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Nordisk kernesikkerhedsforskning
Norrænar kjarnöryggisrannsóknir
Pohjoismainen ydinturvallisuustutkimus
Nordisk kjernesikkerhetsforskning
Nordisk kärnsäkerhetsforskning
Nordic nuclear safety research

NKS Policy, Framework and Procedures

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Note: The official NKS policy document, NKS(08)2, is in Swedish. See www.nks.org. This is an abridged and adapted translation for those preferring an English overview.

Introduction

Nordic Nuclear Safety Research (NKS) is a platform for Nordic cooperation and competence in nuclear safety and related radiation protection issues including emergency preparedness and protection of the environment. The work is financed and supported by Nordic authorities, companies and other organizations. Information on NKS activities is disseminated through seminars, reports, electronic newsletters and the NKS website, www.nks.org. They are used by financiers and other participating organizations in their decision making processes and information efforts, and are available free of charge to anyone interested in NKS activities.

This is an abridged version of the official policy document NKS(08)2 which is written in Swedish and available on the NKS website. Should the two versions conflict or give rise to interpretations, the Swedish version takes precedence over the English one. The main difference between the two versions is that the Swedish document is more specific as regards practical work, detailed instructions, responsibilities and tasks at the different levels of the organization.

Practical NKS work is governed by an administrative handbook in Danish, also available at www.nks.org. Reviews and updates of the policy document and the handbook will be brought to the Board for approval; smaller changes will be decided by the chairman.

Divided into three main chapters, this document gives background information on NKS and its structure; a presentation of the current scientific framework program; and guidelines for practical work and how to join it. The target group is first and foremost active NKS participants; but it is hoped that any organization or individual wishing to learn what NKS stands for and how work is conducted will find the document useful.

This document sets out to answer questions like:

- What is NKS all about?
- How is NKS and its work organized?
- Who pays?
- What are the main areas of work?
- Do I have to live in one of the Nordic countries to participate?
- How do I join?
- What is a Call for Proposals?
- Can I suggest new activities?
- What criteria must proposals meet?
- How do I get NKS funding?
- How is the quality of the work evaluated?
- How are NKS results communicated?

If, after reading this document, any of your questions remain unanswered, please contact the appropriate Program Manager or the Secretariat at nks@nks.org.

This is NKS

Scope and Objectives

NKS (Nordic Nuclear Safety Research) is a platform for Nordic cooperation and competence in nuclear safety and related radiation protection issues including emergency preparedness and protection of the environment. The work centers around nuclear power related issues and is divided into two main areas:

- Reactor Safety (NKS-R)
- Emergency Preparedness (NKS-B)

In addition, some activities will be identified as being cross-disciplinary, i.e., belonging to both NKS-R and NKS-B.

Normally, the NKS program does not include safeguards; transport of nuclear or radioactive materials; general radiation protection; or external threats.

The hallmark of NKS is a spirit of sharing – all results are available free of charge, not only to NKS participants but worldwide. When quoting NKS material or work supported by NKS, a reference to the source shall be made.

The Nordic Perspective

NKS is an informal forum, serving as an umbrella for Nordic initiatives and interests. Its purpose is to carry out joint activities producing seminars, exercises, scientific articles, technical reports and other types of reference material. Special efforts are made to engage young scientists. The work is financed and supported by Nordic authorities, research institutions, power companies, contractors and other organizations. The results are used by participating organizations in their decision making processes and information efforts. To ensure that the Nordic perspective prevails, all major activities should include representatives from at least three Nordic countries.

The region in question is the five Nordic countries, i.e., Denmark (including the Faroe Islands and Greenland), Finland, Iceland, Norway and Sweden. With a total population of some 25 million people, and a common cultural and historic heritage, the Nordic countries have cooperated in the field of nuclear safety for approximately half a century. Informal networks for exchange of information have developed throughout the years, strengthening the region's potential for fast, coordinated and adequate response to nuclear threats, incidents and accidents. NKS has served well as a platform for such activities.

Major Nordic Nuclear Installations

The Nordic interest in cooperation and pooling of resources via NKS is due to the large number of nuclear installations and activities in the region. There are four nuclear power reactors in operation in Finland, and one (Olkiluoto 3) is under construction. Sweden has 12 nuclear power reactors. Of these, 10 will continue operation and two have been permanently shut down (Barsebäck 1 and 2). The Barsebäck reactors are being decommissioned. There are research reactors in Denmark, Finland, Norway and Sweden. The three Danish reactors have been closed and decommissioning work has started. The reactors in Finland and Norway are still in operation. The two Swedish research reactors have been shut down and face decommissioning. In Sweden there is also a nuclear fuel production plant in operation. All five Nordic countries have interim storages for radioactive waste. Finland, Norway and Sweden have final repositories in operation for low and medium level waste. In Finland and Sweden work is in progress

to allow construction of final repositories for spent fuel. Apart from nuclear installations in the Nordic countries, there are commercial, research and naval nuclear reactors and other nuclear installations in surrounding eastern and western countries.

Financial Support

Only activities of interest to financing organizations and other end users are carried out. The results must be of relevance, e.g., practical and directly applicable. The owners and main financiers are:

- Danish Emergency Management Agency
- Finnish Ministry of Employment and the Economy
- Icelandic Radiation Protection Institute
- Norwegian Radiation Protection Authority
- Swedish Radiation Safety Authority

Additional financial support is obtained from these organizations:

- Fennovoima Oy in Finland
- Fortum Power and Heat Oy in Finland
- TVO in Finland
- IFE in Norway
- Forsmarks Kraftgrupp AB in Sweden
- Nuclear Training and Safety Center AB (KSU) in Sweden
- OKG Aktiebolag in Sweden
- Ringhals AB in Sweden

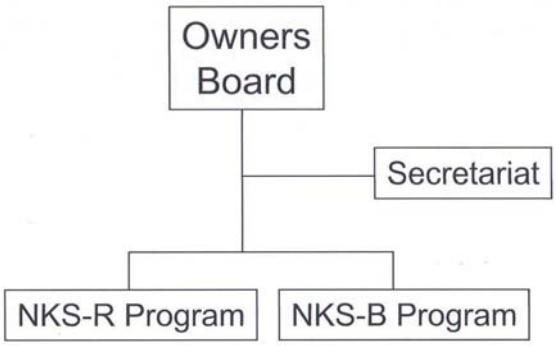
In 2007 the contributions of the owners together with support from the additional financiers above totalled some 7.9 million Danish crowns (1.1 million euros). To this should be added in-kind contributions by participating organizations, e.g., work hours, travel expenses, and laboratory and other resources. These contributions are expected to be worth approximately as much as the actual NKS budget, and the program is highly dependent on them. Hence, all activity proposals are expected to offer at least a 50/50 in-kind contribution by the applicants.

All decisions on budgetary matters are made by the Board, usually for a period of one year at a time. NKS only supports the work of Nordic organizations, although international participation is sometimes accepted granted that external funding is provided by the foreign organizations, fully covering their costs. Non-Nordic participation in the cooperation is welcomed whenever relevant to the overall objectives of NKS and in line with the current program and policy; it will however not be supported financially by NKS. An exception is that travel costs to NKS seminars and workshops can be reimbursed for especially invited participants (e.g., key lecturers).

Organization

The owners and main financiers of NKS are four central authorities and one ministry in the Nordic countries. Together with a number of experts appointed by the owners they constitute the NKS Board. Decisions on financing, program activities, NKS policy etc. are made by the owners and the Board. All major activities are handled by the two program managers, one responsible for reactor safety (NKS-R), one for emergency preparedness (NKS-B). The Board will decide on a case-by-case basis where cross-disciplinary activities belong. A secretariat handles administrative duties such as economy, electronic media, publishing of reports etc.

Organization of NKS:



Presently, the following organizations form the NKS Board:

Denmark	Danish Emergency Management Agency (DEMA)
	Danish Radiation Protection Authority (SIS)
Finland	Ministry of Employment and the Economy (TEM)
	Finnish Radiation and Nuclear Safety Authority (STUK)
	Fortum Nuclear Services Ltd
	Technical Research Center of Finland (VTT)
Iceland	Icelandic Radiation Protection Institute
Norway	Norwegian Radiation Protection Authority (NRPA; two persons)
	Institute for Energy Technology (IFE)
Sweden	Swedish Radiation Safety Authority (two persons)
	Vattenfall AB

Fortum Nuclear Services Ltd and Vattenfall AB represent the nuclear industry in the countries.

Overall Framework Program

Program Areas

Nuclear safety and emergency preparedness have been major Nordic priorities for many years. Two of the greatest challenges are the complexity of the systems and the need integrate knowledge from many different areas (reactor technology, nuclear physics, measurement techniques, environmental sciences, radiobiology, information and communication technology to mention a few). Continuous development and improvement is necessary: new knowledge must be gathered and tools created and kept operational. Optimized use of national resources and the potential need for cooperation and assistance between neighboring countries is of the essence; so is communication with media and individual members of the public. Common Nordic views and approaches are important in order to maintain public confidence in authorities and other actors in the nuclear field.

Therefore, in 2007 the NKS Board adopted a dynamic scientific framework program, divided into two main areas, each led by a program manager:

- NKS-R: Reactor Safety
- NKS-B: Emergency Preparedness

Some activities will be identified as **cross-disciplinary**, i.e., belonging to both NKS-R and NKS-B. The main part of the research program is constituted by NKS-R and NKS-B activities, whereas cross-disciplinary activities are expected to be more sporadic. Financial support is to be given fairly evenly to NKS-R and NKS-B in a long-time perspective.

Activities

The work is divided into activities of varying size and duration and may consist of **studies** (research, investigations, exercises etc.) or **dissemination of information** (conferences, seminars, workshops, courses, websites, scientific papers, technical reports etc.), or (usually) a combination of both. The aim is to maintain and build up **competence** and to develop close informal **networks**. In order to make seminars more valuable, participants should also take part in the preparations and follow-up work, e.g., writing the final report. Care should be taken to use other related Nordic, European and other international seminars for exchange of information and networking, where appropriate.

In many cases the issues at hand generate considerable public interest. Activities on information strategies, management and technologies in relation to NKS-R and NKS-B will therefore be included in the program, when appropriate.

The contents, time frames and budget of the program and its many activities are decided by the Board, in accordance with the NKS-R and NKS-B frameworks outlined below. The criteria summarized in a later section are applied when evaluating the proposals. The program is flexible since the results of ongoing work are evaluated at the biannual Board meetings in May and November. Changes in work plans are made when called for. Activities may be expanded, reduced, or aborted; new activities may be added. The program is constantly renewed through an annual (in exceptional cases, biannual) procedure of **Call for Proposals**, which is open to all relevant Nordic organizations and results in an expansion of the program. When an activity has been finished and the final

report accepted by the Board, the results will be disseminated and can be implemented by the end users.

Young Scientists

In order to maintain a high level of competence in the longer perspective, it is important to ensure that enough young people choose to specialize in nuclear safety, radiation protection and related studies. In most Nordic countries, the number of experts is limited. The university sector plays an important role and must be stimulated to offer courses and relevant thesis projects, and to carry out research projects. Competence can be strengthened by NKS through education in different ways, e.g., by organizing and supporting joint Nordic M.Sc. and Ph.D. courses. It is also beneficial if NKS work is relevant for individual students and their NKS participation can aid in their studies. Other forms of educational activities can also be considered, e.g.,

- Workshops of various types, with invited lecturers, preferably producing proceedings in a refereed publication
- Training programs and exchange visits between research organizations

NKS-R Framework: Reactor Safety

R1 Priorities and Challenges

The research activities within the reactor safety part of the NKS program have changed from time to time depending on subjects of interest. This chapter gives a guidance to which areas will be prioritized for financing in years to come. Research activities may be of different kinds, such as developing new knowledge; compilation of knowledge in a systematic manner aiming to support applications; or a pilot project demonstrating the use of new knowledge or techniques. It could also be seminars or courses to spread knowledge.

NKS funding is limited, roughly only one percent of the total Nordic funding in the area of reactor safety, phase-out and waste treatment. The funding can therefore not be expected to be of vital importance for the development in these areas. In addition to the expected result of a research activity in terms of knowledge, it will also be prioritized based on its contribution to the overall NKS criteria, e.g., a Nordic common view on nuclear safety. Priority will also be based on the importance to the safety of existing reactors. Non-safety operational issues as well as economical issues are given low priority. If a proposed activity supports or duplicates other national or international activities, this will also affect the NKS decision on funding.

The nuclear power industry and regulatory bodies have a number of challenges of particular interest where research activities are essential and will be prioritized. The areas are safety upgrade of older reactors comparable to modern standard; harmonization of reactor safety; power upgrade; ageing/life management; phase-out and dismantling of nuclear facilities; waste treatment and final storage.

R2 Main Research Areas and Program Contents

The following main areas are judged to be of current interest and examples are given for each area:

Abbreviations used:

BWR	Boiling Water Reactor
CFD	Computational Fluid Dynamics
HR	Human Reliability
NDT	Non-Destructive Testing
PSA	Probabilistic Safety Analyses
RI-ISI	Risk-Informed In-Service Inspection

Reactor Physics and Thermo-Hydraulics
Examples:

- Core instability/oscillations in BWR high burn-out fuel
- Reactor physics and dynamics
- Thermo hydraulic and CFD calculations
- Integration of different models

Modernization, Introduction of New Techniques and New Demands
Examples:

- Digital control rooms; new demands
- Power up-grades

Ageing of Nuclear Facilities
Examples:

- Thermal and mechanical fatigue
- Radiation induced defects on reactor vessels
- Ageing of concrete containments
- NDT technology and validation of methods
- RI-ISI, strategies and application of methods
- Ageing managing program and ageing mechanisms
- Ageing properties of new materials

Severe Accidents
Examples:

- Chemical behavior of iodine and halogens during severe accidents
- Core – concrete interaction

Probabilistic Methods
Examples:

- Application of PSA in safety assessments
- Clear presentation of PSA results
- Assessment of uncertainties
- Assessment of defense in depth using PSA
- Nordic harmonization of demand on PSA for different applications
- Reference library for rules and guides
- Harmonization of definitions in PSA

Organization, Man and Safety Culture
Examples:

- Models and methods for safety review
- Safety culture significance in occurred events
- Actions taken as a result of event analyses

- Benchmarking between nuclear industry and other industries with high potential risks
- Safety assessment of organizational changes
- Safety culture and assessment of organizations
- Safety aspects on using subcontractors in nuclear power plants
- Introduction of new techniques and new working procedures
- Application of HR methods in nuclear power plants

Phase-Out and Decommissioning of Nuclear Facilities
Examples:
- Phase-out and decommissioning of research reactors
- Stakeholder involvement in the Nordic countries
- Regulatory demands by Nordic authorities on decommissioning projects
- Experience from decommissioning projects

Common Seminars for Reactor Safety and Emergency Preparedness
Examples:
- PSA, severe accidents and emergency preparedness
- Phase-out and demolition of nuclear facilities including release of protection of area
- Environmental Impact Assessments

The list of subjects given above is not complete, and other proposals that can be associated with any of the eight categories above will also be considered in the evaluation process. More specific priorities regarding subjects to be covered can be given in connection with each "Call for Proposals".

NKS-B Framework: Emergency Preparedness

B1 Aim and Challenges

The aim of the NKS-B program is to strengthen Nordic work concerning
- radiological emergency preparedness
- management of radioactive waste and discharges
- radioecology and environmental assessments

In addition to the threats from potential nuclear accidents, threats related to the possibility of malicious uses of radioactive or nuclear substances is now seen as a major concern. The case of polonium-210 poisoning and contamination in London in November 2006 is an example of an unexpected situation that demonstrates new challenges related to, e.g., special competence regarding measurement/analytical techniques and radiation protection assessments.

During the last 30 years or so, a lot of experience and knowledge regarding consequences of radioactive discharges, fallout and environmental radioactivity have been gained. The research has to a large extent focused on the behavior of a few important radionuclides. This competence and knowledge must be maintained and further developed to include a wider range of relevant radionuclides.

In the past, radiation protection criteria were developed only for humans, and it was assumed that by protecting man, other species would be protected to an acceptable

degree. In recent years several problems have been identified with this existing tenet, with the result that systems for protection of flora and fauna, *per se*, are being developed and tested. Several knowledge gaps relating to this have already been identified, especially with regard to radionuclide uptake, transfer and biological response indicators. Furthermore, there is a need to obtain more experience in the practical application of environmental protection frameworks in typical Nordic environments.

Since 2004, uranium prices have increased sharply, leading to a higher interest in uranium prospecting, and also thorium, in several Nordic countries. Mining and milling for uranium and thorium, and also some other metals, give rise to waste rock and tailings with enhanced concentrations of radioactive substances from the natural series. A wide range of monitoring and measurement techniques will be needed for the risk assessments.

The program is structured into three basic fields: Research activities, investigations, exercises etc.; Seminars; and Education. Work performed within the first of these fields should be focused on maintaining and building up competence. Seminars should aim at building and maintaining both competence and networks. Education should help building competence in the individual countries with the aim of reaching the common goals.

When evaluating proposals for activities they will be judged against how well they seem to fulfil the aims of the respective fields, as well as against their scientific and pedagogical merits.

B2 Main Research Areas and Program Contents

E Emergency Preparedness (in general, as well as specific tools)
Examples of activities:

- Recent nuclear and radioecological emergencies and incidents causing public interest: lessons learned and implications for emergency preparedness
- Potential malicious uses of radioactive substances: security and emergency response
- Exercises and harmonization of activities
- Dose assessments and biodosimetry
- Countermeasures: effectiveness and practicability
- Information and communication: further development of systems and methods
- Decision support systems: integration of existing knowledge

W Waste and Discharges
Examples of activities:

- Waste and discharges from decommissioning activities
- Cost assessments of decontamination measures and remediation
- NORM waste from mining and milling (NORM: Naturally Occurring Radioactive Material)
- Interventions and clean-up operations
- Disposal of radioactive sources

R Radioecological Assessments

Examples of activities:

- Transport and ecological transfer of radionuclides in terrestrial environments
- Radioactivity in natural produce and foodstuffs produced in contaminated areas: temporal trends and seasonal effects
- Dose assessments from artificial and natural radionuclides
- Radiation effects in biota: studies of reference ecosystems and reference species for Nordic environments
- Case studies at locations with elevated concentrations of radionuclides
- Marine environments of special importance
- Syntheses of earlier radioecological studies of Nordic interest

M Measurement Strategy, Technology and Quality Assurance

Examples of activities:

- Implementation of international standards and regulations in Nordic countries (e.g., foodstuffs, bulk materials)
- Sampling/measurement strategies for contaminated material, - areas, - foodstuffs
- Systems for mobile measurements
- Validation of methods for sampling and preconcentration of radionuclides
- Radionuclide analytical techniques and intercomparisons

The list of subjects given above is not complete, and other proposals that can be associated with any of the four categories above will also be considered in the evaluation process. More specific priorities regarding subjects to be covered can be given in connection with each “Call for Proposals”.

Cross-Disciplinary Activities

In the near future issues regarding decommissioning of nuclear installations and waste management will demand increased attention. This will include analyses of technical safety aspects, volumes and properties of radioactive waste, radioactive releases and protection of the environment. Hence, activities in a number of fields will not always be strictly R or B related but may be relevant to both programs. The Board decides whether such an activity will be handled under the R or B program, or if it should be treated in some other way.

Some examples of possible areas for cross-disciplinary activities:

- Decommissioning and waste management
- Common seminars covering both R and B activities
- Information and communication activities targeting media and the general public

Guidelines

From Proposal to Final Report

Call for Proposals

During an annual (in exceptional cases, biannual) procedure of Call for Proposals the R and B program managers invite the Nordic nuclear community to submit activity proposals and apply for NKS funding. Usually this takes place in the fall, with a possible extra opportunity in the spring. Relevant information on the procedure (time schedule; deadline for applications; information to be supplied; criteria to be met; evaluation of the proposals; formalities including forms to be used; etc.) is made available well in advance on the NKS website and distributed to the subscribers of the electronic newsletter. The applicants are expected to demonstrate that at least half of the necessary funding of the activity in question will be supplied by the participating organizations, usually in the form of in-kind contributions.

All applications received before the deadline is evaluated by a group of specialists, chaired by the program manager in question. The proposals are evaluated for compliance with the NKS criteria below. The evaluation results are compiled by the program manager together with any recommendations, and a report is sent to the Board members. At its next meeting, the Board decides what activities are accepted, the size of the NKS funding supplied, and any special conditions to be met. The program manager and the various activity leaders then sign individual contracts regarding each activity. This should be done before the subsequent Board meeting, when progress will be scrutinized and continued work approved or aborted. It is the responsibility of the NKS program manager to ensure that the time schedule and budget of the individual activities are kept, together with any conditions specified in the contract, and to report the status of the activity to the Board at its meetings, until the activity is finally finished and the results are accepted by the Board. The results may then be officially published and handed over to the financiers, participating organizations and end users for information and implementation. The Board should initiate an evaluation of activities once they have been concluded and approved.

Proposals turned down by the Board should be listed for future reference and the activity leaders informed on the Board's decision as soon as possible after the Board meeting. In some cases the Board may indicate that a refused proposal should or could be completed and submitted at a later occasion for renewed assessment.

Silent Procedure

On special occasions the Board may decide to go ahead with an activity even though it has not followed the normal Call for Proposals procedure. The Board will then decide on any special conditions for that particular activity. E.g., in urgent cases the chairman may initiate a Silent Procedure where an activity proposal and pertaining information is distributed electronically to the Board members, together with a suggested decision on the further handling of the proposal. Members who agree with the suggested action need not answer; those opposed must submit their comments before a specified date. If no objections are received, the suggested action is taken.

Criteria for NKS Activities

The entire NKS program as well as the various activities shall fulfil the following criteria:

- Demonstrated compatibility with the current framework program
- A clear Nordic added value, including
    - creating and maintaining Nordic networks
    - dissemination and increase of Nordic competence within the program area in question
- Current interest in and high international standard of the technical/scientific work
- Comprehensive and transparent activities, open to the widest possible range of participants, including young scientists
- Active participation and/or declared interest in the expected results of organizations in at least three Nordic countries in all major activities (occasionally, two countries may be acceptable)
- Distinct and measurable goals
- Relevance to financiers and end users
- The practical results shall be presented
    - at conferences, seminars, workshops etc
    - in technical reports and scientific articles in refereed journals
    - as recommendations, manuals, handbooks, checklists
    - in electronic form such as DVDs, CD-ROMs, websites
    - in the form of educational and information material

NKS work is dependent on in-kind contributions worth on the average at least as much as the NKS funding. These contributions may be work hours, travel expenses, laboratory resources etc. and should be clearly specified in all proposals submitted under the Call for Proposals procedure.

NKS aims at an approximately even overall distribution of funding between the R and B programs as well as between participating Nordic countries and organizations within the various activities. Gender neutrality and participation of young scientists shall be encouraged. When possible and relevant, M.Sc. and Ph.D. support should be included in ongoing or proposed activities and NKS activities coordinated with international projects. Measures should be taken to ensure cost-efficiency, save resources and protect the environment, e.g., by substituting travels and business meetings with electronic contacts and virtual meetings.

Quality Assurance

The quality of the work performed and the activities at large is constantly being surveilled and assured through

- evaluation of applications received during the Call for Proposals
- participation of end users throughout the entire process: planning, execution, deliverables, reporting, implementation, and evaluation
- reporting and discussions at Board meetings
- publication of results in reports and refereed journals
- dissemination and discussions of NKS results in Nordic and international fora (conferences, seminars, topical meetings, workshops etc.)

- regular evaluations of the entire technical/scientific program and the administrative support structure

International Cooperation

There is no formalized NKS cooperation with other international organizations. Participation in international projects is to follow decisions and conditions given by the Board. NKS should strive to create and maintain relevant international contacts and keep the international audience informed on its progress. Whenever feasible and desirable, NKS activities should be coordinated with similar Nordic and international activities in order to increase efficiency and improve exchange of results and experience. When needed, NKS can be used as a platform for international coordination and promotion of Nordic views. Non-Nordic cooperation in NKS activities must be approved by the relevant program manager beforehand and will not be supported financially by NKS.

Communication and Dissemination of Information

NKS communication activities (including information and dissemination of results) shall be planned, systematic and in compliance with directives laid down by the Board. The target groups shall be informed about the possibilities offered by NKS as regards cooperation, funding, and exchange of knowledge. The communication efforts shall help establish a picture of NKS as a competent and active organization – nationally, regionally and internationally. The results of NKS work shall be presented openly and free of charge so as to render them useful and easy to implement. When quoted, due credit should be given to the proper NKS sources and a link to the NKS website www.nks.org given.

The major channels for distributing NKS information are:

- the NKS website
- electronic newsletters and newsflashes
- electronic and (occasionally) printed reports and pamphlets
- conferences, seminars, workshops and international cooperation projects
- scientific articles in refereed journals
- internal NKS correspondence and communication

NKS newsletters are normally published biannually, prior to the regular NKS Board meetings in May and November. The newsletters come without attachments of any kind, and the object is to give links to material on the NKS website for more information on new reports, invitations to seminars and similar events. The material referred to can be downloaded free of charge. In addition to the biannual newsletters, brief newsflashes will be distributed as soon as new reports have appeared or when new information is available on upcoming seminars etc. Anyone wishing a free subscription to the newsletters and newsflashes should contact the Secretariat at nks@nks.org.