u>

9.1 Description of the Priority

Department:	Physics and Astronomy			
Program:	Applied Nuclear Physics (and Material Physics)			
Title:	Platform for neutron research			
Support:	**May require department support:**	Yes	**May require faculty support:**	No

9.1.1 Goal

Establish a complete concept of a compact neutron source in Uppsala to strengthen research in materials and applied nuclear physics and support ITER and the usage of the European Spallation Source.

9.1.2 Expected meaningful research improvement

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

Neutrons are used to address scientific questions such as the structure and dynamics of light elements and magnetism, nuclear physics far from the line of stability. Neutrons are used in nuclear technology and needed to study radiation effects on electronics and materials. Neutron science is decisive for development of sustainable societies. We will develop a compact neutron facility (HiCANS), with a low access-threshold in Uppsala, as well as user education and training. HiCANS will provide a platform to perform high-end research at key future international infrastructures such as the European Spallation Source (ESS) and ITER. With recent developments of high-current proton accelerators, neutron targets, moderators and time-of-flight neutron instrumentation, compact, accelerator-driven neutron sources became competitive to smaller reactors and spallation sources. A local HiCANS allows UU to expand its positions, lower the access barriers for less experienced users, provide capabilities for education and promote industrial research. The scientific competence developed during the design phase will benefit other infrastructure initiatives at the dept.

9.1.3 Implementation plan

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

We analyze the needs and opportunities of HiCANS, recently identified in a collaboration between Uppsala and Lund Universities, and use it as input for writing the conceptual design report (CDR). On the basis of the CDR a detailed technical design report (TDR), including performance and radioprotection calculations, a detailed budget and specifications of all components will be compiled, including benchmarking against existing facilities. The resources required to complete the two tasks are approx. 10 MSek. The TDR will be written in a collaboration between material physics, applied nuclear physics, the FREIA laboratory, and partners in the ELENA network. In parallel, further competence will be built by collaborations on instrument projects at ESS, ITER, and external partners from academia and industry with and interest of irradiation of electronics and material with neutrons. The project would benefit from departmental support aligned with installation of an instrumentation center, during planning and the later stages of construction and operation.

9.1.4 What previous accomplishments indicate a high likelihood of success?

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

At IFA we have broad competence in construction and operation of research infrastructures. Relevant examples are in applied nuclear physics (experience in design and development of neutron sources and beams), the FREIA laboratory (contribution to the construction of the ESS accelerator), the Tandem laboratory (operating several accelerators for ion-beam materials research), and materials physics (rebuilding and operation of Super ADAM as national Swedish infrastructure at ILL (Grenoble, France). The programs are engaged in, e.g., ESS instrument projects (SAGA, Port-GISANS), neutron spectrometry at ITER, and a neutron source for IGISOL (Jyväskylä, Finland).

9.2 Current status of the area at Uppsala University

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

Currently, more than 50 researchers, in several departments at UU use neutrons in their research. The research is facilitated by the center for neutron scattering. We currently develop a 14-MeV neutron source (NESSA) which provides both support and serves as stepping stone towards HiCANS.

9.2.1 Current and planned contributions to support the initiative

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

Neutrons science is a key area at the department. Resources are dedicated to NESSA which will support HiCANS. One professor spends part time to promote HiCANS. We plan to increase the support to the project in order to move towards a conceptual design report (CDR), aligned with other infrastructure initiatives.

9.3 Strategic value

9.3.1 Strategic value of the area in the global context

Motivation: To ensure consideration of the larger context.

Neutron research provides decisive information for several of the areas defined as global issues by the United Nations. HiCANS will provide capacity and continuity to allow long-term projects and education as well as it lowers the entry barrier, which hinders industrial and applied research.

9.3.2 Strategic value of the area at the next level

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

HiCANS will provide an ideal platform for collaborations at the Department (FREIA - instrumentation, applied nuclear physics, materials physics) and beyond (Chemistry, Geology, Biomedicine, Humanities). It will allow to incorporate neutron science into education, make meaningful input to ESS and ITER and benefit from it.

9.4 Contributions needed for success

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

For a local HiCANS a CDR and TDR is required. Required resources are: CDR ca. 2 FTE (2.5 MSek) and TDR 6 FTE (7.5 MSEK). They provide the scientific case, functional layout, expected performance and budget. In addition, resources are required to develop strategies for sustainable funding of the facility.

9.4.1 Success indicators

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

A completed TDR, and a plan for construction and a strategy for funding and operation. Being the leading center for neutron research in the country. Significant publications in neutron research, training of students, tight collaborations with ESS and other sources/projects.

9.4.2 First steps that can be taken today

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

We joined the ELENA network (https://elena-neutron.iff.kfa-juelich.de) and contribute to strategies for neutron science on national and European level. Develop the NESSA neutron facility. A doctoral network (EU-GENESO) is planned. Broad support for a HiCANS as national Swedish infrastructure is established.

10 Priority 3 of 3: An activity that may require faculty support

10.1 Description of the Priority

Department:	Physics and Astronomy			
Program:	Applied Nuclear Physics			
Title:	ANItA (Academic-industrial Nuclear technology Initiative to Achieve a sustainable energy future)			
Support:	**May require department support:**	Yes	**May require faculty support:**	Yes

10.1.1 Goal

Firmly secure ANItA as a platform for research and development in nuclear technology at the faculty. Recent developments in new reactor technology such as SMR (small modular reactors) and Gen-IV require improved competence in a range of fields. ANItA coordinates relevant research activities within UU. It is a national center, hosted by Uppsala University, and gathers academic and industrial nuclear technology competence in both technical and non-technical areas. Together with other universities in Sweden and the Nordic nuclear sector, our aim is to solve challenges towards achieving global sustainability goals.

10.1.2 Expected meaningful research improvement

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

ANItA significantly enhances the Faculty's and the department's multidisciplinary research capabilities, positioning Uppsala University to meet the evolving demands of Sweden's nuclear energy landscape.
The collaboration with industry partners offers real-world applications, access to industry-specific resources, and potential technology transfer opportunities.
Current activities in ANItA focus on Small Modular Reactors. Applied nuclear physics focuses on safety related challenges within nuclear data uncertainties and their propagation through the fuel cycle, fuel technology, technical aspects of nuclear safeguards and related instrumentation. The focus will be broadened and include research into Gen-IV concepts and, with focus on MYRRHA, accelerator-driven systems for transmutation of nuclear waste.

10.1.3 Implementation plan

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

ANItA receives funding from the Swedish Energy Agency for an initial period of five years, ending in 2027. It is expected that this funding period for SMR research will be extended until 2031. Meanwhile, the program and its partners have secured funding for research in Gen-IV systems.
To support this development and ANItA new internal funding is necessary and allow for staking out a path where both Applied Nuclear Physics and other involved research programs collaborate in order to meet the increased need for expertise in the nuclear technology.
The program currently funds a comparable large part of ANItA in-kind. During the second half of the initial project, ANItA is expected to provide knowledge-based insights on how new reactor technologies such as small modular reactors should be implemented in as efficient way as possible and the program needs to be augmented with new recruitments on the lector or professor levels.

10.1.4 What previous accomplishments indicate a high likelihood of success?

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

The national competence center, ANItA, was conceived and is managed by the program. ANItA is currently funded by the Swedish Energy Agency. Significant co-funding is provided from Swedish and Finnish resources; Uppsala University, KTH, Chalmers, Vattenfall, Uniper, Fortum, Westinghouse, and Studsvik Nuclear. The Swedish and Finnish regulators have observer status in ANItA. It is an achievement to gather all relevant Nordic actors within this field. The research program has had leading roles in relevant major European programs like APIS and EURAD. On a national scale, the program has acquired additional funding for nuclear technology research from the Swedish Energy Agency, SSM, and SKC.

10.2 Current status of the area at Uppsala University

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

ANItA coordinates research and development work in nuclear power technology and comprises research at Applied Nuclear Physics, Materials Theory, Industrial Engineering and the Department of Business Studies. Funding to expand ANItA to include GEN-IV has been secured from the Swedish Energy Agency.

10.2.1 Current and planned contributions to support the initiative

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

While the faculty and the Vice Chancellor financially contribute to ANItA, coordination is funded from the program. Supervision, a research engineer, and some other auxiliary costs connected ANItA is also funded within the program. Limited internal funding puts new undertakings within ANItA at risk.

10.3 Strategic value

10.3.1 Strategic value of the area in the global context

Motivation: To ensure consideration of the larger context.

Affordable and clean energy is one of the 17 sustainable development goals of the UN. An well-established nuclear technology center at UU addresses the challenges for a sustainable fuel cycle, and contributes to innovations in, e.g., SMR-technology, GEN-IV research, and development of accident tolerant fuels.

10.3.2 Strategic value of the area at the next level

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

The center is contributing to cross-disciplinary research, collaboration with authority and industry, and education on all levels. An established and supported center will have excellent chances to compete successfully in future national and international calls in the nuclear technology domain.

10.4 Contributions needed for success

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

For long-term sustainability and ability to develop and expand ANItA, and to support the successful efforts already made by the program, an additional 0.75 FFF from the faculty is requested. We plan a recruitment on the lecturer or professor level and eventually a startup package from IFA for the successful candidate.

10.4.1 Success indicators

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

We manage to develop ANItA into a long-term platform for national nuclear technology research and education. We secure additional funding and broaden the scope of ANItA.
We managed to make a high-level recruitment.

10.4.2 First steps that can be taken today

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

Broaden the current goals of ANItA and involve more programs. Ensure that the evaluation of ANItA in 2026 will be successful and the center will get prolonged support. Actively seek and identify possible candidates for hiring.

11 Questions to the panel

(approximately 600 characters)
Question 1:
Question 2:
Question 3: