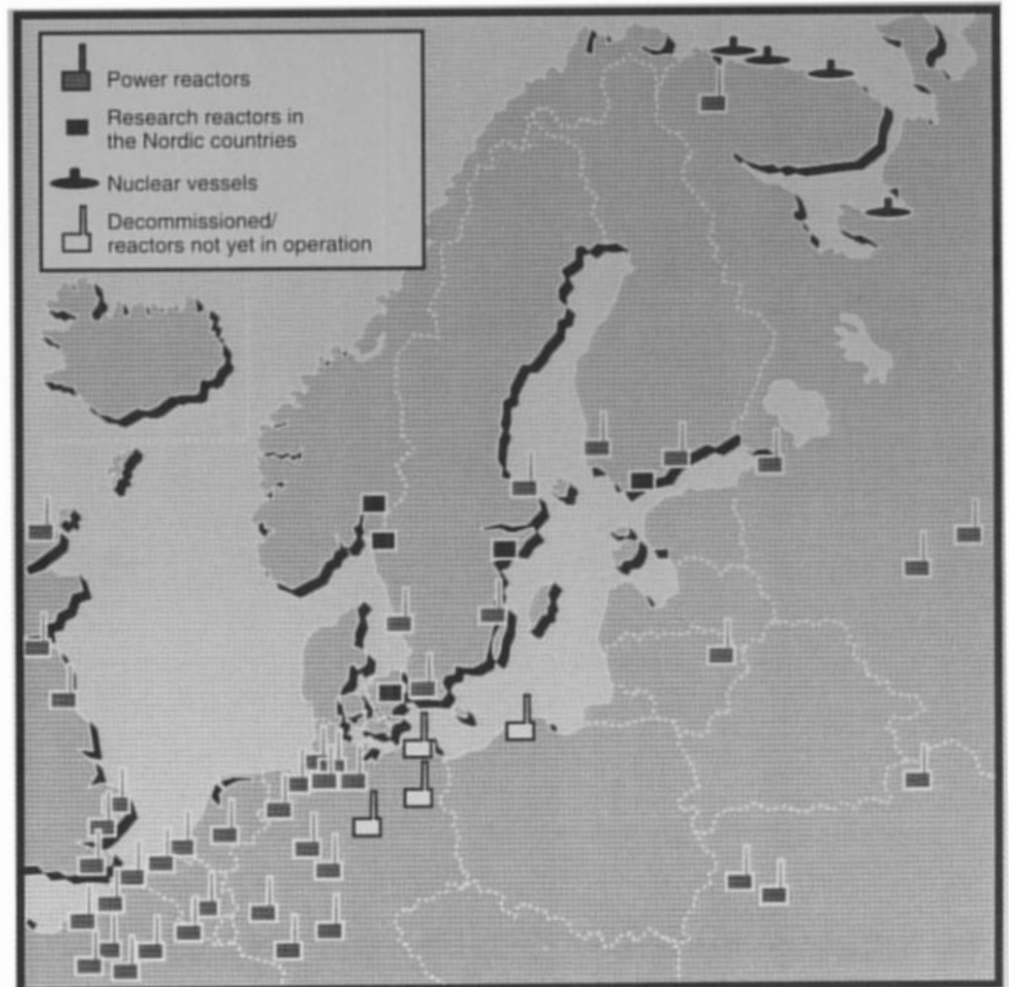


# Nordic Nuclear Emergency Exercises



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*Final Report of the Nordic Nuclear  
Safety Research Project BER-5*

**Torkel Bennerstedt  
Erling Stranden  
Anneli Salo**

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## **Nordic Nuclear Emergency Exercises**

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**NKS**

P.O.Box 49

DK-4000 Roskilde

Telefax (+45) 46 32 22 06

### **The Nordic Council of Ministers**

was established in 1971. It submits proposals on co-operation between the governments of the five Nordic countries to the Nordic Council, implements the Council's recommendations and reports on results, while directing the work carried out in the targeted areas. The Prime Ministers of the five Nordic countries assume overall responsibility for the co-operation measures, which are co-ordinated by the ministers for co-operation and the Nordic Co-operation Committee. The composition of the Council of Ministers varies, depending on the nature of the issue to be treated.

### **The Nordic Council**

was formed in 1952 to promote co-operation between the parliaments and governments of Denmark, Iceland, Norway and Sweden. Finland joined in 1955. At the sessions held by the Council, representatives from the Faroe Islands and Greenland form part of the Danish delegation, while Åland is represented on the Finnish delegation. The Council consists of 87 elected members - all of whom are members of parliament. The Nordic Council takes initiatives, acts in a consultative capacity and monitors co-operation measures. The Council operates via its institutions: the Plenary Assembly, the Presidium, and standing committees.



## **Abstract**

This report describes two Nordic emergency exercises, engaging primarily decision makers in the five countries (Denmark, Finland, Iceland, Norway and Sweden). The main objective was to test and harmonize Nordic decision making in an emergency situation. Both exercises were conducted simultaneously in all five countries.

In the first exercise, NORA, an acute-phase emergency situation was simulated, involving two colliding naval vessels. The second exercise, ODIN, dealt with a late-phase fallout situation following a reactor accident outside the Nordic region.

The practical organization of these two large regional exercises is described. Difficulties and problems are discussed, and the evaluators' reports from the two exercises summarized. Objectives, scenario, participating organizations, number of staff, necessary facilities and other crucial issues are presented. The lessons learned from the Nordic exercise program, as presented in this report, might serve as valuable input to future international exercises.

### **Key words:**

Acute phase; Checklist; Communication; Data exchange; Decision making; Denmark; Emergency plans; Evaluation; Finland; Harmonization; Iceland; Information; Late phase; Norway; Planning; Radiation accident; Reactor accident; Scenario; Sweden



## Summary

In all Nordic countries, nuclear emergency provisions have been revised following the Chernobyl accident. Local and national exercises are carried out regularly in each country. Several actions have been taken to harmonize the emergency approaches of the Nordic countries. In order to further promote consistent decisions in an emergency situation, two Nordic exercises were conducted in 1993.

It was important to see if all five countries (Denmark, Finland, Iceland, Norway and Sweden) responded in a similar way to a given situation, as far as risk assessment and protective measures were concerned. The exercises were mainly aimed at decision makers and advisers of the five national emergency organizations. Thus, the exercises did not include comparison of underlying calculations on, e.g., atmospheric trajectories or transfer of radioactive material from air to ground. Such functions were tested separately in drills that also formed part of the Nordic emergency preparedness program.

The main argument for a coordinated Nordic intervention policy is that the general public would not understand or accept significantly different ambition levels in the five Nordic countries. There has to be a good reason for any differences in protective measures. Otherwise there will be a loss of confidence as far as authorities are concerned, and necessary protective actions may suffer.

It turned out that considerable effort is required to prepare exercises of this kind and magnitude. In each country, a national exercise leader was appointed. A Nordic evaluation team was set up. Common rules for the simulated inputs during the exercise and for the evaluators were decided on. The scenarios were prepared by an independent group. An essential planning item is the coordination of the Nordic exercises with those performed on a more routine basis in each country.

The exercises included an acute-phase situation (NORA), and a late-phase situation (ODIN).

The Nordic exercises aroused international interest, and hence observers from IAEA, OECD/NEA and the European Union were invited to the exercises. NORA was observed by representatives from IAEA (in Finland) and OECD/NEA (in Sweden). ODIN was attended by IAEA (in Sweden) and the European Union (in Norway).

Generally speaking, regional exercises such as NORA and ODIN help improve national emergency preparedness planning, organization and operations as well as international coordination. At the same time they offer an opportunity to train the staff and check the equipment. If and when regional harmonization is desired in decision making or information policy, joint exercises provide an excellent platform.

It is believed that the experiences of the two Nordic exercises could be of value to other organizers of international exercises.

## **NORA**

The exercise NORA was conducted on January 14, 1993, simultaneously in all five countries, to test the exchange of information among countries and promote neighborly discussions prior to making important decisions. During this exercise, responses to a common external threat were tested.

In the NORA scenario, two nuclear powered vessels headed for their home harbors, one in the East and one in the West, after a collision off the coast of Norway. Measurement data indicated that both vessels had suffered damage to at least one reactor each. There were also rumors that the vessels carried nuclear weapons.

This exercise showed that it cannot be taken for granted that decisions made in one of the Nordic countries will be in harmony with those made in the neighboring countries. It also turned out that there will not necessarily be a coordinated response to questions from non-Nordic countries or international organizations in the acute phase, even when such coordination has been explicitly requested.

A limited number of contacts were made with Nordic colleagues during the exercise, mainly concerning radiation measurements, general information on the situation and, to some extent, nuclear safety matters. NORA revealed that Nordic contacts need to be systemized during normal conditions, so that they form a natural part of the tasks in emergency situations.

The results of NORA also suggest that one way of transferring experience and sharing knowledge would be to invite observers from other Nordic countries to national exercises.

There seems to be Nordic consent that the exercise was useful and worthwhile, since it raised important policy questions regarding Nordic acute-phase contacts. These questions remain unsolved and will have to be discussed in the future.

In the future, economic consequences of protective measures should be considered, in particular in situations where hardly any health risks are to be expected.

The exercise has contributed to prompt an in-depth discussion at the policy making level, regarding the desirability - and feasibility - of a coordinated Nordic intervention policy. It has also become clear that certain items have to be coordinated in advance, such as communication procedures, intervention levels and information policies. Other actions and measures, more intimately related to the acute situation, will have to be left until an actual emergency.

## **ODIN**

The exercise ODIN was conducted on November 26, 1993, simultaneously in all five countries. Also in this exercise, it was essential to check communication between the countries. A secondary object was to test the independent national response of the five countries to a common threat, and to compare their actions afterward. All countries were given similar scenarios. The participants were brought to the sixth day after a serious accident abroad, leading to severe radioactive fallout. The type of accident and its causes had no immediate bearing on the scenario. The decision makers had to assess the situation, evaluate risks and reconsider the protective measures that had been taken during the first few days. They also had



to decide on further actions and additional protective measures as new data were made available.

Prior to the exercise, each of the participating emergency organizations was asked to fill out a checklist, to indicate what measures had been taken (or not taken) during the first five days after the accident. This checklist turned out to be a valuable tool and is recommended for use by future organizers of late-phase exercises. The five national sets of answers to the checklist were in good agreement with each other. Thus, the initial risk assessment was basically the same in all countries. A majority of the initial actions were maintained throughout the exercise.

While the decision making process was well coordinated nationally, in the Nordic perspective this was not so. The Nordic contacts concentrated mainly on exchange of information rather than on consultations. Technically, the communications worked as smoothly as can be expected. An already existing Nordic catalog of telephone and fax numbers was found to be useful. The exercise showed that there is still need for improvement as regards knowledge of the Nordic neighbors' emergency organizations. Modern technical tools such as computers and electronic mail should be used to a higher degree in Nordic contacts than was the case during ODIN.

The information to the public was efficient, although "double messages" (i.e., contradictory information or differing decisions in neighboring countries in spite of similar situations) were not entirely avoided.

The fact that the intervention levels for food are not the same in all Nordic countries caused some concern. This was identified as one area suitable for further Nordic harmonization.

The evaluators point out that late-phase exercises present a number of problems that differ from those of acute-phase exercises. Briefing of the players prior to the exercise is an example of this. It is difficult to convey all information available in the scenario to the participants in, say, half an hour. Had it been a real accident, the participants would have followed the development closely for a number of days.

Similar contamination levels occurring simultaneously in all countries is not a very likely situation. Therefore, the late-phase scenario of ODIN was judged not to be very realistic.

## **Lessons learned from the Nordic exercise program**

Some major conclusions from the conduct of exercises NORA and ODIN are given below.

- 1      **International contacts and exchange of information during an exercise**
  - are not to be expected other than sporadically during the acute phase, since all national organizations are busy with tasks that have a higher priority in the national context
  - but are to be expected (and will be required) during the late phase, when long-term action plans are made
- 2      **International coordination and harmonization of emergency preparedness is a continuous process that should promote:**
  - International agreements on protection strategies, including action levels
  - Exchange of information on national emergency organizations, measurement programs etc.
  - Information policies, including communication procedures, designed to avoid contradictory messages
- 3      **If possible, national or regional exercises should be coordinated with international exercises to save resources.**
- 4      **In order to create an international scenario that is equally interesting to all involved countries, it may be necessary to refrain from realism as regards either events, time-frame or geographic conditions.**
- 5      **In preparing scenarios, one should**
  - concentrate on the really important aspects and issues
  - avoid going into too much detail
  - not try to cover all aspects or issues

**Small international workshops, with one or two participants from each country or major national organization, provide an efficient forum for scenario preparation.**
- 6      **When organizing late-phase exercises, it is recommended that each of the participating organizations completes a checklist for measures taken in the initial (pre-exercise) period of the emergency. Such a list**
  - makes the exercise more realistic and provides means to identify possible differences in the interpretation of the scenario
  - contributes to the commitment of the leaders of the emergency organizations

# Svensk sammanfattning

## (Swedish summary)

I samtliga nordiska länder har beredskapsorganisationerna setts över och vid behov ändrats som en följd av Tjernobylolyckan. Lokala och nationella beredskapsövningar genomförs regelbundet i de fem länderna. Åtgärder har vidtagits för att harmonisera agerandet länderna emellan. För att ytterligare främja ett samstämmigt nordiskt agerande under likartade beredskapsbetingelser i de fem länderna genomfördes två nordiska övningar under 1993.

Avsikten var att undersöka om alla fem länderna (Danmark, Finland, Island, Norge och Sverige) hanterade likartade situationer på ungefär samma sätt, vad gäller riskuppskattningar och åtgärder. Övningarna vände sig i första hand till beslutsfattare och rådgivare i de fem nationella beredskapsorganisationerna. Övningarna inkluderade inte jämförelser av bakgrundsfakta t ex i form av beräkningar av trajektorier eller överföring av radioaktivt material från luft till mark. Detta testades i stället i separata funktionsövningar som också genomfördes inom ramen för det nordiska beredskapsprogrammet.

Att arrangera övningar av det slag och den omfattning som beskrivs i denna rapport visade sig vara mycket krävande. En nationell övningsledare utsågs i varje land. En nordisk utvärderingsgrupp tillsattes. Gemensamma bestämmelser fastställdes för inspelen under övningen, och regler skrevs för utvärderarna. Scenarierna utarbetades av en särskild arbetsgrupp. Ett viktigt inslag i planeringen av övningen var koordineringen med de mer regelbundet förekommande nationella övningarna.

Övning NORA behandlade akutfasen i samband med en olycka, medan ODIN rörde sig om senfasen efter en annan olycka.

De nordiska övningarna rönt internationellt intresse, varför IAEA, OECD/NEA och Europeiska Unionen (EU) inbjöds att sända observatörer. NORA följdes av representanter för IAEA (i Finland) och OECD/NEA (i Sverige). ODIN bevakades av IAEA (i Sverige) och EU (i Norge).

Generellt sett bidrar regionala övningar som NORA och ODIN till att förbättra såväl den nationella beredskapsplaneringen, organisationen och insatserna som den internationella koordineringen. Samtidigt ger övningarna tillfälle att träna personalen och prova utrustningen. Om det är möjligt och önskvärt att harmonisera beslutsfattande eller informationspolicy, så utgör gemensamma övningar en bra grund.

## NORA

Övning NORA genomfördes samtidigt, den 14 januari 1993, i alla de fem nordiska länderna, för att testa informationsutbytet mellan länderna och stimulera diskussioner länderna emellan innan man fattade viktigare beslut. I denna övning studerades hur de olika nationella organisationerna förhöll sig till ett gemensamt externt hot. Två kärnkraftdrivna fartyg hade kolliderat utanför Norges västkust och försökte ta sig till sina hemmahamnar, en i öst och en i väst. Mätdata visade att minst en reaktor på vardera farkosten skadats. Det gick även rykten om att farkosterna var utrustade med kärnvapen.

Det viktigaste skälet för att ha en gemensam nordisk policy i åtgärdsfrågor är att allmänheten skulle ha svårt att förstå eller acceptera avsevärt olika ambitionsnivåer i de olika länderna. Det måste finnas starka skäl för eventuella skillnader. Annars kommer allmänheten att tappa förtroendet för myndigheterna, och beslutade insatser kommer inte att bli så effektiva som avsett.

Övning NORA visade att man inte kan ta för givet att de beslut som fattas i ett nordiskt land harmonierar med beslut i grannländerna. Det visade sig också att det inte är självklart att man länderna emellan koordinerar sina svar på frågor från icke nordiska länder eller internationella organisationer under akutfasen, inte ens där detta uttryckligen begärts.

I framtiden bör större vikt läggas vid de ekonomiska konsekvenserna av olika åtgärder, särskilt i situationer där inga direkta hälsorisker förväntas.

Övningen har bidragit till en fördjupad diskussion i beredskapsledningarna huruvida en samordnad nordisk åtgärds- och informationspolicy är önskvärd och möjlig. Det har visat sig att vissa frågor måste koordineras i förväg, t ex sambandsrutiner, åtgärdsnivåer och informationspolicy. Andra mera situationsanpassade åtgärder måste vänta till ett verkligt beredskapsläge.

Antalet nordiska kontakter under övningen var relativt begränsat. De bestod främst av mätdata, allmän lägesinformation och vissa kärnsäkerhetsfrågor. NORA visade tydligt att nordiska kontakter bör systematiseras redan innan något händer, så att de blir en naturlig del av arbetsuppgifterna i ett skarpt läge.

NORA visar också att ett sätt att överföra erfarenheter och sprida kunskaper kunde vara att inbjuda observatörer från de nordiska grannländerna till nationella övningar.

Även om övningen var tids- och resurskrävande tycktes det råda nordisk samstämmighet om att den var nyttig och meningsfull, eftersom den väckte viktiga frågor av policykaraktär om nordiska kontakter under en akutfas. Dessa frågor kommer förhoppningsvis att diskuteras närmare i framtiden.

## ODIN

ODIN genomfördes samtidigt i de fem nordiska länderna den 26 november 1993. Även denna gång var kommunikationerna mellan länderna av central betydelse. Ett delmål var att se vilka åtgärder som genomfördes i de fem länderna och jämföra de vidtagna åtgärderna efteråt. Alla länderna fick likartade scenarier, byggda på ett nordiskt grundscenario. Övningen utspelades den sjätte dagen efter en allvarlig reaktorolycka utanför Norden, vilken medfört kraftigt nedfall. Det var inte väsentligt för övningen vilken typ av olycka det gällde eller vad som orsakat den. Övningsdeltagarna skulle skapa sig en bild av situationen, uppskatta riskerna och utvärdera de åtgärder som vidtagits under de fem första dygnen efter olyckan. Deltagarna skulle vidare fatta beslut om ytterligare insatser och åtgärder vartefter nya mätdata blev tillgängliga.

Före övningen fick beslutsfattarna i vart och ett av de deltagande länderna fylla i en checklista, där de lämnade uppgifter om vilka åtgärder som vidtagits (eller inte vidtagits) under tiden fram till övningsdagens morgon. Denna checklista befanns vara ett utmärkt hjälpmedel och rekommenderas för framtida organisatörer av senfasolyckor. Överensstämmelsen mellan de fem nationella svaren på checklistan var god. Det betyder att man gjorde ungefär samma bedöm-

ning av riskerna i utgångsläget i samtliga länder. I de flesta fall valde myndigheterna att hålla fast vid de åtgärder som beslutats under de första dagarna.

Nationellt var beslutsfattandet väl koordinerat. Sett i det nordiska perspektivet var det dock sämre. De nordiska kontakterna inriktades mera på informationsutbyte än konsultationer. Tekniskt sett fungerade kommunikationerna så bra man kan begära. En sedan tidigare befintlig sambandskatalog befanns värdefull. Moderna hjälpmedel som datorer och elektronisk post skulle emellertid kunna användas i högre utsträckning än som var fallet under ODIN. Kunskaperna om de nordiska grannländernas beredskapsorganisationer behöver förbättras.

Informationen till allmänheten sköttes effektivt. Man lyckades dock inte helt undvika "dubbla budskap", det vill säga motstridig information eller skilda beslut i de olika länderna trots likartade förhållanden.

Det faktum att åtgärdsnivåerna för livsmedel inte är samma i de fem länderna orsakade en del bekymmer. Här kan ytterligare insatser göras för att åstadkomma nordisk harmonisering.

Utvärderarna påpekar att svårigheterna med en senfasövning skiljer sig en hel del från en akutfasövning. Genomgången med deltagarna inför en senfasövning är ett exempel på detta. Det är svårt att på cirka en halv timme lämna all den information som scenariot innehåller. Hade det rört sig om en verklig olycka, så skulle deltagarna ha följt utvecklingen på nära håll i ett antal dagar.

En situation med ungefär lika allvarlig kontamination samtidigt i de fem nordiska länderna är mycket osannolik. Därför bedömdes senfascenariot i ODIN som inte särskilt realistiskt.

# **Erfarenheter av det nordiska övningsprogrammet**

De viktigaste slutsatserna och lärdomarna från övningarna NORA och ODIN sammanfattas här.

- 1      **Internationella kontakter och utbyte av information under en övning**
  - kan inte förväntas annat än sporadiskt under akutfasen, när alla nationella organisationer är upptagna med högre prioriterade nationella arbetsuppgifter
  - men kan förväntas (och kommer att krävas) under senfasen, då handlingsplanerna på längre sikt fastläggs
  
- 2      **Internationell koordinering och harmonisering av olycksberedskap är en kontinuerlig process som ska verka för**
  - internationella överenskommelser om skyddsstrategier, inklusive åtgärdsnivåer
  - utbyte av information om nationella beredskapsorganisationer, mätprogram etc
  - en informationspolicy (inklusive sambandsprocedurer) som motverkar motstridiga budskap
  
- 3      **För att spara resurser bör om möjligt nationella och regionala övningar samordnas med internationella övningar**
  
- 4      **För att konstruera ett scenario som är lika intressant för alla deltagande länder kan det vara nödvändigt att släppa kravet på realism vad gäller antingen händelseförlopp, tidsramar eller geografiska förhållanden**
  
- 5      **När man skriver scenarier bör man**
  - koncentrera sig på de verkligt viktiga aspekterna och ämnesområdena
  - undvika att bli alltför detaljerad
  - inte försöka täcka in alla aspekter eller ämnesområden

Små internationella arbetsgrupper, med en eller ett par deltagare från varje land eller de större nationella organisationerna, är ett effektivt forum för scenariearbete
  
- 6      **Rekommendation för organisatörer av senfasövningar: Låt varje deltagande land fylla i en frågelista avseende vilka åtgärder som vidtagits initialt (under perioden före den tidpunkt som övningen avser övningen), eftersom en sådan lista**
  - gör övningen mer realistisk och gör det möjligt att urskilja ev olika tolkningar av scenariot
  - bidrar till att ledarna i beredskapsorganisationen engagerar sig i övningen

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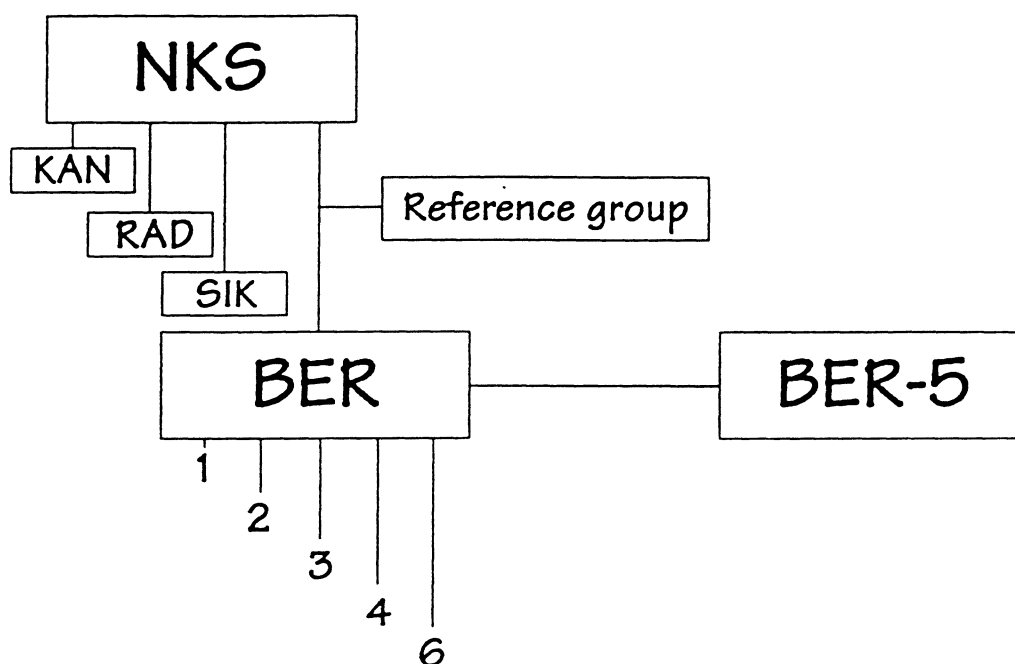
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# Preface

## Why and for whom is this report written?

This is the final report on the Nordic nuclear emergency exercise program carried out during the years 1990 thru 1993 by NKS (the Nordic Committee for Nuclear Safety Research). NKS and its scientific program are briefly described on the back cover of this report and illustrated below. Emergency preparedness issues were studied in a specific program called BER, which in turn was divided into separate but interlocking projects. One of them, BER-5, dealt with two Nordic emergency exercises, NORA and ODIN, carried out in 1993.



The present report is aimed, firstly, at all participating organizations, and secondly, at any Nordic or international body wishing to draw from our experience of organizing large scale international exercises. The objective is to show the complexity of the matter, illustrate some of the difficulties encountered enroute, and stress the need for internationally endorsed procedures not only when organizing exercises, but primarily in case of a real accident.

Harmonization of procedures and close cooperation at a planning stage could facilitate and improve data exchange, emergency response, remedial actions, and information to the public.

It can be learned from the Nordic exercise program that preparation of a regional exercise is time consuming and requires considerable resources, both in manpower, funds and equipment. One major benefit, as compared to previous smaller national projects, is the wider scope offered by the Nordic perspective and the subsequent extended national engagement. It turned out to be important to involve **decision makers of all relevant authorities** and other organizations. Their commitment is a necessary prerequisite in order to enhance the emergency preparedness capacity and rescue capability of the society and encourage contacts between

various disciplines and expert groups. It was widely felt that the large-scale exercise program made all parties feel that the outcome and practical results of the exercises were not only their responsibility but also their common property.

The overall Nordic experience is described in the main sections of this report, while special attention is given to important details in the Appendices. Far from saying that this is the proper way to prepare and conduct an international exercise, we rather hope that some of the mistakes we made can be avoided by future organizers. Whether our efforts serve as a warning to others or offer valuable advice is for the reader to decide when planning international or large-scale national exercises.

# **1 Introduction**

## **1.1 Why arrange international exercises?**

Nuclear accidents know no boundaries when it comes to threats and consequences. A radioactive cloud may cause serious fallout in several countries. Bearing this in mind, it is obvious that exercises dealing with accident situations or nuclear threats should be not only national or bilateral but also from time to time international.

A number of international regulations, conventions, treaties and agreements have been ratified in the nuclear field regarding, among other things, notification, early warning and exchange of information. It is only natural to test internationally that the procedures necessary to fulfill the obligations are operable and that the organization is adequate.

In addition to this more formal approach to handle a real situation, it is important that contacts be made also in the case of rumors. This is particularly true in case of neighboring countries where the populations display parallel patterns of behavior and reaction, due to their similar cultural background, historic heritage etc., as in the Nordic countries. It is of vital importance that the messages conveyed by the independent national emergency organizations are as identical and coherent as possible, to avoid international and national confusion. If this is not the case, i.e., if the information given or the measures taken diverge significantly from one country or organization to the other, neither of the organizations or nations will be considered trustworthy.

One useful way of checking whether the countries in question would react in a similar fashion to a given situation is to perform a simulation or to conduct an exercise. This might prevent confusing "double messages" of at least two types:

- \* A certain protective measure is carried out in one country but not by its neighbors, although the situation is similar. "Why is this dangerous in our neighboring countries but not here?"
- \* "You shouldn't do this or that, but in case you already have, it won't harm you" - messages of a type found in abundance after the Chernobyl accident.

As a consequence of modern computer technology and data transmission the world has become smaller and all nations more integrated. The direct links between countries will be put to test in an accident situation. Therefore, it is important to check beforehand whether the advanced technological systems work. So the mere fact that we have such an excellent set of tools gives us another reason for conducting international exercises.

## **1.2 The IAEA concepts of Drills and Exercises**

One of the best and most efficient (but not necessarily most inexpensive) methods of upgrading the emergency organization and training the staff is to engage in drills and exercises.

IAEA differentiates between drills, partial exercises and integrated exercises (see below).

International exercises can be subdivided into several groups. One type would be to have all participating countries report to some central organization, such as the IAEA, but not to establish contact with other countries. Another type would be an exercise with bilateral and multilateral communication between all involved countries, as well as with relevant international organizations, and where each country also had to consider its domestic authorities, other organizations, newsmedia and the general public.

NORA and ODIN were international exercises in the latter, more demanding sense, their scope, however, being a partial exercise in IAEA terminology.

**IAEA definitions (Safety Series No. 73):**

- \* **DRILL:** "Conducted to develop and maintain skills in certain basic operations or tasks."
- \* **EXERCISES** are more demanding, both in scope and in terms of what is required from the participants. IAEA distinguishes between two categories of exercises:
  - **PARTIAL:** "A combination of basic operations or tasks designed to develop or test the interaction between tasks and/or organizations"
  - **INTEGRATED:** "The most ... exhaustive test of emergency response capability ... involving full participation by all on-site and off-site response organizations."

### **1.3 Why this program?**

What, then, makes a Nordic program of joint exercises interesting? To our knowledge, NORA and ODIN were the first multinational exercises of their kind, with respect to format and scope.

The Nordic exercises performed under this program aimed at testing and harmonizing decision making and exchange of information between the participating nations. Traditional objectives, like testing national organizations, communication links, information to media and the general public etc., were of minor concern in this case. They were assumed to be tested in advance and should work satisfactorily. Some function tests of this kind were carried out prior to NORA and ODIN.

There will be plans for OECD/NEA, IAEA, European Union and other international exercises in the future; others have already been conducted (e.g., the NEA exercise in 1993 called INEX1). Rather than taking the giant leap from the national to the fully international level, the Nordic countries have divided it into two smaller steps: first from the national to the Nordic (i.e., regional) level, and from there to a wider international level. This should facilitate matters, the first step providing valuable information while preparing for the second.

To emphasize the international aspect of the Nordic program, representatives of relevant international organizations were invited to follow the conduct of NORA and ODIN. IAEA, OECD/NEA and the European Union accepted the invitation and sent observers to Finland, Norway and Sweden.

Thanks to the Nordic heritage, difficulties due to different cultural, social, political and economic background are minimal. This means that more time and energy can be devoted to solving accident management problems than overcoming national barriers.

## **2 Objectives**

### **Main objective**

The main objective of exercises NORA and ODIN was to test and harmonize Nordic decision making in an emergency situation.

### **Secondary objectives**

From this the following secondary objectives emerged:

- \* To test the methods of cooperation between the Nordic countries
- \* To test contacts with countries outside the Nordic region and with international organizations
- \* To exercise the national emergency organizations in a Nordic perspective
- \* To improve the ability of the Nordic countries to cope with an emergency situation involving
  - a rumor of an accident (NORA)
  - a large ground deposition of radionuclides (ODIN)
- \* To supply background material for necessary adjustments of the national emergency organizations concerning:
  - Organizational structure
  - Ways of cooperation
  - Manpower
  - Other resources
  - Exchange of information (international, Nordic, national)
  - Policy for decision making

### **Remark**

The above objectives were common to both exercises.

For objectives specific to NORA, turn to Appendix A.2, page 43.

For objectives specific to ODIN, turn to Appendix A.3, page 51.



## **3 Prior Nordic experience**

During the last couple of years, the national nuclear emergency organizations of the Nordic countries have gained wide experience through actual incidents and accidents as well as by means of national, bilateral and multilateral exercises. Under the NKS program some basic functions have also been tested.

### **3.1 Accidents and threats**

The Chernobyl accident demonstrated in a dramatic way that many countries lacked a proper emergency organization. In all Nordic countries this experience led to changes or improvements in the existing national nuclear emergency organization. The need for contacts between the Nordic central authorities and for harmonization of information to the public was also clearly demonstrated.

After the Chernobyl accident the Nordic nuclear emergency organizations have been activated in several cases:

- \* Submarine accidents in the North Sea and in the Arctic area
- \* Rumors of a radioactive plume from the Kola peninsula
- \* Incidents at the nuclear power plants in Ignalina and Sosnovyj Bor
- \* Underground nuclear weapons tests in Novaya Zemlya
- \* Reentering nuclear powered satellites

In all of these cases, contact was established between the Nordic authorities, and their actions were to some extent harmonized.

### **3.2 Exercises, drills and staff training**

Finland and Sweden being nuclear power nations have directed much of their efforts in emergency planning, drills and exercises toward their own power plants, while the other Nordic countries concentrate mainly on external threats. Normally, national exercises have never involved the Nordic neighbors, with one exception. Denmark and Sweden regularly conduct bilateral exercises concerning the Swedish nuclear power plant at Barsebäck, located close to the Danish border and Copenhagen, the capital of Denmark.

During the previous NKS project period (1990 - 1993), all of the Nordic countries conducted one or more national exercises involving the national authorities. The BER reference group promoted the joint Nordic project and helped establish valuable contacts, thus facilitating the practical work. Without NKS, the BER program and its reference group, exercises NORA and ODIN would not have been possible. This experience shows that it is important to invite top decision makers, responsible for emergency operations, and their staff for discussions and considerations regarding international exercises.

Under the NKS program, a number of Nordic and national drills have been performed to test various technical skills and functions, e.g., regarding decision making, exchange of information and meteorological prognoses. Therefore, these skills could be assumed to exist at the time when NORA and ODIN were performed.

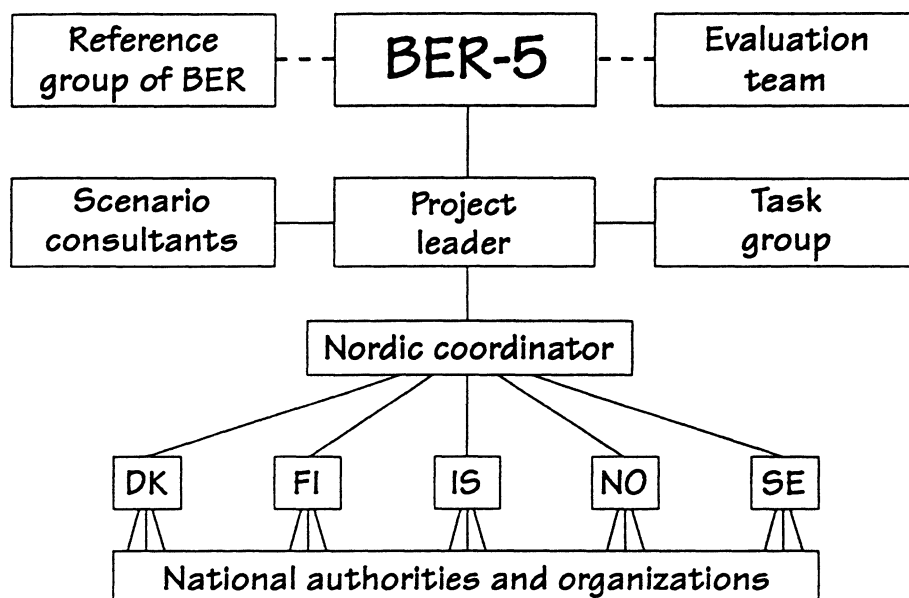




## 4 Organization and planning

### 4.1 Project organization

The preparations for the two exercises were carried out using the following project organization:



The BER-5 project leader was in charge of the work and reported directly to NKS. Key personnel from all the Nordic countries constituted a task group to assist the project leader, especially in national matters.

Directly under the project leader, a Nordic coordinator planned the practical work and supervised national preparations in all five countries.

Each country appointed a national coordinator, responsible for the practical arrangements in cooperation with all national organizations involved. The national coordinators also liaised with the Nordic coordinator.

The scenarios for NORA and ODIN were developed by independent consultants in close cooperation with the project leader and the Nordic and national coordinators.

An evaluation team, consisting of national representatives and led by a Nordic chairperson, compiled a report for each exercise. All suggestions for improvements of Nordic cooperation and national organizations made in the present report are based on the findings of the evaluation team. Their results were presented at a Nordic seminars shortly after NORA. Regarding ODIN, the evaluation report was distributed to participants only, since a seminar on the entire BER program was arranged in May, 1994. Chapter 7 of the present report is based on the conclusions of the evaluation team. For more details, please refer to Appendix A.1.

## **4.2 Regulations and guidelines for the conduct of the exercises**

Joint Nordic regulations and guidelines for the exercises were agreed upon and published well in advance of NORA and ODIN, respectively. They served as common rules as to the minimum common standards regarding preparations, procedures and conduct of the two exercises. The Nordic regulations and guidelines were later complemented by strictly national issues, which were not allowed to contradict the Nordic rules.

The Nordic regulations and guidelines

- specified the objectives of the exercise in question
- outlined the scenario
- presented the general timetable for the day of the exercise
- stipulated that national catalogs of telephone and telefax numbers be prepared for national, Nordic and international telecommunications
- regulated the registration and documentation of all messages (sent or received), decisions, actions taken, media contacts and other items of interest; the log was to be handed over to the evaluators after the exercise
- pointed out that international observers would follow the exercise
- suggested that field organizations and local authorities not be involved unless necessary for the proper conduct of the exercise
- named the Nordic evaluation team
- named the Nordic and national supervisors
- mentioned that advance information on the exercise would be prepared by the BER-4 team
- stated that rules for contacts with news media were a national concern

The language to be used for Nordic contacts was recommended to be any of the Scandinavian languages (Danish, Norwegian, Swedish), since Finland is officially bilingual (Finnish and Swedish), and many Icelanders speak or understand Danish. For clarity, English could be used in Nordic contacts, and had to be used in all non-Nordic international contacts. National contacts were naturally to be conducted in the national language.

The following items were explicitly left to the national emergency organizations to decide on:

- Participants (how many; from what organizations; etc.)
- Venue
- Test of emergency alert
- Check-in procedures
- Interactors and service staff (how many; tasks; etc.)
- Practical details such as office services, meals etc.

## **5 Exercise format and scenarios**

### **5.1 Format of the exercises**

At an early stage it was decided that the purpose of the BER-5 program was best served if it included two exercises, focusing on different aspects of international cooperation and harmonization of the decision making process.

The first exercise, NORA, was also known as the acute phase. It dealt with a rumor that an accident had occurred or might occur. If the rumor turned out to be true, a major threat would be presented to all Nordic countries. Hence, the emergency organizations of the five countries were alerted in immediate response to the situation. The participants were expected to find out what had actually happened and take proper action. Exchange of information and harmonization of decisions were the essential traits of NORA. Consequently, the exercise was conducted simultaneously in all five countries, on January 14, 1993.

A tentative evaluation of NORA served as input in preparing for ODIN, the second exercise. Thus, the experiences from NORA were fed back into the emergency response organization and the layout of ODIN. As is demonstrated below, this led to an important shift in character and objective of ODIN.

ODIN was also known as the late phase. Now the objective was to test how the five national organizations responded to a similar situation and a set of similar events. A severe fallout situation six days after an accident abroad was studied. Originally, the idea was to compare how the five national organizations handled similar situations, and hence the exercise was intended to be carried out on separate dates in each country. In that manner five independent solutions would result.

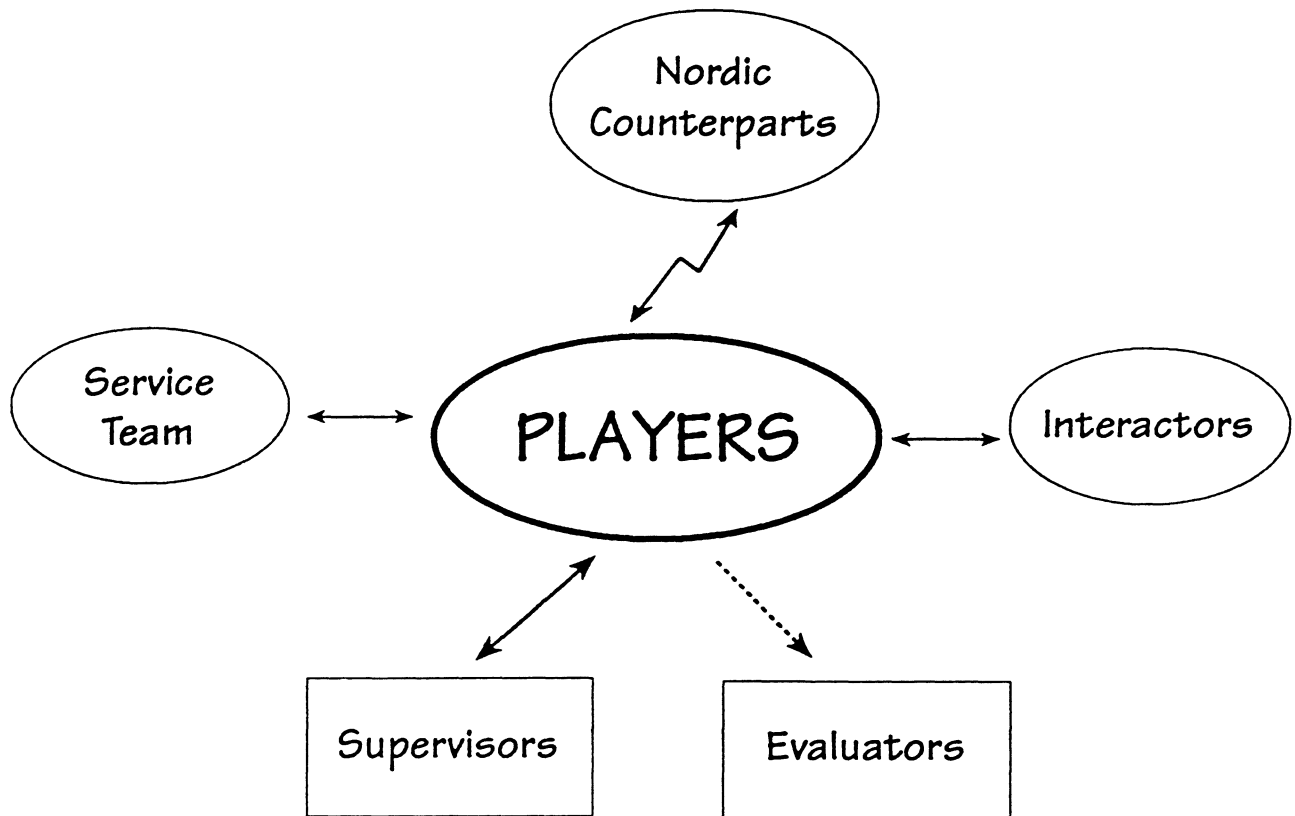
However, as the evaluation of NORA showed that Nordic contacts left much to be desired, it was decided to perform ODIN simultaneously in all five countries, the main objective once again being Nordic cooperation and exchange of information. This new format is also by far more realistic than the original one.

Some details on the NORA and ODIN scenarios are given below. More detailed information can be found in Appendices 2 and 3.

Participating groups and their interactions are schematically depicted in the figure on the next page.

## NORA and ODIN:

### Schematic representation of participating groups



The team of PLAYERS constituted a group of national decision makers, subject to the exercise. The PLAYERS represented all involved authorities and other organizations. They interacted with other participants in the exercise and responded to external input.

The PLAYERS could establish contact with their Nordic counterparts by means of telephone and telefax communications, for exchange of information, discussions etc.

The PLAYERS had access to a service team, offering assistance in practical matters such as copying, various errands, lunch, tea and coffee.

A team of national interactors represented the world outside the one represented by the PLAYERS. The interactors asked questions, made comments, spread rumors etc., as laid down in their scripts. They also had to act independently in response to the development of the situation, from time to time in cooperation with some or all of their Nordic colleagues.

The PLAYERS and the entire exercise were followed by a number of supervisors, who were instructed to

- act as exercise leaders and follow the events
- keep in touch with their Nordic colleagues to ensure that the agreed policy for the leaders and the exercise was observed
- answer any questions that might arise
- decide on what action to take in situations that were not foreseen
- intervene if the exercise took a different course than was planned, threatening the objectives of the exercise

The exercise was watched and scrutinized by a group of evaluators, who collected information and made notes during the exercise and discussed the exercise with all involved groups immediately afterward. Each national group of evaluators then compiled a national report to the team of Nordic evaluators. They, in turn, prepared the final Nordic evaluation report regarding the exercise. The evaluators were not expected to interact with the PLAYERS during the exercise, just observe their work. The evaluation was also to include comments on the preparation of the exercise, the performance of the leaders, the degree of realism of the scenario and the scripts, etc.

## **5.2 NORA**

### **5.2.1 General**

It is of major importance to be able to establish the right contacts, check the available communication channels and agree on a common policy for decision making at a very early stage of an accident; preferably even prior to an accident. The following points were of particular interest in the acute phase scenario of NORA.

As soon as the national organizations have been mobilized, telecommunications should be checked and contacts with relevant national and international organizations established, especially with neighboring countries' emergency operations centers.

If necessary and practically achievable, available resources in manpower, data bases, reference material and other background information could be pooled and coordinated between the countries.

Starting at an early stage, each country must observe the international development in protective measures, plans, time schedules and use of resources. This will prove beneficial when planning or deciding on national actions.

The need for information to mass media and the public must be analyzed continuously by the responsible authorities. Official information policies and strategies as well as all messages of greater importance from the authorities should be coordinated internationally, to the greatest extent possible.

In order to disclose unwarranted dissimilarities in emergency preparedness and response between participating countries and organizations, the exercise had to take place simultaneously in all five countries.

### **5.2.2 Scenario**

To ensure maximum involvement of all countries and organizations, a variety of scenarios were studied. Turn to Appendix A.2 for the options under consideration. Finally, the scenario outlined below was chosen.

Two nuclear powered naval vessels of different national origin appeared to have collided in the North Sea. One was a western submarine, the other an eastern battleship. Rumors of the accident started to spread, and news media picked up the story. National authorities would have to establish contact with their Nordic counterparts in order to get a true picture of what had actually happened and the likely impact of the event. Basically, the rumors were found to be true, and national emergency operations commenced in the five Nordic countries.

The submarine was reported to travel in a westerly direction, toward its home port. The surface vessel was found to head for a harbor on the Baltic Sea after the collision. Indications suggested that there was something wrong with at least one of the power generating reactors of each vessel. Rumor had it that the submarine might sink before reaching its destination, and that the nuclear weapons presumably carried by both vessels might go off by accident.

The pressure exerted by media and the general public increased. So did the flow of questions concerning fisheries, trade and shipping companies etc. directed to the authorities. Some measurements indicated that there had been releases of radioactive material to the air.

Authorities in all countries were also faced with rumors that a neighboring country had decided on important protective measures like evacuation or distribution of iodine tablets.

A more detailed description of the scenario is given in Appendix A.2, together with details on the script for interactors.

## **5.3 ODIN**

### **5.3.1 General**

ODIN, the late phase scenario, was conducted mainly to once again check and test Nordic contacts and information exchange. Furthermore, it was desirable to test decision making in a given fallout situation, including a reevaluation of protective measures already taken during the first days after a fallout. It was important to see whether all five countries responded in the same way to a given situation, as far as risk assessment and protective measures are concerned. National deviations may be justified for a number of reasons, such as differences regarding geography, topography, demography, agriculture, infrastructure, politics, and other relevant factors. It is important that these differences be disclosed, explained and accounted for, and that corrective action be taken when called for.

In order to check whether the goals outlined above were fulfilled, the exercise had to take place simultaneously in all five countries.

### 5.3.2 Scenario

The exercise started in the morning of the sixth day after a serious nuclear accident abroad, resulting in heavy fallout a few days later over parts of each participating country. Details on the accident were not disclosed since they were of limited value in this case.

All countries were given similar scenarios, with as few national deviations as possible. No reference was made to the source term, which was considered to be immaterial as far as ODIN was concerned. The ODIN scenario had no connection to the one dealt with during NORA.

The scenario featured a fairly well-known deposition of radionuclides covering parts of each country. Some protective measures had already been executed when ODIN started, and the national measurement programs were well under way.

In order to make the scenario as realistic as possible, the five national emergency organizations were given a checklist over two weeks prior to the exercise. The checklist consisted of a number of questions regarding measures taken during the first five days after the accident (e.g., evacuation, sheltering, iodine tablets, food restrictions, measurements, Nordic and international contacts, information to mass media and the public etc. The five national adaptations of the common Nordic scenario were based on the information given in the national checklists, which were also to be distributed to the Nordic neighbors prior to the exercise. (The entire checklist is found in Appendix A.3, page 52 ff.)

The played time of the year was chosen to be during the hectic midsummer period in order to create maximal difficulties and problems with regard to tourism, agriculture etc. and decisions in these respects.

The problems presented were as far as possible designed not to offer simple solutions. There might, however, be several rational and justified solutions to a given problem, depending on which factors were considered most important in the particular case. Apart from radiation protection issues, other health related, psychological, social and economic factors might have to be taken into account. In the final decision making in a real situation, political factors will clearly play an important role, but can never be the object of an exercise of this type.

The full scenario, including early measurement data and the first protective measures were presented to the players prior to the exercise and were summarized at the outset of the exercise. The players had to take it from there. They were asked but one question: "What do you do now?". They had to do their own evaluations, ask relevant questions and obtain the information needed to make rational decisions.

Key questions thus identified by the players in the course of the exercise were:

- Must groups of people be evacuated or relocated?
- Are further restrictions of any kind needed?  
(E.g., regarding farming, foodstuff, travels etc.)
- May some of the earlier restrictions be abolished or eased?
- Is there need for additional action levels or a revision of those already in use?

Some key facts, such as initiated monitoring programs and measurement data, were reported at the start of the exercise. More information was given later or could be obtained from the inter-actors or the exercise leaders. A more detailed description of the scenario is given in Appendix A.3 (maps, fallout, measurement data, early decisions and information to the media etc.).





## 6 Conducting the exercises

Details on national organizations and their responsibilities are given in the evaluation reports of the two exercises.

### 6.1 NORA

Details on the special objectives, scenario, script etc. are given in Appendix A.2, page 43 ff.

#### 6.1.1 Denmark

NORA was conducted in the emergency command center belonging to the Emergency Management Agency. The center is situated in a 900m<sup>2</sup> underground bunker (Bernstorffbunkeren). Half of that area is available for the Emergency Management Agency in case of a nuclear emergency. The bunker has recently been equipped with modern communication equipment, a PC network etc., especially furnished for that purpose.

Number of persons involved in the exercise:

Players	22
Supervisors	8
Evaluators	8
Others	7

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Total	45
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The bunker switchboard serves 12 incoming lines and some 100 extensions. Dedicated telephone lines are established to the Danish Meteorological Institute, the National Institute of Radiation Hygiene, Risø National Laboratory, the Copenhagen Police Headquarters, the Chief of Defense and (in Sweden) the Malmö County Headquarters. Also available are

- 5 telefaxes
- 3 telexes and 1 telex modem
- 1 loudspeaker system
- Ethernet network with 5 PCs and 1 printer
- A BARCO superscreen for presentations (maps, graphics, TV etc.)

**Timetable for the exercise (local time):**

08:15 Gathering; Roll call; Breakfast  
08:45 Introduction of the scenario  
09:30 Exercise NORA; Part 1  
12:00 Announcement of the 24-hour time shift  
Presentation of the new scenario; Lunch  
12:30 Exercise NORA; Part 2  
14:00 End of NORA; break  
14:30 Group discussions  
15:30 Closing of the exercise  
15:45 End

**Contacts with mass media:**

Radio Denmark and the news agency Ritzaus Bureau represented connections to other media and the public, and would normally act to ensure that media and the public would get verified information from the Emergency Management Agency as soon as possible. Other national and local TV channels were also allowed to report from the exercise. Although the reporters were very interested in the exercise, coverage of NORA was minimal due to important simultaneous political events. NORA was mentioned on TV (channel TV2) only some time (a few days) after the exercise.

### **6.1.2 Finland**

The participants used their normal offices. Only the Finnish Center for Radiation and Nuclear Safety occupied a temporary emergency center. This was necessary, since the organization was at the time normally located in several places around Helsinki.

**Number of persons involved in the exercise:**

Players	160
Interactors	17
Supervisors	5
Evaluators	17
Others	14

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Total	213
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Normal telecommunication resources were used. The supervisors had access to new telephone and telefax lines. There was also a separate communication network. All participants were responsible for their own equipment.

#### **Timetable:**

- The supervisors had a meeting at 08:30 - 09:30 local time
- 15 - 20 minutes were scheduled for information on the 24-hour switch in time
- Directly after the exercise internal debriefing meetings were held at the participating organizations. Duration: about one hour.
- The next day a 5-hour national evaluation meeting was held at the Ministry of the Interior

#### **Information issues:**

Information was transmitted promptly. Various means were used:

- Press releases
- Text TV
- Recorded telephone messages
- A press conference

Media also got a chance to inspect the offices of the Ministry of the Interior. The Finnish Broadcasting Corporation had the possibility to follow the work of the supervisors.

### **6.1.3 Iceland**

The Emergency Operations Center of the National Civil Defense was used during NORA.

Number of persons involved in the exercise:

#### **Players:**

- Experts	9
- Support staff	10
Interactors	3
Supervisors	4
Evaluators	4

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Total	30
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The following communication equipment was available:

- \* A 10-line telephone exchange
- \* Direct telephone lines to
  - The National Defense Forces
  - The Meteorological Office
  - The police
  - Various radio and TV stations
- \* One telefax for both receiving and transmitting messages
- \* Wireless telecommunication equipment

Timetable for the exercise (local time):

07:45 Gathering  
08:00 Presentation of the exercise  
08:30 Start of exercise NORA  
11:00 Announcement of the 24-hour time shift  
Presentation of the new scenario  
13:30 End of NORA  
13:45 Review of the exercise  
14:45 End

Mass media showed interest in the exercise. The coverage, however, was rather low key.

#### 6.1.4 Norway

The exercise took place in the assembly room of AVA (the Norwegian emergency organization) in Oslo.

Number of persons involved and telephones used in the exercise:

Players	21 persons	12 telephones
Interactors	6	3
Supervisors	2	2
Evaluators	4	3
National observers	3	
Secretariat	7	3

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Total	44 persons	23 telephones + 1 switchboard
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Two telefaxes were used, one for incoming and one for outgoing messages. Two copiers were available.

Timetable for the exercise (local time):

08:15 Assembly, check-in, roll call  
08:30 Presentation of the exercise  
09:20 Break  
09:30 Exercise NORA; Part 1  
12:00 Announcement of the 24-hour time shift  
Presentation of the new scenario  
12:10 Exercise NORA; Part 2  
14:30 End of NORA  
14:35 Summary and evaluation  
15:50 End

There were no real contacts with the press during the exercise. A press release on NORA was published on January 11, and another shortly after the exercise. The press were invited to contact AVA for further information. Their interest in NORA after the exercise was very little.

As far as Norway is concerned, NORA took place at an unfavorable moment. The emergency organization was being restructured at the time of NORA, and new assembly rooms were being prepared. These conditions were reflected in the results of the exercise.

#### **6.1.5 Sweden**

NORA was conducted in SSI's annex Haga with its specially equipped facilities for emergency situations and exercises. Office space had been reserved for participants from other authorities and organizations, as members of the national radiological emergency team.

Number of persons involved in the exercise:

Players	22
Interactors	5
Supervisors	2
Evaluators	3
International observer	1
Others	8

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Total	41
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Timetable for the exercise (local time):

08:30 Gathering  
08:45 Introduction of the scenario  
09:30 Exercise NORA; Part 1  
12:00 Announcement of the 24-hour time shift  
Presentation of the new scenario  
12:10 Exercise NORA; Part 2  
14:30 End of NORA; break  
14:50 Discussion  
15:50 Closing remarks  
16:00 End

SSI's switchboard was used throughout the exercise for incoming calls. One telefax was used for receiving messages, one for sending messages. All other office equipment used (such as copiers) was the same as under normal conditions.

Media coverage before, during and after the exercise was scarce, although TT (Tidningarnas Telegrambyrå, a leading news agency) published the joint Nordic press release prior to the exercise.

## 6.2 ODIN

### 6.2.1 Denmark

ODIN was conducted in the emergency command center belonging to the Emergency Management Agency. The center is situated in a 900m<sup>2</sup> underground bunker (Bernstorffbunkeren). Half of that area is available for the Emergency Management Agency in case of a nuclear emergency. The bunker has recently been equipped with modern communication equipment, a PC network etc., especially furnished for that purpose.

Number of persons involved in the exercise:

Players	32
Supervisors	7
Evaluators	7
Others	6

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Total	52
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The staff of players was enlarged with representatives from other parts of the emergency organization than those participating in NORA.

The bunker switchboard serves 12 incoming lines and some 100 extensions. Dedicated telephone lines are established to the Danish Meteorological Institute, the National Institute of Radiation Hygiene, Risø National Laboratory, the Copenhagen Police Headquarters, the Chief of Defense and (in Sweden) Malmö County Headquarters. Also available are

- 5 telefaxes
- 3 telexes and 1 telex modem
- 1 loudspeaker system
- Ethernet network with 5 PCs and 1 printer
- A BARCO superscreen for presentations (maps, graphics, TV etc.)

Timetable for the exercise (local time):

08:00 Gathering; roll call  
08:15 Briefing by the shift leader of the night shift  
09:00 Start of exercise ODIN  
15:00 End of exercise ODIN; Group discussions  
15:45 Closing remarks  
16:00 End

Radio Denmark represented connections with other media and the public. The news agency, Ritzaus Bureau, was unable to participate in the exercise, but would normally be present to handle all written press releases. No other media were present during the exercise, and there has been no interest in mass media after the exercise.

### 6.2.2 Finland

In Finland the Ministry of the Interior has the responsibility for the over-all coordination of the emergency response. The authorities and experts invited by the Ministry to participate in the coordination group were selected for the special occasion of a late-phase scenario. In addition, a number of liaison officers were invited from the Defense Staff, three counties and Åland. The total participation was about 150 persons.

The participants used their normal offices. Only the Finnish Center for Radiation and Nuclear Safety occupied a temporary emergency center. This was necessary, since the organization was at the time normally located in several places around Helsinki.

Normal telecommunication resources were used. Each participant had his own telephone line. The supervisors had access to new telephone and telefax lines. There was also a separate communication network. All participants were responsible for their own equipment.

### 6.2.3 Iceland

The exercise took place at the Emergency Operations Center of the National Civil Defense Authority and at the National Institute of Radiation Protection, where the experts were located.

Number of persons involved in the exercise:

#### Players

* Experts	8
* Support staff	4
Interactor	1
Supervisor	1
Evaluators	2

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Total	16
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The following communications equipment was available:

#### At the Emergency Operations Center:

- \* A 10-line telephone exchange
- \* Direct telephone lines to
  - The National Defense Forces
  - The Meteorological Office
  - The police
  - Various radio and TV stations
- \* Two telefaxes, one for receiving and one for sending messages
- \* Wireless telecommunication equipment

#### At the National Institute of Radiation Protection:

- \* A 6-line telephone exchange
- \* One telefax for receiving and sending messages

Timetable for the exercise (local time):

07:00 Gathering  
07:15 Report from the night shift  
08:00 Start of exercise ODIN  
14:00 End of exercise ODIN  
14:15 Review of the exercise  
15:15 End

#### **6.2.4 Norway**

The exercise was conducted in the new emergency center at the Norwegian Radiation Protection Authority.

Number of persons involved and telephones used in the exercise:

Players	22 persons	11 telephones
Interactors	5	3
Supervisors	2	3
Evaluators	5	1
Secretariat	10	1
Observers	2	

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Total            46 persons    19 telephones + 1 switchboard

Two telefaxes were available, one for receiving and one for sending messages.

Timetable for the exercise (local time):

08:00 Assembly, check-in  
08:10 Presentation of the scenario  
09:00 Start of exercise ODIN  
15:00 End of exercise ODIN  
15:10 Summary and discussion  
16:00 End

There were no media contacts during the exercise.

#### **6.2.5 Sweden**

Having abandoned the annex in Haga, ODIN was conducted in the main building of SSI, where new emergency headquarters had recently been established and now were put to a first, serious test.



**Number of persons involved in the exercise:**

<b>Players</b>	<b>20</b>
<b>Interactors</b>	<b>4</b>
<b>Supervisors</b>	<b>2</b>
<b>Evaluators</b>	<b>4</b>
<b>International observer</b>	<b>1</b>
<b>National observer</b>	<b>1</b>
<b>Others</b>	<b>7</b>

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<b>Total</b>	<b>39</b>
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**SSI's switchboard was used throughout the exercise for incoming calls. One telefax was used for receiving messages, one for sending messages. All other office equipment used (such as copiers) was the same as under normal conditions.**

**The media coverage of ODIN was minimal.**



## 7 Evaluation and conclusions

### 7.1 General

There is a long tradition of Nordic cooperation in many fields, including radiation protection, nuclear safety and emergency preparedness. Information is often exchanged among sister organizations. There are many joint projects underway, such as the programs under the umbrella of NKS.

The five Nordic countries are signatories to the Convention on Early Notification of a Nuclear Accident and to the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency. In addition to these international conventions, the Nordic states (except Iceland) have bilateral agreements on early notification and exchange of information. Although general guidelines for the implementations have been prepared, a joint Nordic emergency plan does not exist.

The importance of rapid and frequent contacts between the authorities in the Nordic countries has increased along with the quick media transmittance of information and rumors on nuclear related events. The national authorities are expected to be able to respond quickly even in cases in which there is no urgency to protect people against radiation. In some cases large economic losses may occur, e.g., in agriculture and fishing, if there are delays in informing the public in time.

The Nordic exercises NORA and ODIN aimed at testing and - if possible - improving Nordic exchange of information and harmonization of decision making. The exercises were studied by Nordic and national evaluators.

Country	Number of evaluators	
	NORA	ODIN
Denmark	8	7
Finland	17	13
Iceland	4	2
Norway	4	5
Sweden	3	4

The following NKS reports summarize the findings of the evaluation teams:

- \* Evaluation of the Nordic Exercise NORA  
NKS Report No. 1993:567  
May 4, 1993
- \* Evaluation of the Nordic Exercise ODIN  
NKS Report No. 1994:556  
February 15, 1994

## **7.2 Guidelines for the evaluation**

The Guidelines for the evaluation of the exercises were basically identical for NORA and ODIN.

Section 1 of the Guidelines specified the main and secondary objectives of the exercise.

Section 2 of the Guidelines specified the purpose of the evaluation.

The national evaluation, carried out in each of the participating countries, aimed at offering feedback to the national emergency preparedness organization. The joint Nordic evaluation should focus on ways of improving Nordic cooperation and communications in the emergency situation as specified by the scenario of the exercise in question. Nordic harmonization of decisions, protective measures and other actions taken in the specified situation were also to be stressed by the Nordic evaluation.

The Guidelines clearly stated that the evaluators should not interfere with the exercise, try to make corrections or point out mistakes etc. during the exercise. Such remarks should be left to the written report.

Section 3 of the Guidelines specified the organization of the evaluation. The evaluation team for both exercises (NORA and ODIN) consisted of

- \* a chief evaluator, representing NKS
- \* a Nordic evaluator in each country
- \* a number of national evaluators in each country

The task of the national evaluators was to register chronologically all major events and occurring problems or difficulties. Their written reports (one per country) should suggest improvements.

The Nordic evaluators had the double task of national evaluation chiefs and Nordic evaluators, reporting to the Nordic chief evaluator. They were responsible for the written national evaluation reports.

The Nordic chief evaluator was responsible for the Guidelines and the coordination of the Nordic and national evaluations. Furthermore, she was responsible for the final evaluation report.

A timetable for the evaluation concluded Section 3.

Section 4 of the Guidelines gave the criteria for the evaluation and the tasks of all members of the evaluation team. Material to be collected, observations to be made etc. were specified in detail, as were the contents of their respective preliminary reports.

The functions performed by the players during the exercise were to be graded GOOD, SATISFACTORY or UNSATISFACTORY. The ratings were defined in the evaluation report as follows:

**GOOD** implies that the response or function was performed without significant failings in all countries.

**SATISFACTORY** implies that the response or function was performed with minor failings and delays, creating some confusion.

**UNSATISFACTORY** implies that the response or function was performed with major failures which could have contributed at least to economic losses.

The evaluation of each function should be brief and consist of three parts:

- \* Observations
- \* Recommendations
- \* Appraisal

Reference should be made to the main and secondary objectives of the exercise. Nordic and national aspects should be separated.

Section 5 of the Guidelines specified key functions of the evaluation. Since it is impossible to observe and note all events, certain functions were prioritized, such as:

- \* Initial response by the emergency organizations
- \* Assessment of the emergency situation
- \* Decision making process
- \* Nordic and international contacts
- \* Technical facilities
- \* Planning and conduct of the exercise
- \* Overall evaluation of the exercise

The special evaluation form to be used during the exercise was given in Annex 1. A draft outline of the contents of the final Nordic evaluation report was suggested in Annex 2.

### **7.3 Lessons learned from organizing exercises**

To organize an international large-scale exercise is a very time consuming and demanding business. Funds, staff and other resources must be allocated and put to work at an early stage if the project is to be fruitful. Once the commitment has been made, there are a number of ways to ensure that time and money are spent wisely, in a cost effective manner. Keep the number of organizers at a minimum. Personal meetings, if not too frequent, are valuable; but so can telephone conferences be.

Get on with the practical work and the professional aspects of the exercise as soon as possible: objectives, scenario, script, participants, technical facilities and so on. Administration and purely organizational matters are easily overdone, forgetting the overall objectives of the project. As little time and effort as possible should be spent on setting up working groups, writing memos, discussing formalities etc.

Meetings with the organizing committee should be constructive and could preferably be used to solve practical problems, coordinate national and international scenarios, write scripts etc., rather than discussing abstract issues or presenting detailed reports on the national situation.

It is however crucial that the main objective and any secondary objectives be discussed in depth and decided on at an early stage. Otherwise the whole foundation of the work is unstable. Stop at frequent intervals and compare the work done so far with the plans, and immediately correct any deviations, unless new input has been received, warranting a change of plans. The objectives should be so formulated as to facilitate an evaluation of whether and to what extent they have been met.

On the other hand, it is necessary not to be too ambitious as to the objectives of the exercise. It is better to concentrate on relatively few objectives, which one could realistically hope to achieve. It is also important not to go into too much detail in the chosen objectives.

It has often been complained that exercises are not rewarding, that the scenario was not interesting, that basic assumptions were unrealistic etc. To avoid this kind of criticism after exercises dealing with late-phase situations (a few days or more after an accident), the use of a checklist such as the one presented in Appendix A.3 is recommended. The players of the exercise are then offered an opportunity to influence the scenario, making it as realistic as possible.

It is important that the organization responsible for the exercise is flexible and the applied routines not rigid, in order to be able to immediately benefit from new knowledge or feedback from the work so far.

In the particular case of BER-5, there are two examples of this. The first one is that it was originally (in 1990) planned to arrange both NORA and ODIN at the end of 1993, giving maximum time for planning and preparation during the present 4-year NKS program. However, in 1992 it was discussed whether NORA should be carried out in the beginning of 1993. In that way experiences from NORA could be used to improve ODIN, and perhaps also offer feedback to the international exercise INEX1 in the spring of 1993. INEX1, in turn, could perhaps give valuable information when preparing ODIN. It was therefore decided to organize NORA early in 1993 and ODIN at the end of the year.

The second example of the value of flexibility is the fact that the relatively disappointing number of Nordic contacts during NORA (the acute phase situation), led to a total change of format of ODIN (the late phase situation). Originally, ODIN was meant as a test of the already existing degree of Nordic harmonization in decision making. ODIN was to be conducted on five different days in the Nordic countries, without any real Nordic contacts. Instead, the responses of the five different national organizations to threats of similar type and magnitude were to be tested. Once the outcome of NORA was known, a complete review of the purpose and format of ODIN was made. It was decided to conduct ODIN simultaneously in all five countries, once again stressing Nordic contacts.

When choosing the date for any major exercise, national or international, it is wise to ensure that it does not coincide or compete with other important exercises or events. As it happened, ODIN was performed the day after a Swedish drill of information specialists of the national emergency organization, involving to a large extent the same people both days. This could easily have been avoided.

## **7.4 Findings of the Nordic evaluation team**

Some general lessons learned from the two exercises were:

- \* During the acute phase international contacts for purposes of harmonization cannot and will not be prioritized; if international harmonization is crucial during this phase, it will have to be achieved beforehand. If international contacts are desired, the corresponding procedures should form an integral part of the emergency plan.
- \* International contacts and harmonization of long-term measures are primarily to be expected during the late phase, when the initial pressure is off, and the organization has settled.
- \* Unrealistic response, however desirable from the organizers' point of view, cannot be forced or triggered during the exercise by external pressure, especially not in acute situations.
- \* When planning for future exercises, it is important to listen to the views of the emergency organization and the staff subjected to the exercises; and to draw from past experience.
- \* The scenario, and especially the script, should not be too detailed, unless the object is to test how the emergency organization operates under extreme stress; otherwise it is better to have relatively few phone calls, fax messages, press contacts etc. prepared in advance, and improvise additional contacts as needed.
- \* Concentrate on the most important aspects throughout the work (planning, preparations, conduct, evaluation); avoid unnecessary and distracting details.

### **7.4.1 NORA**

Below are given summaries of the observations, recommendations and appraisals of the most important functions, as reported by the evaluation team.

As regards the initial responses by the emergency organizations the **OBSERVATION** was that national responses were highly professional but Nordic contacts not prioritized. The **RECOMMENDATION** was that in order to ensure effective Nordic communications a "Nordic awareness" should be instilled in all relevant persons of the emergency organization, leaving it to the head-of-staff to decide on proper measures to that end. The **APPRAISAL** was nationally **GOOD**, but only **SATISFACTORY** from a Nordic viewpoint.

The **OBSERVATION** regarding the assessment of the emergency situation was that earlier Nordic contacts would have given better overview of the situation and improved planning for actions. Exchange of monitoring results functioned fairly well. Risk assessments were not compared prior to decision. The **RECOMMENDATION** was that procedures for rapid data transfer be further developed, together with personal contacts. The **APPRAISAL** was nationally **SATISFACTORY**, and **SATISFACTORY** as regards Nordic data exchange but **UNSATISFACTORY** with regard to assessments and discussions prior to national decisions.

As for the decision making process, the **OBSERVATION** was that the Nordic harmonization did not exist or take place, although attempts were made in that direction. This led to a decision in one of the countries to distribute iodine tablets and shelter the population. This differed from the decisions taken in similar exposure situations in the other four Nordic countries. No reactions were observed on requests for coordinated responses to various issues, such as a joint passenger policy, questions and requests from WHO, the Nordic Council, CNN etc. The **RECOMMENDATION** was to improve Nordic contacts between authorities responsible for decisions on protective measures, and to discuss the possibilities of improving harmonization of intervention levels. The **APPRAISAL** was nationally **SATISFACTORY** but as far as Nordic contacts were concerned, **UNSATISFACTORY**.

Regarding Nordic and international communications, the **OBSERVATION** was that there were technical difficulties as well as errors in the telephone and telefax directories published just prior to the exercise. The **RECOMMENDATION** was that communication facilities be checked regularly, and that contacts for important functions should be based on regular contacts as far as possible. The **APPRAISAL** was **UNSATISFACTORY** as regards Nordic communications.

Information distribution within a country was considered to have run smoothly as regards other authorities (**OBSERVATION**). Views on the frequencies for distributing information to the public, and possibly also the preparedness to implement information distribution, may vary from country to country; this could however not be fully assessed due to the limited participation by news media in the exercise. The **RECOMMENDATION** was to continue Nordic cooperation in this field, in order to maintain the personal contacts between information officers of the central authorities. The **APPRAISAL** was **SATISFACTORY**, but it varied between the Nordic countries both as regards information to other authorities and to the public.

On the item of planning and conduct of the exercise, the **OBSERVATION** made was that the scenario was very good, covering a geographically wide area and offering equal impacts in all five countries. It was however found that the shift of date (the 24-hour leap at 12:00) caused about as many problems as it solved. The information on actions taken etc. during the missing 24 hours was incomplete. In its **RECOMMENDATIONS**, the evaluators state that real names for organizations and radiation threats should be used, to avoid confusion; that it should be made perfectly clear which organizations participate in the exercise; and that the natural counterparts should be involved from all participating countries. The **APPRAISAL** was **GOOD**.

The overall evaluation of the exercise was that Nordic contacts or harmonization cannot be taken for granted. In the future, economic consequences should be more emphasized, in particular in situations where hardly any health consequences from radiation are to be expected. The exercise will hopefully prompt a discussion on the desirability and feasibility of a coordinated Nordic intervention policy, of what has to be coordinated in advance and what can be left to the actual emergency situation. The need for personal contacts was clearly demonstrated during the exercise. All in all, the performance relating to the Nordic element was **SOMEWHAT LESS THAN SATISFACTORY**, but nationally **SOMEWHAT BETTER THAN SATISFACTORY**. The objectives of the exercise were considered to have been met **SATISFACTORILY**, and the exercise made a valuable contribution to further develop the Nordic cooperation.



#### **7.4.2 ODIN**

Below are given summaries of the observations, recommendations and appraisals of the most important functions, as reported by the evaluation team.

The OBSERVATION of the response by the emergency organizations to the checklist, referred to earlier in this report and presented in Appendix A.3, was that the answers to the checklist were highly professional, although some of them did not specify the exact time when the actions were taken during the five day period preceding the exercise. The answers were mostly in good agreement with each other. A RECOMMENDATION to use similar checklists in future late-phase exercises was issued. The APPRAISAL was that the professionalism of handling the acute phase of the accident by means of the checklist was of high standard, and that the agreement between the answers from different countries was SATISFACTORY.

Regarding the evaluation of the situation during the exercise, the OBSERVATION was that a majority of the actions taken during the first five days after the exercise (and reported in the checklist) were maintained in all countries during the exercise, with a few exceptions. Several countries expressed their concern with differences in intervention levels for food. Given the limited areas of high contamination, these differences would only have caused limited differences in health and economic consequences in a real situation. It was decided as a part of the exercise that a Nordic coordination meeting on food restriction strategies be held the next day. In its RECOMMENDATION, the evaluators point out that the importance of harmonization of intervention levels for food must be stressed. Hence, responsible Nordic authorities must arrive at common principles and strategies, accomodating existing special requirements of international trade (Codex Alimentarius) and EU standards. However, flexibility should be maintained to allow for necessary adjustment of the long term strategy to the actual situation. In their APPRAISAL, the evaluators conclude that the capability to assess the situation was GOOD in the Nordic countries. Since the derived conclusions may show national variations due to the lack of advance harmonization and consultations during the exercise, the situation was found NOT YET SATISFACTORY in this respect.

With regard to the decision making process, the OBSERVATION was that nationally the decisions were coordinated between relevant authorities; but the Nordic contacts taken concentrated mainly on exchange of information rather than consultations, food restrictions being an exception. As a RECOMMENDATION early communication between the Nordic countries to avoid "double messages" was stressed. The APPRAISAL was GOOD as regards the national decision process, but only PARTLY SATISFACTORY when it comes to Nordic consultation and coordination.

The general observation on communications with Nordic neighbors, other countries and international organizations was that the few technical problems were soon sorted out, and that the catalog of telephone and fax numbers was an excellent tool. The countries were aware of the actions taken by their Nordic neighbors. Simulated contacts with other countries and international organizations were carried out as expected. One RECOMMENDATION given was to improve the knowledge of the emergency organizations of the other Nordic countries. Measurement data, information on actions taken, current phone and fax numbers etc. should be available to all Nordic countries by means of modern electronic methods. The APPRAISAL of the communication between Nordic countries was GOOD as regards the amount of contacts, but only SATISFACTORY regarding the substance. The simulated contacts were GOOD.

The OBSERVATION on information to the public was that it was efficient, although not sufficient to avoid Nordic "double messages". The RECOMMENDATION was therefore that the communication between responsible information officers should be further developed also in the late-phase situation. The APPRAISAL was in general SATISFACTORY.

As for technical facilities, the OBSERVATION was that they were mainly good. The RECOMMENDATION to the Nordic countries was to deploy modern technical aids for communication (such as electronic mail) as much as practicable, bearing in mind their vulnerability. The APPRAISAL of the technical facilities was SATISFACTORY, but the need for upgrading was pointed out.

Several OBSERVATIONS were reported regarding the planning and conduct of the exercise. A late-phase accident exercise differs from an acute-phase emergency exercise. One problem is how to brief the participants on events and decisions from the period prior to the exercise. The checklist was a useful tool, but not enough. In some of the countries the actions taken during the first five days were presented and discussed at length before the exercise; in other countries, the briefing was too short. The scenario and the event sequence descriptions were suitable for testing Nordic collaboration. The scenario was not considered very realistic. It should however be kept in mind that it is not easy to develop a realistic scenario with equal and simultaneous contamination levels in limited areas in each of the Nordic countries. The exercise directives with the communications information were good. The management of the exercise and the supervisors functioned well. As a RECOMMENDATION if future Nordic exercises are planned, it is important to consider how to make the scenario more realistic, and how to brief the participants to achieve the same level of knowledge as in a real late-phase situation. More exercise is also needed for the exercise itself, from 10 to 24 hours. The general APPRAISAL of this first Nordic late-phase exercise was in general GOOD.

The exercise ODIN was in the overall evaluation found to have made a valuable contribution to increase the Nordic countries' capability of handling a joint deposition situation and to obtain a Nordic view in emergency response. Thus, the main objective of the exercise was met SATISFACTORILY. The exercise hopefully prompts in-depth discussions between relevant Nordic authorities, leading to an agreement on the late-phase intervention strategy, including in particular food intervention levels. If so, the exercise would have met its main objective perfectly. The planning and conduct of the exercise was in general good.

# Appendices

## Appendix A.1

### Organizing the work

- \* Operational structure
- \* Key persons
- \* Participating countries and organizations
- \* Practical work
- \* Overall time schedule
- \* NORA: Important deadlines
- \* ODIN: Important deadlines

## Appendix A.2

### NORA - The acute phase

- \* General
- \* Special objectives of NORA
- \* Selecting the type of threat
- \* Scenario
  - General
  - Background information
  - Weather report and forecasts
- \* Scripts
  - Events during the first part of NORA
  - Change of date
  - Events during the second part of NORA

## Appendix A.3

### ODIN - The late phase

- \* General
- \* Special objectives of ODIN
- \* Scenario
- \* The checklist
- \* Scripts
- \* Fallout maps
- \* Summary of answers to the Nordic late-phase checklist

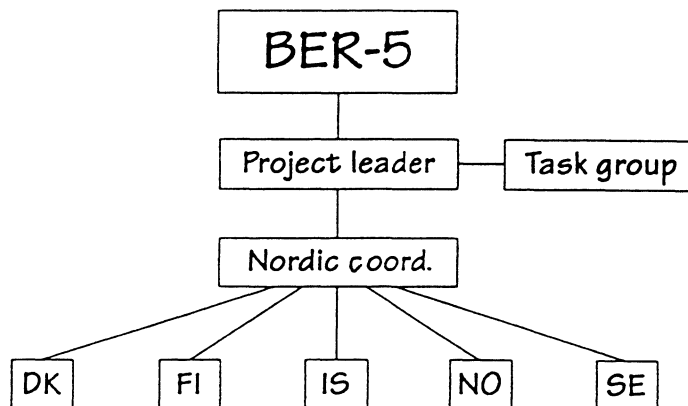


# Appendix A.1

## Organizing the work

### Operational structure

The work of the BER-5 team was organized according to the figure below.



The BER-5 project leader headed a task group of seven members, representing the five Nordic countries and their emergency organizations. A Nordic coordinator, who reported directly to the project leader, served as the link between the five countries and all their national authorities and organizations on the one hand, and the project leader on the other. Each country, in turn, had a national leader in charge of the preparations and national coordination.

### Key persons

Project leader: Mr. Erling Stranden (Norway)

Task group:

- Mr. Franz Marcus (NKS, Denmark)
- Mr. Johs. Jensen (Denmark)
- Mr. Leif Blomqvist (Finland)
- Mr. Harry Frelander (Finland)
- Mr. Sigurður Magnússon (Iceland)
- Mr. Svein Uhnger (Norway)
- Mr. Mauritz Wallin (Sweden)

Nordic coordinator: Mr. Torkel Bennerstedt (Sweden)

Chief evaluator: Ms. Anneli Salo (NKS, Finland)

Scenario consultants: Mr. Per Ole Nielsen (Scandpower, Norway)  
Mr. Ole Walmod-Larsen (Risø, Denmark)

## Participating countries and organizations

In the case of Norway, due to a major revision of the emergency preparedness organization between the exercises NORA and ODIN, two separate entries are given. As for the rest of the Nordic countries their respective organizations were basically unchanged. In Denmark and Finland, however, a few ministries and authorities not participating in NORA were added to the list of participants during ODIN. This is indicated by the addendum (ODIN) after the name of that organization. All other authorities etc. listed below participated in both exercises.

### Denmark

Ministry of the Interior	Indenrigsministeriet
Emergency Management Agency, DEMA	Beredskabsstyrelsen
Danish Meteorological Institute, DMI	Danmarks Meteorologiska institute
Flag Officer Denmark	Søværnets Operative Kommando
Risø National Laboratory	Forskningscenter Risø
National Institute of Radiation Hygiene, SIS	Statens Institut for Strålehygiejne
National Food Agency	Levnedsmiddelstyrelsen
State Police	Rigspolitiet
Chief of Defense - Denmark	Forsvarskommandoen
Danish Radio	Danmarks Radio
Ritzaus Bureau	Ritzaus Bureau
Ministry of Foreign Affairs	Udenrigsministeriet
Plant Directorate, Ministry of Agriculture (ODIN)	Plantedirektoratet, Landbrugsministeriet

### Finland

Ministry of the Interior, SM	Sisäasiainministeriö
Finnish Center for Radiation and Nuclear Safety, STUK	Inrikesministeriet
Cabinet's Information Unit	Säteilyturvakeskus
Ministry of Foreign Affairs	Strålsäkerhetscentralen
Ministry of Social Affairs and Health	Valtioneuvoston tiedotusyksikkö
Ministry of Agriculture and Forestry (ODIN)	Statsrådets informationsenhet
Ministry of the Environment (ODIN)	Ulkoasiainministeriö
Ministry of Transport and Communications (ODIN)	Utrikesministeriet
National Board of Waters and the Environment (ODIN)	Sosiaali- ja terveysministeriö
General Staff of the Defense Forces (ODIN)	Social- och hälsovårdsministeriet
	Maa- ja metsätalousministeriö
	Jord- och skogsbruksministeriet
	Ympäristöministeriö
	Miljöministeriet
	Liikenneministeriö
	Trafikministeriet
	Vesi- ja ympäristöhallitus
	Vatten- och miljöstyrelsen
	Pääsikunta
	Huvudstaben

Finnish Meteorological Institute, FMI

National Food Administration

Finnish Broadcasting Company

Ilmatieteenlaitos

Finska Meteorologiska Institutet

Elintarvikevirasto

Livsmedelsverket

Suomen Yleisradio

Finlands Rundradio

## **Iceland**

Civil Defense Authority

The National Institute for Radiation Protection

The Marine Research Institute

The National Center for Food Control

The National Weather Bureau

Almannavarnir ríkisins

Geislavarnir ríkisins

Hafrannsóknarstofnun

Hollustuvernd ríkisins

Vedurstofa Íslands

## **Norway - NORA**

The Norwegian Emergency Organization

Aksjonsutvalget ved atomulykker (AVA)

### *Members:*

Ministry of Foreign Affairs

Directorate of Civil Defense and

Emergency Planning

State Pollution Control Authority

Shod. Norway Military Head Quarter

Directorate of Health

Utenriksdepartementet

Direktoratet for sivilt beredskap

Statens Forurensningstilsyn

Forsvarets overkommando

Helsedirektoratet

### *Associate members:*

Ministry of Fisheries

Ministry of Transport and Communications

Ministry of Agriculture

Fiskeridepartementet

Samferdseldepartementet

Landbruksdepartementet

### *Advisors:*

Norwegian Radiation Protection Authority, NRPA

Norwegian Institute for Energy Technology, IFE

Norwegian Institute for Air Research, NILU

Norwegian Meteorological Institute, DNMI

The National Institute of Public Health

Norwegian Food Control Authority

Geological Survey of Norway

Norwegian Defense Research Establishment

Institute of Marine Research

Agricultural University of Norway

Statens Strålevern

Institutt for Energiteknikk

Norsk Institutt for Luftforskning

Det Norske Meteorologiske Institutt

Statens Institutt for Folkhelse

Statens Næringsmiddeltilsyn

Norges Geologiske Undersøkelse

Forsvarets Forskningsinstitutt

Havforskningsinstituttet

Norges landbrukshøyskole

**Norway - ODIN**

A new emergency response organization was established in 1993, between exercises NORA and ODIN. The nuclear emergency organization consists of Ministries, the Ministerial Coordination Committee, the Advisory Committee for Nuclear Accidents, the Crises Committee for Nuclear Accidents, the Secretariat for the Advisory Committee and for the Crises Committee. The Crises Committee is responsible for managing the acute phase after an accident.

*The Advisory Committee for Nuclear Accidents: Faglig råd for atomulykker:*

Norwegian Radiation Protection Authority, NRPA	Statens strålevern	*
Directorate of Civil Defense and Emergency Planning	Direktoratet for sivilt beredskap	*
Norwegian Food Control Authority	Statens Næringsmiddeltilsyn	*
Shod. Norway Military Head Quarters	Forsvarets overkommando	*
Directorate of Health	Helsedirektoratet	*
Ministry of Justice: Department of Police	Justisdepartementets politiavdeling	*
State Pollution Control Authority	Statens Forurensningstilsyn	
Directorate for Nature Management	Direktoratet for naturforvaltning	
Institute for Energy Technology, IFE	Institutt for Energiteknikk	
Norwegian Institute for Air Research, NILU	Norsk Institutt for Luftforskning	
Norwegian Meteorological Institute, DNMI	Det Norske Meteorologiske Institutt	
The National Institute of Public Health	Statens Institutt for Folkhelse	
Geological Survey of Norway	Norges geologiske undersøkelse	
Norwegian Defense Research Establishment	Forsvarets Forskningsinstitutt	
Institute of Marine Research	Havforskningsinstituttet	
Agricultural University of Norway	Norges landbrukshøgskole	
The Norwegian College of Veterinary Medicine	Norges veterinærhøgskole	

*Asterisk: Member of the Crises Committee for Nuclear Accidents*

*Medlem i kriseutvalget for atomulykker \**

**Sweden**

Swedish Radiation Protection Institute, SSI	Statens strålskyddsinstitut
Swedish Rescue Services Board, SRV	Statens räddningsverk
National Food Administration	Statens livsmedelsverk
Swedish Board of Agriculture	Statens jordbruksverk
Swedish Nuclear Power Inspectorate, SKI	Statens kärnkraftinspektion
Swedish Meteorological and Hydrological Institute, SMHI	Sveriges meteorologiska och hydrologiska institut



## Practical work

At regular intervals meetings were held with the task group, the project leader, the Nordic coordinator and the scenario consultants. The object was to

- \* discuss and agree on
  - main and secondary objectives of the exercises
  - participating authorities and other organizations
  - the organization and timetable of the work
  - the scenario
  - Nordic exercise regulations and guidelines
  - Nordic and national scripts
  - documentation of the work
- \* solve practical problems that occurred during the work
- \* make decisions on issues affecting all Nordic countries
- \* report the status of the work
- \* exchange information, share ideas and compare notes
- \* feed-back prior experience regarding exercises
- \* follow up the work accomplished so far
- \* coordinate efforts and policies
- \* inform NKS on the progress of the work and get instructions for the continued work

Between such Nordic meetings, national workgroups worked to apply the Nordic policies and decisions, take care of all practical and national details etc. Bilateral contacts were taken when needed.

The executive secretary of NKS, the project leader, the Nordic coordinator and the scenario consultants met as appropriate to decide on policies, scenario issues etc., and to give directives to the national workgroups.

## Overall time schedule

1990	Preliminary discussions, decision on program
1991	Planning, preparations
1992	Preparations
1993	Preparations, Conduct, Evaluation
1993	Evaluation report on NORA published
1994	Evaluation report on ODIN published
1995	Final report published

## **NORA: Important deadlines**

*	Nordic and national supervisors appointed	Dec. '91
*	National teams of evaluators appointed	Feb. '92
*	Nordic team of evaluators appointed	March '92
*	Time schedule accepted	April '92
*	Outline of scenario prepared	May '92
*	Players appointed	Aug. '92
*	Nordic evaluation regulations confirmed	Sept. '92
*	Nordic exercise regulations confirmed	Sept. '92
*	National exercise regulations confirmed	Nov. '92
*	Interactors appointed	Nov. '92
*	Detailed scenario determined	Nov. '92
*	Nordic and national scripts determined	Nov. '92
*	Nordic and national preparations finished	Dec. '92
*	National evaluation regulations confirmed	Dec. '92
*	Exercise NORA conducted	Jan. '93
*	National evaluation reports submitted	Feb. '93
*	Draft NKS evaluation report presented	April '93
*	Nordic follow-up seminar	April '93
*	Final NKS evaluation report published	May '93
*	Draft NKS report on NORA and ODIN published	Dec. '93

## **ODIN: Important deadlines**

*	Nordic and national supervisors appointed	Nov. '92
*	Nordic evaluation team appointed	Nov. '92
*	Time schedule accepted	Dec. '92
*	Outline of scenario prepared	Dec. '92
*	Players appointed	April '93
*	National evaluation team appointed	April '93
*	Nordic exercise regulations confirmed	June '93
*	Interactors appointed	July '93
*	Nordic evaluation regulations confirmed	Sept. '93
*	National evaluation regulations confirmed	Sept. '93
*	National exercise regulations confirmed	Sept. '93
*	Detailed scenario determined	Sept. '93
*	Nordic and national scripts determined	Sept. '93
*	Nordic and national preparations finished	Oct. '93
*	Exercise ODIN conducted	Nov. '93
*	National evaluation reports submitted	Dec. '93
*	Draft NKS report on NORA and ODIN published	Dec. '93
*	Draft NKS evaluation report presented	Jan. '94
*	Nordic follow-up seminar	Feb. '94
*	Final NKS evaluation report published	Feb. '94

## **Appendix A.2**

### **NORA - The acute phase**

#### **General**

The exercise NORA was conducted on January 14, simultaneously in all five Nordic countries.

#### **Special objectives of NORA**

In addition to the main and secondary objectives presented in Section 2 for the entire BER-5 exercise program, some phase specific objectives concerning NORA were identified:

- \* To test and develop the ability of the Nordic countries to jointly and simultaneously respond to a situation that evolves
  - from a rumor of a serious incident
  - via a threat of an accident
  - to a confirmed accident with serious consequences
- \* To coordinate Nordic and national resources
- \* To create and utilize communication paths and information exchange within the Nordic region
- \* To handle and assess the situation and the information received in cooperation with the Nordic neighbors
- \* Decide on action levels, protective measures, press releases etc. in a Nordic perspective
- \* Avoid "double messages" such as
  - Contradictory messages: One country makes one decision while the neighboring country makes the opposite decision, in spite of similar radiological conditions
  - Confusing messages: "You shouldn't do this or that, but if you already have, it won't harm you"

#### **Selecting the type of threat**

The scenario was designed to ensure maximum involvement of all participating countries. A variety of nuclear threats were considered:

- \* A nuclear power accident in Finland or Sweden. This was rejected for several reasons:
  - The threat to the country where the accident originated would be out of proportion compared to the other countries, especially Iceland.

- The Finnish and Swedish organizations have been designed and trained to handle this type of accident, giving them an advantage over the other countries.
- \* A nuclear power accident in a non Nordic country. This was ruled out because
  - The threat to Iceland would be substantially less than to the other countries.
  - Denmark, Iceland and Norway (i.e., the three non-nuclear power countries) preferred a scenario not involving nuclear power - all exercises so far had dealt with nuclear power.
- \* A research reactor accident in a Nordic country. But the threat was not considered great enough for the purposes of this exercise, especially in Iceland.
- \* An act of terrorism. This could involve any of the five countries, but unlikely more than two or three. After the initial phase of rumors and incomplete information, several countries would be singled out as not affected by the threat - or the exercise. This scenario, then, was not adequate.
- \* A nuclear weapons test. But this would not offer a situation of an initial rumor that was so important in this case.
- \* This left a mobile threat. Several options were considered:
  - A reentering satellite, which would present an equally great threat to all countries, until the crash, when only a few countries would be affected. Another disadvantage was that the acute phase (the time from a warning that the satellite has left its normal orbit until reentry) is too long for this exercise. The decisions required and the envisaged exchange of information could be carried out during several days in a real situation.
  - A transport accident. Experience tells us that the threat would not be serious enough to any country.
  - A nuclear weapons accident. But several real cases show that the threat is very local and not serious enough to the purposes of this exercise.
  - An accident involving one or more nuclear powered vessels. This is the scenario that was finally chosen. It was decided that two vessels were needed to give an "equal risk" situation in Finland and Iceland, as compared to the Scandinavian countries. Since the Nordic region covers a vast geographical area, it was necessary to have one damaged vessel approach Iceland from the west coast of Norway, and another damaged vessel heading for a harbor in the Baltic, close to Finland. Both vessels would present a threat to Norway, and the one heading for its Baltic harbor offered the required threat to Denmark, Sweden and Finland.

## Scenario

### General

As has been argued above, the general requirement that the scenario should present an equal severity to all participating countries limited the number of choices. Actually, a mobile threat was the only one left after thorough scrutiny of all alternatives.

The exercise started in real time, on January 14, 1993. But before commencing the play, a detailed background story was presented to the players and interactors. (The latter had also been briefed in advance.)

## Background information

For about a week intensive naval military activity had been reported in the North Sea just off the coast of Norway. It was obviously a large-scale drill, conducted by an eastern country and probably closely watched by a western country.

In the morning of January 13, there were reports that indicated that something was wrong. Eastern battleship VORIK was believed to have collided some 100 km west of Bergen with an unknown object under the surface of the water. The rumor was reported by Nordic news media.

VORIK headed south, for Danish waters, seemingly on a return voyage to its home harbor in the Baltic. It was observed off Skagen at 21:00 UTC of January 13. Nothing was known at that time about the fate of the underwater object off Bergen.

Around midnight, however, a western submarine was observed at the surface some 40 km north of the Faroe Islands. The speed was moderate.

At 01:00 UTC the gamma monitoring stations at Landvetter and Ringhals indicated a small increase above the normal background radiation level in the south-west of Sweden. The increase was not high enough to trigger an alarm, so the events passed unnoticed. This was also the case for the station at Prestebakke in the south-east of Norway.

VORIK was followed by a Danish SOK ship, specially designed for emergency operations and with facilities for monitoring dose rates. (SOK is the Danish Navy Command, Søværnets Operative Kommando.) At 04:30 UTC the SOK ship reported 200 $\mu$ Sv/h at a distance of 1 km downwind of VORIK and 15 km east of Æbeltoft on the coast of Jutland. This caused Danish authorities to declare an emergency situation (haverilarm). The Danish Meteorological Institute started to prepare trajectories. Information on the situation was sent to the other Nordic countries.

In the early morning of January 14, traces of I-131, I-133, Cs-134, Cs-137 and Ru-103 were registered by the air monitoring stations at Østerås and Kjeller in Norway, close to Oslo. There was however no indication of any acute health hazards. No alarm was triggered. The winds had been westerly all night, indicating that the radiation source could possibly be located west of the Bergen - Stavanger area. The air monitoring station at Nordmoen also registered increased radiation levels, but not high enough to cause an alarm.

The SOK ship reported intermittent increased dose rates, indicating releases from time to time. VORIK was on its way to Storebælt at a speed varying from 8 to 18 knots. There were obviously propulsion problems. At one time, VORIK came to a complete stop and then resumed at a speed of 15 knots.

At 07:30 UTC Norway reported that its air monitoring station in Birkenes, which could not be contacted earlier due to a technical failure, had now been repaired. The station had registered a considerable increase in radiation level last evening. Had the station been in order, an alarm would have been sent.

When the exercise started on January 14 at 08:30 UTC, all national emergency organizations were gathered in their respective command centers. The weather conditions and most

important inputs of data, information, requests, messages etc. are compiled in the following sections.

### **Weather report and forecasts**

From the evening of January 13 until approximately 09:00 on January 14:  
Pasquill C; velocity 5 m/s; wind from WSW. Dry.

January 14, from 10:00 until 12:00:  
Pasquill D; velocity 10m/s; wind direction shifting toward S. Possibly cloudy in the western parts of Denmark.

January 14, from 12:00 until 18:00:  
Pasquill D, velocity 15 m/s. Wind from SW. Possibly local showers.

January 14 at 18:00 until 12:00 on January 15:  
For the eastern part of the Baltic: Pasquill D; velocity 20 m/s; wind from WSW. Local showers.

January 15 from 12:00:  
For the eastern part of the Baltic: Pasquill D; velocity 18 m/s; wind direction shifting from SW to S. Rain expected over large areas.

For the Atlantic:  
Strong winds, almost hurricane; snowstorm in the area south of Iceland; shifting wind directions; velocity 18 - 25 m/s. Heavy precipitation over large areas.

## **Scripts**

### **Events during the first part of NORA**

The most important events, messages, measurements and other actions during the first part of the exercise are listed below. Actions that affected two or more Nordic countries, or were expected to trigger Nordic or international contacts are included. So are the most important national events.

The country codes used below agree with the ones recommended by ISO (International Standardization Organization):

- Denmark DK
- Finland FI
- Iceland IS
- Norway NO
- Sweden SE

If all Nordic countries are affected by an input, this is denoted by All under the heading Country in the list below.

Time (UTC)	Country	Message, action etc.
09:30	NO	A Bergen science teacher reports increased radiation levels.
09:30	DK	VORIK at Korsør. Short increase in radiation level: 50 $\mu$ Sv/h.
09:30	SE	30-minute raise in radiation level at the Halmstad gamma monitoring station: 400 nSv/h.
09:30	DK	Short raise in radiation level at the Lynås gamma station: 700 nSv/h. Drops to 100 nSv/h after 5 minutes. Normal level: 70 nSv/h.
09:40	IS, NO	Fax from Nippon Fish Trade Ltd.: Nuclide specific Radiation Freee Certificates will be required for each shipment of fish and fish products, otherwise the trade is to be discontinued. The company refers to the Force Majeure clause of the million dollar contracts, that are now in jeopardy.
09:50	All	The Swedish news agency TT contacts the emergency organization in all five countries, asking for a status report including measurements and risk assessments.
10:00	All	The Ministry of Foreign Affairs in all five countries sends a fax message saying that the Trade Minister of Germany considers advising against travels to the Nordic countries, no matter what the purpose.
10:00	All	Message from the Russian Embassy in all five countries to the Ministry of Foreign Affairs: Warship VORIK has collided with U.S. submarine CAVALLA. Damages to both reactors of KIROV will lead to small intermittent releases of radioactive material. No risk for larger releases. VORIK will be able to continue to cross the Baltic without assistance.
10:00	All	Message from the U.S. Embassy in all five countries to the Ministry of Foreign Affairs: The submarine CAVALLA has collided with Russian warship VORIK. The secondary cooling system of the reactor oc CAVALLA has been damaged, but the vessel can head for the USA at reduced speed without risk for an accident. Small radioactive releases might occur.
10:10	FI	Finnish newspaper Helsingin Sanomat asks STUK for comments on the Danish decision to evacuate Korsør. (This is a false rumor.)
10:10	DK	Temporary increase of the radiation level at the Risø gamma station from 80nSv/h to 1 100 nSv/h. This drops to 100 nSv/h after 20 minutes.

10:20	NO	Norwegian authorities report that a submarine of the STURGEON class has been observed WNW of the Faroe Islands, heading in a westerly direction at a speed of 10 knots. It is travelling at the surface, with damages to the tower clearly visible.
10:20	FI	The Baltic Council asks for risk assessments for the three Baltic States, a status report for the entire Baltic area and information on how trade and communications will be affected. The Baltic Council also asks Finland to assist in sending the same request to Denmark and Sweden, due to problems with the telecommunications with those countries.
10:30	All	Die Welt calls to get comments from the authorities regarding a possible German governmental decision to recommend people not to travel to the Nordic countries.
11:00	DK	Temporary increase in the radiation level at the Glostrup gamma station: 830nSv/h. This drops back to the normal value (100 nSv/h) after 20 minutes.
11:15	DK	The shipping agent Dansk FRaktfart A/S reports that one of its cargo vessels with a load of foodstuffs has passed CAVALLA at close range and observed a cloud from the submarine. Assistance is now requested to arrange measurements of the cargo in Reykjavík and if possible issue Radiation Free Certificates.
11:15	DK	Detailed data from analysis of the air filter at Risø are now available. The information will be given to those asking for it.
11:30	IS	The Nordic Council convenes in Akureyri and now requests that Iceland prepare a summary of expected damages to the Nordic countries, and effects regarding tourism and agriculture the coming summer season.
11:30	NO	IOC (the International Olympic Committee) requests immediate information on the situation as regards ski training and competition in Norway, Sweden and Finland. Norway is asked to make a joint statement for all three nations. The matter is urgent, since it might affect a test race in Lillehammer next weekend. Will it still be possible to arrange the Winter Olympics in Lillehammer?
11:45	NO	Norwegian news paper Verdens Gang asks the RNorwegian Radiation Protection Authority to comment the Danish decision to distribute iodine tablets in Gedser. (This is a false rumor.)



## Change of date

At this point in the exercise it had been decided to make a short break and announce that there had been a 24-hour leap in time, so that the date was now January 15, but the time of day the same as before.

The reason for the change of date was to offer a greater threat to Finland and Iceland. Without the change, VORIK and CAVALLA would not get close enough to the shores of these countries to offer a serious threat. When preparing the exercise, the advantages of the increased threat were expected to be greater than the problems created for the players by this sudden change.

The events, messages, measurements etc. that were reported to all players were basically of two kinds:

- \* Additional measurement data from gamma stations or air filter stations. (Data from all countries were given to all players, indicating that Nordic contacts had functioned satisfactorily during the last 24 hours.)
- \* Contacts with IAEA to report the national situations.

National events and actions were added to the above.

## Events during the second part of NORA

Time (UTC)	Country	Message, action etc.
12:30	FI	The radiation level at the Dragsfjärd gamma station shows 120 nSv/h above normal values and is still increasing.
12:30	SE	Swedish radio newscast: A physician comments the Danish decision to distribute iodine tablets in Gedser and warns against allergic reactions. (This is a false rumor.)
12:45	FI	The gamma station in Parainen registers 145 nSv/h above the normal value. The reading is still increasing.
12:55	FI	The gamma station in Turku registers 165 nSv/h above the normal value. The reading is still increasing.
13:00	DK, SE, FI	NucNet requests a status report. Since NucNet does not have any contacts with Iceland or Norway, NucNet asks Denmark to report from Iceland and Sweden to report from Norway.
13:10	FI	The gamma station in Salo registers 110 nSv/h above the normal value. The reading is still increasing.

13:20	FI	The gamma station in Uusikaupunki registers 210 nSv/h above the normal value. The reading is still increasing.
13:30	IS	The American Embassy requests assistance in rescuing the crew aboard CAVALLA. Some crew members require medical treatment due to radiation doses and contamination. The situation is getting worse; a total loss of the submarine cannot be excluded. The reactor is seriously damaged and cannot be turned off completely. An American rescue vessel is on its way and is expected to reach CAVALLA in 24 hours.
13:30	SE	Téléray in France requests Nordic nuclide specific measurement data.
14:00	DK	The WHO office in Copenhagen requests a Nordic report, compiled by the Danish emergency organization, on expected collective doses for the first year after the accident.
14:30	All	End of the exercise.

## Appendix A.3

### ODIN - The late phase

#### General

The exercise ODIN was conducted on November 26, 1993, simultaneously in all five Nordic countries.

#### Special objectives of ODIN

In addition to the main and secondary objectives presented in Section 2 for the entire BER-5 exercise program, some phase specific objectives concerning ODIN were identified:

- \* To test and develop the ability of the Nordic countries to respond to a given, common situation
  - with substantial fallout
  - some 3 - 4 days after an accident
  - with some protective measures already being taken
  - where the players are given the full responsibility for further actions
- \* To improve national emergency preparedness organizations by evaluating and comparing national responses and results

#### Scenario

During a heavy thunderstorm, the electric power system of one of the blocks at Nuclear Power Plant NABO was demolished by a bolt of lightning. The reactor was immediately shut down and the emergency power system started. The necessary cooling capacity was thereby secured.

Shortly afterwards another bolt of lightning and a fire destroyed the power cables of the block, disabling further cooling of the reactor. This happened some time after midnight on June 17. A core melt-down was to be expected within 24 hours.

In a message from NABO at 08:00 hours in the morning the same day, a reactor accident classified as INES 3 was confirmed.

The block lacked both containment and an adequate filter system. Its cooling capacity turned out to be less than expected. Safety valves were opened by the increasing pressure, leading to a loss of cooling water. The core was overheated, and a beginning meltdown led to a radioactive release at 16:00 hours, June 17, at first only containing noble gases but later also fission products, predominantly iodine and cesium. The classification of the NABO accident was changed to INES 6 on June 17 at 18:00 hours.

24 hours later it was reported from NABO that the release had ceased thanks to reestablished cooling of the secondary side of the steam generators.

Until the day of the accident, the NABO region and the five Nordic countries had been enjoying a wonderful summer weather. During June 17, this situation is changed completely. Unstable Pasquill A conditions transport the radioactive cloud back and forth all over the Nordic countries. Heavy showers deposit varying amounts of radioactive material in that area.

The weather is gradually turning stabile again in the course of June 20 and 21, bringing back the summer weather from before the accident. However, reliable fallout measurements cannot start until June 21, at varying times of the day, depending on the country.

Since this occurs around midsummer, a traditional holiday and celebration season as well as a very hectic vacation and farming period in the Nordic countries, problems regarding tourism, agriculture etc. are to be expected.

The given fallout situation, of similar severity in all Nordic countries, as known at 08:00 Scandinavian time on the morning of the exercise, is presented in the attached maps.

The detailed weather conditions during the exercise were irrelevant, since no new releases were expected from NABO. Hence, the participation of meteorologists was not necessary in this case.

## **The checklist**

In order to make the exercise as realistic as possible, and at the same time making the leaders of the national emergency organizations committed to the exercise, a common checklist was agreed upon. It was handed over to the national emergency organizations 18 days before ODIN, together with the general scenario, a preliminary fallout map, the Nordic and national regulations and guidelines for the exercise plus other relevant background material. The leaders of the emergency organizations were asked to discuss the checklist internally and, if so desired, with their Nordic counterparts. A comprehensive list of decisions, protective measures etc. for the first five days after the accident at NABO was to be finished no later than 11 days before ODIN. The national exercise leaders were then to condense the answers to the checklist and exchange the material with their Nordic colleagues. One week prior to ODIN these Nordic condensed checklists were to be sent to all ODIN participants, together with the scenario for the five first days after the accident and a preliminary national fallout map.

The leaders of the national emergency organizations were asked in the checklist to report what actions (if any) they had taken, at what time, for what duration, and in which part of the country regarding the following issues:

- \* Evacuation / Relocation
- \* Sheltering
- \* Use of ventilation
- \* Closing doors and windows
- \* Iodine tablets
- \* Special protective measures for children and pregnant women

- \* Restrictions regarding
  - milk
  - vegetables
  - trade and shipping
  - tourism
  - traffic and communications
  - outdoor activities
  - use of rainwater / surface water
  - other issues of interest

The national emergency leaders were also requested to report decisions and actions in the following areas:

- \* Alert and summoning of the national emergency organization
- \* National contacts:
  - central and local authorities
  - other organizations
  - mass media
  - the general public
  - others
- \* International contacts:
  - Nordic countries
  - other countries
  - international organizations etc.
- \* Information activities:
  - from central authorities
  - press releases
  - press conferences
  - establishment of a central information center to answer questions from the public
  - views on information policies
- \* Decisions on action levels
- \* Initiated measurements:
  - active surveillance of automatic gamma monitoring stations
  - air filter stations
  - other stationary measuring stations
  - airborne measurements
  - fixed measuring points and survey routes
  - food samples
  - environmental and water samples
  - other types of measurements and samples
- \* Most highly prioritized tasks
  - for the next 48 hours (counting from the start of ODIN on the morning of the sixth day after the accident)
  - in a longer perspective
- \* Other issues and matters of importance for the exercise

The national answers to the checklist are summarized in the attached table.

## Scripts

Scandinavian time is used throughout. Finnish time: + 1 h. Iceland: - 2 h (since the scenario depicts the situation during the summer, and Iceland, contrary to its Nordic neighbors, does not apply daylight saving time).

The most important events, messages, measurements and other actions during the exercise are listed below. Actions that affected two or more Nordic countries, or were expected to trigger Nordic or international contacts are included. So are the most important national events.

The country codes used below agree with the ones recommended by ISO (International Standardization Organization):

- Denmark DK
- Finland FI
- Iceland IS
- Norway NO
- Sweden SE

If all Nordic countries are affected by an input, this is denoted by All under the heading Country in the list below.

Time	Country	Message, action etc.
09:00	All	Fax from WHO: * What relocation criteria are used? * Is relocation likely to be considered? * If Yes: - Where? - How many people are affected? - What is the estimated averted dose? * - What duration is envisaged?
09:00 until 09:50	All	Studies of the newly presented material (from the last 24 hours): - New fallout maps - New measurement data
09:20	NO	The county governments in Oslo and Akershus request assistance with written information to the general public, due to a great demand for information regarding health, foodstuffs, travels, tourism, drinking water, grazing cattle etc.
09:30	IS	Question from "Glacier Travels" whether a 3-day safari to Vatnajökull is safe, and if glacier water can be used for drinking and cooking.
09:40	NO	Question from the county government in Vestfold: Can the planned arrangements for the St. Hans celebrations be carried out?

09:45	DK, IS	The main dairies want information on how to handle contaminated farm milk.
09:50	SE	The county government in Västerås requests assistance with information to the general public.
10:00	NO	Measurements from Romerike: - Total deposition: 25 kBq/m <sup>2</sup> I-131; 5 kBq/m <sup>2</sup> Cs-137 - Dairy milk: 20 Bq/l I-131; 900 Bq/l Cs-137 - 200 - 310 nSv/h
10:00	SE	Measurement value of milk: 30 Bq/l of I-131 (tank with milk from several farms).
10:05	SE	The county government in Falun wants recommendations on any actions necessary due to the traditional midsummer celebrations.
10:13	DK	Local communities in Djursland and Samsø request more detailed gamma surveys.
10:30	IS	The county council of Hornafjörður requests advice to the public regarding outdoor activities and the consumption of milk and surface water.
10:30	SE	In situ gamma measurements from Tuna-Hästberg indicate 5 000 nSv/h.
10:40 until 11:00	All	Similar events in all Nordic countries: The Government requests written information before 13:00 on * an update on measures and decisions so far * a comparison with the Nordic neighbors * a short explanation of any differences * short-term national action plans (for the next week) * if possible: the corresponding Nordic plans
11:00	IS	Icelandair requests advice whether any precautions are necessary for flights to and from Scandinavia.
11:00	NO	Measurement data from Østfold: - Total deposition: 300 kBq/m <sup>2</sup> I-131; 60 kBq/m <sup>2</sup> Cs-137 - Dairy milk: 240 Bq/l I-131; 11 kBq/l Cs-137
11:00	NO	Gamma dose rate in the Sarpsborg area: 2 400 - 3 600 nSv/h, with a local maximum of 20 000 nSv/h (hot spot).
11:04	DK	A local radio station report high gamma radiation levels in the Swedish city of Malmö. Questions raised by this: What are the true values for Copenhagen? Are the authorities trying to cover up the real situation? How come Copenhagen is not affected, when Malmö is? (This is a false rumor.)

11:10	SE	Airborne gamma measurements in the Kopparberg - Sunne region indicate a maximum dose rate of 3 000 nSv/h 1 m above the ground.
11:20	NO	Question from the Civil Defense: What regulations apply for monitoring personnel at border checkpoints regarding, e.g., radiation doses, when checking vehicles and cargo? Include regulations in neighboring Nordic countries, and explain any major discrepancies. To what extent do existing Nordic regulations agree with international recommendations? A reply is requested before 14:00.
11:20	SE	The Ministry of Foreign Affairs forwards a question from the US Embassy regarding the radiological situation plus assistance in sending home American tourists.
11:30	IS	Measurements from Arnessysla of dairy milk: 16 - 45 Bq/l I-131; 300 - 1290 Bq/l Cs-134; 600 - 2750 Bq/l Cs-137
11:30	SE	The county veterinarian in Värmland asks whether the action level 300 Bq/kg for meat is still valid.
11:30	FI	Questions from an embassy regarding health hazards for tourists; available written information etc. The answer should relate to a specified route through a number of Nordic countries. Finland is expected to coordinate the Nordic information. A reply is requested before 14:00.
11:30	NO	New data from Rakkestad - Mysen: 2 MBq/m <sup>2</sup> Cs-137.
11:45	SE	Fax from the International Orienteering Committee regarding the World Championships in Karlstad, Sweden, July 3 thru 8: * How will participants and officials be affected by the fallout? * Can the Championships be conducted in the Karlstad region without health hazards? * Are there alternate locations in the Nordic countries that would be better suited? A reply is requested before 14:00.
11:48	DK	Question from a police precinct whether officers on outdoor duty may have received radiation doses in spite of iodine tablets.
11:50	NO	Question from the US Ambassador, forwarded by the Ministry of Foreign Affairs: What are the plans for the approximately 3 500 American tourists in Norway, especially the 2 500 presently in Østlandet? Can Norwegian authorities assist in the evacuation?

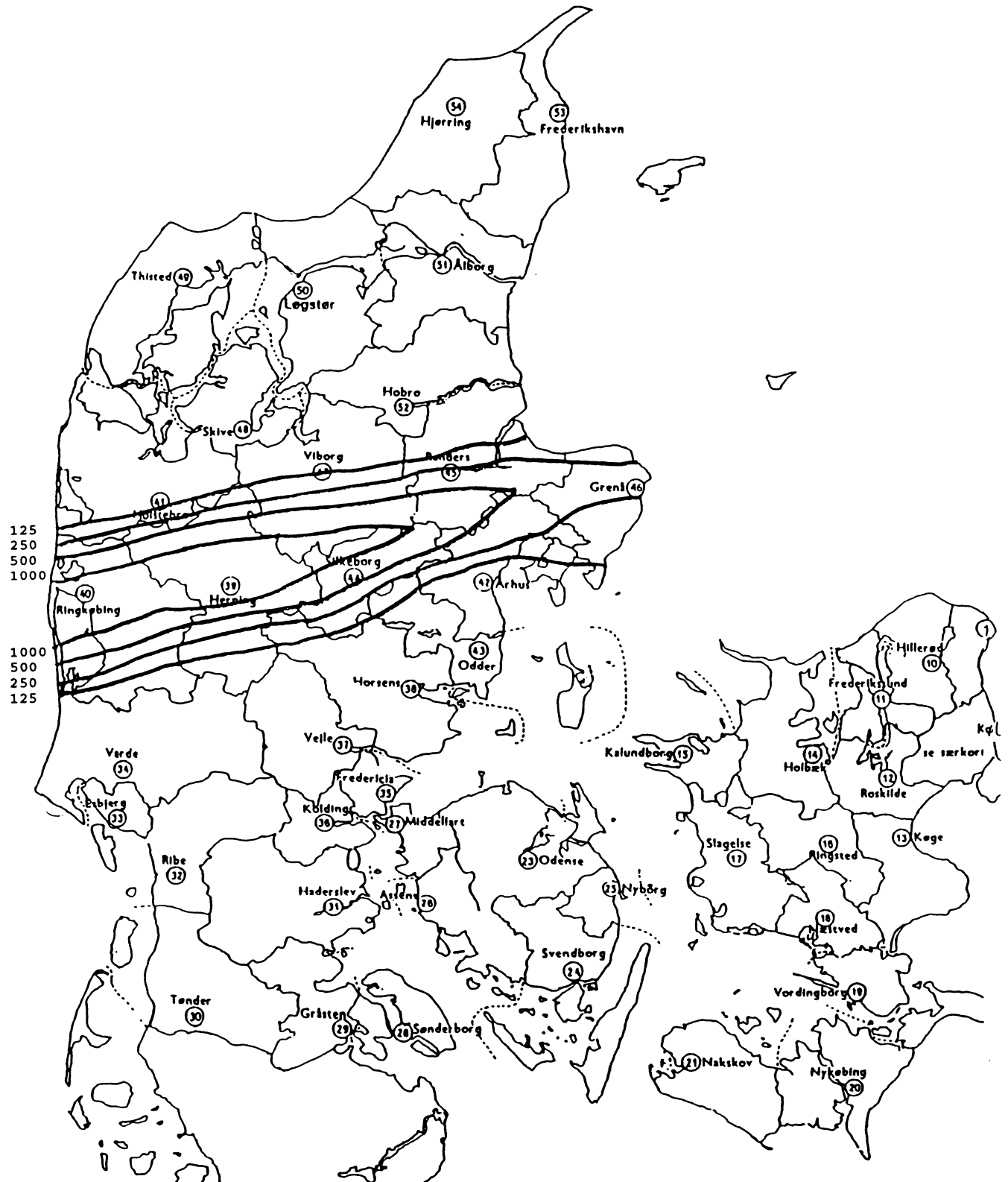


12:00	IS	Question from a journalist: Why are there no official Icelandic action levels on food contamination of the same type applied in the other Nordic countries? What is the status of the Nordic report on action levels for food, written by food and radiation protection authorities? Will the levels recommended in said report be applied under the present conditions in Iceland? A reply is requested before 14:00.
12:30	NO	Travel agents, hotels and similar establishments forward questions from foreign tourists regarding the fallout situation, health hazards, hiking etc. Who will cover the economic losses due to cancelled reservations?
12:30	SE	The Swedish news agency, TT, wants an updated fallout map of areas with dose rates above 150 nSv/h.
12:30	IS	A ferry will arrive from Norway in 2.5 hours. Customs request advice and experts with necessary equipment to monitor passengers, vehicles and cargo.
12:39	DK	The European Community asks Denmark for a report on Nordic actions during the period 210800 - 220800 UTC regarding <ul style="list-style-type: none"> <li>* gamma radiation levels at representative monitoring stations</li> <li>* planned or decided preventive measures, such as access control; evacuation/relocation; sheltering; iodine tablets; other restrictions</li> </ul> A reply is requested before 14:00.
13:00	NO	Message from the Norwegian ambassador to Berlin: The price of fish from the North Sea and the Northern Atlantic is dropping drastically on the German market, after rumors that the fish are contaminated. Relevant ministries in Iceland, Denmark and Norway have decided on a joint action to send correct information on measurement data for fish and fish products. Norway has accepted to compile the data from all three countries.
13:00	IS	New measurements of total deposition from the Hornafjörður area: 1050 - 2100 kBq/m <sup>2</sup> I-131; 100 - 200 kBq/m <sup>2</sup> Cs-134; 200 - 400 kBq/m <sup>2</sup> Cs-137
13:15	DK	Billund Airport requests assistance to ensure that the aircraft are not contaminated by embarking passengers.
13:15	SE	Results from analysis of grass samples: 19 - 53 kBq/kg I-131 and 3.2–10.7kBq/kg Cs-137.

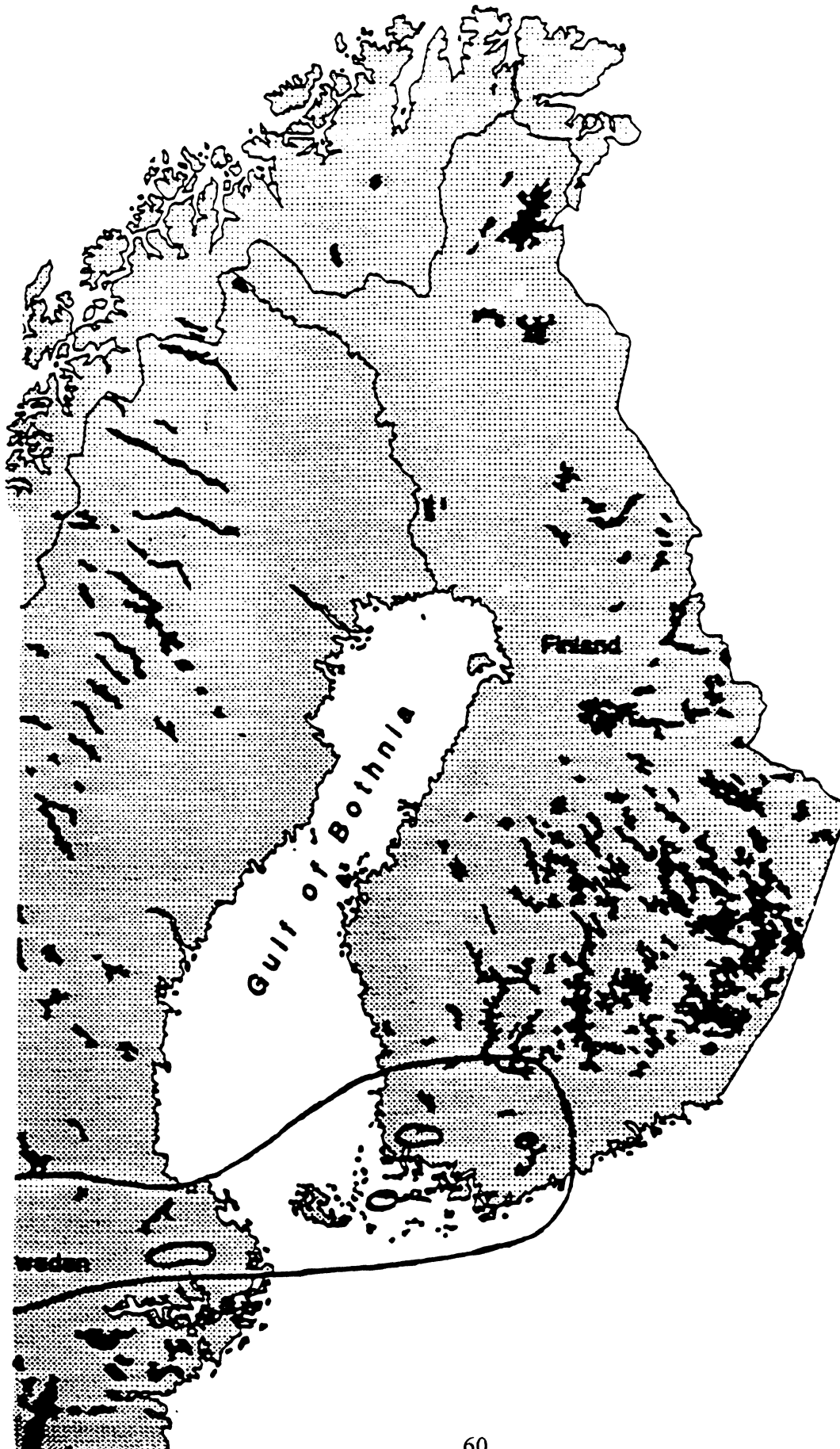
13:17	DK	Questions from a number of farming and agricultural organizations regarding the coming harvest. Can Esbjerg still be used for shipping export produce?
13:30	IS	A local radio station claims that a local expert has measured an external gamma dose rate of 570 mSv/h and that evacuation is needed.
13:45	SE	The Swedish Tourist Council forwards a number of questions from tourists.
14:00	FI	Question to STUK from the Finnish ambassador to Stockholm: Can the ferry bound traffic from the Swedish harbors in Grisslehamn and Kappelskär be allowed to continue, in light of the high contamination levels on the Swedish side? (This is a false rumor.)
14:00	IS	Anxious parents of Icelandic students in Malmö and possibly also Copenhagen turn to Geislavarnir for advice. Should the Icelandic students return home as soon as possible? (This is the same false rumor as referred to in Denmark above.)
14:00	NO	Question from the paper mill in Glomma: How contaminated is the water of Glomma River, used in the process? How contaminated is the used water when returned to the river? What measures are required to produce radiation free paper products?
14:30	IS	The association of travel agents requests information for foreign tourists regarding the fallout situation, health hazards etc.
14:30	SE	A Swedish research team on a glacier in southeast Iceland requests information on the situation in Iceland via the Swedish research center in Umeå. Practical advice is requested regarding drinking water, since they normally use surface water.
14:33	DK	Question from school principals whether the summer vacation should be prolonged for some time, until the fallout situation has been taken care of.
15:00	All	End of the exercise.

## Fallout map - Denmark

All isocurves give external gamma dose rates in nSv/h

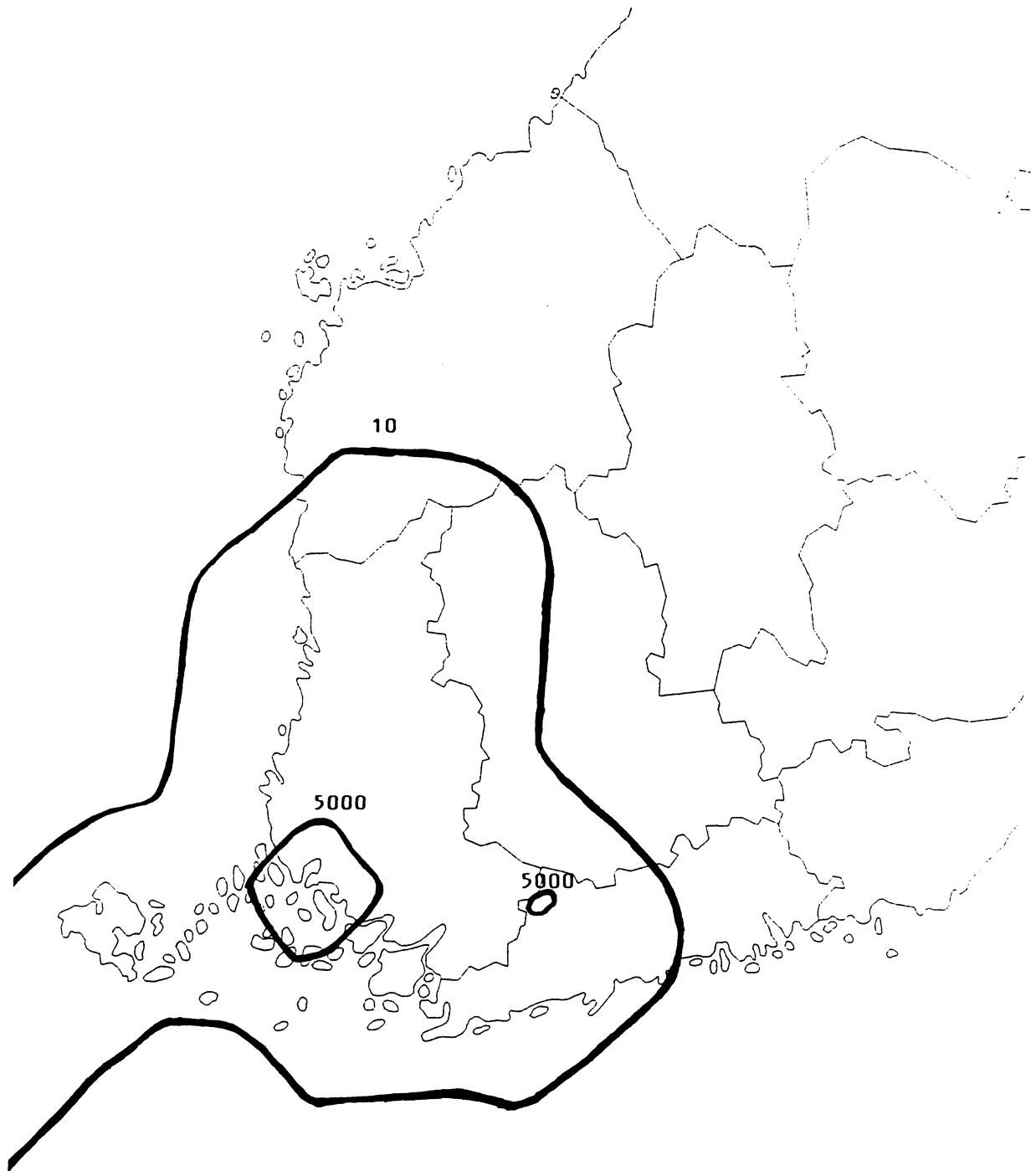


## Overview - Finland



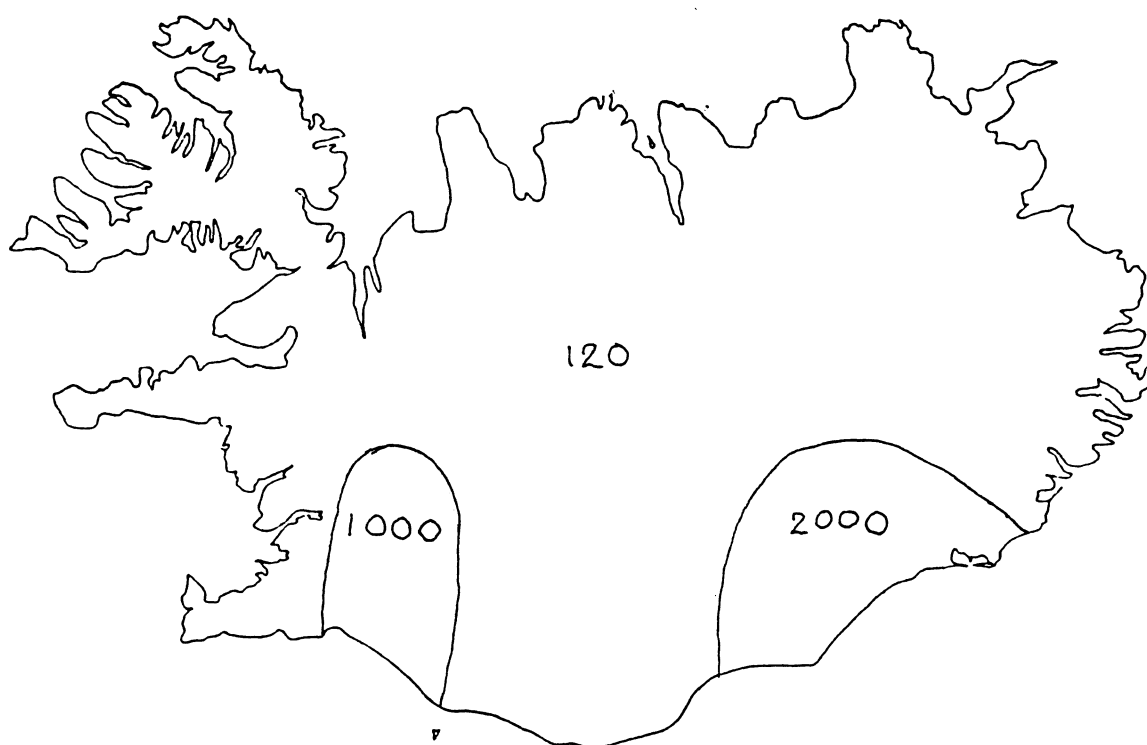
## Detailed fallout map - Finland

All isocurves give external gamma dose rates in nSv/h



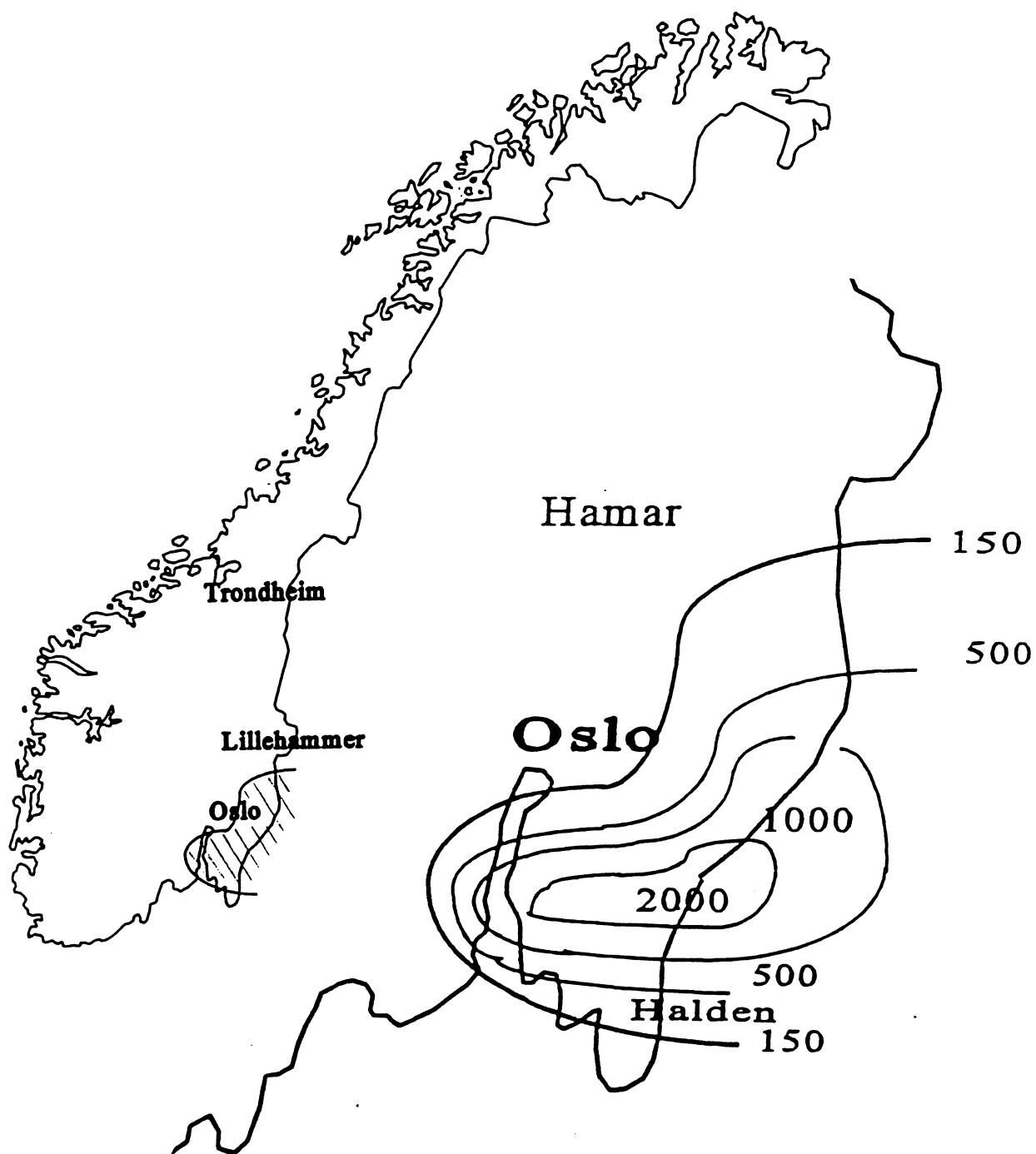
## Fallout map - Iceland

All isocurves give external gamma dose rates in nSv/h

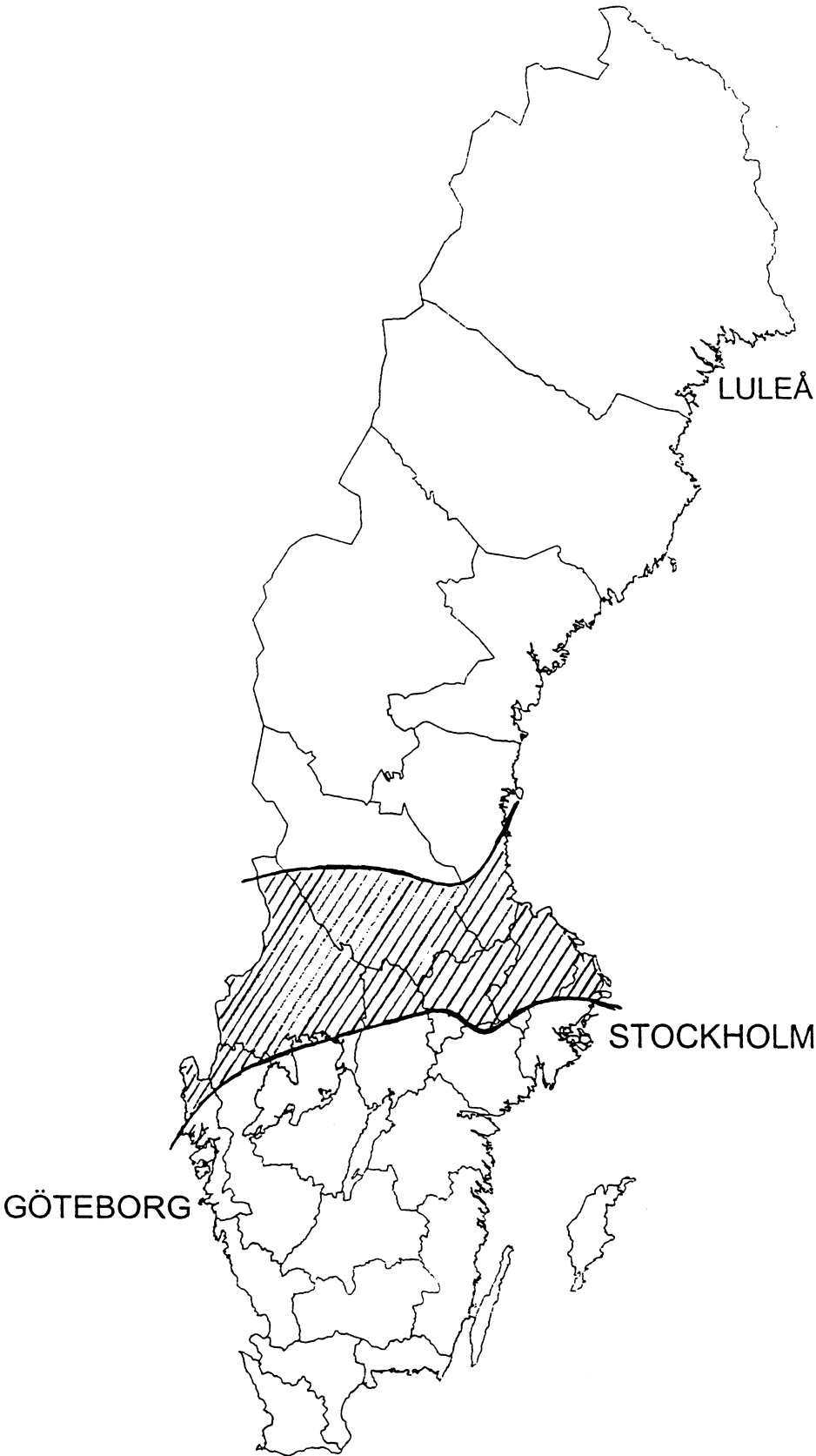


## Overview and detailed fallout map - Norway

All isocurves give external gamma dose rates in nSv/h



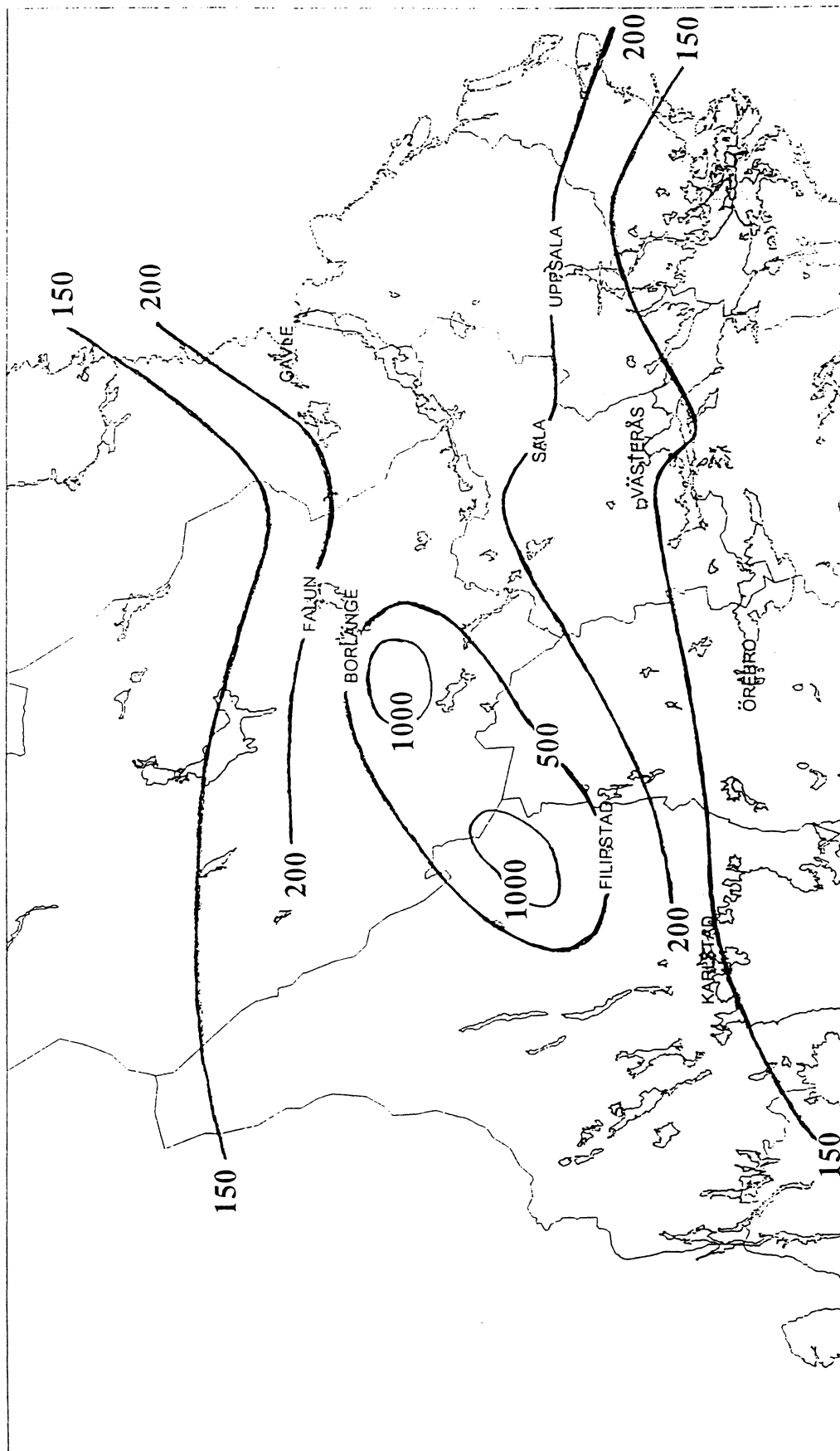
Overview - Sweden





## Detailed fallout map - Sweden

All isocurves give external gamma dose rates in nSv/h





## Summary of answers to the Nordic late-phase checklist

### Organizational issues, contacts

	Denmark	Finland	Iceland	Norway	Sweden
Emergency organization					
- alerted	Day 1	Day 1	Day 1 10:00		Day 1 08:00
- summoned	Day 1	Day 1	Day 1 20:00		Day 1 18:00
- in operation	Day 1 21:00	Day 1	Day 1	Day 1 - 2	
Information to relevant authorities	Yes	Yes	Yes	Yes	Yes
Nordic contacts	Yes	Yes	Yes	Yes	Yes
Other international contacts	European community; OECD/NEA; according to bilateral agreements	Estonia; Russia	IAEA	IAEA; according to bilateral agreements	OECD/NEA; IAEA; according to bilateral agreements
Media contacts	Press releases; Orientations; Press conferences as needed	Press releases; Press conferences	Yes (not specified)	Press releases; Press conferences	Yes (not specified)
<b>Measurements etc.</b>					
Polling of gamma stations	Yes	Yes	Yes	Yes	Yes
Reading of air filter stations	Yes	Yes	Yes	Yes	Yes
Airborne measurements and/or car-borne survey teams	Air: Yes Cars: No	Not specified	Yes	Yes	Yes
Food and environmental samples	Yes	Yes	Yes	Yes	Yes
Long-term dose calculations	Planned	Yes	Planned	Yes	Planned

**Dose reducing measures**

	Denmark	Finland	Iceland	Norway	Sweden
Iodine tablets recommended	No	No	No	No	No
Evacuation; sheltering; close doors and windows; turn off ventilation; etc.	No	Avoid outdoor activities	No	Children <7 years old should stay indoors; Minimize outdoor activities; close doors and windows	No
Measures concerning children and pregnant women	No	No	No	No	No
Sheltering of cattle	No	Yes	Yes, in worst affected areas	Yes, if possible in worst affected areas	Yes, if possible where >150 nSv/h
Use of precipitation and surface water	No restrictions	Restrictions (unspecified)	Do not use surface water	Do not use rainwater	Do not use rainwater
Restrictions on fruits and vegetables	Rinse vegetables	See other foodstuffs	See other interventions	Do not harvest	Sales ban on vegetables from areas with >150 nSv/h (Recommended by SSI)
Other foodstuffs	Milk: No restrictions	Restrictions planned; Temporary sales bans	Restrictions on milk with >1 000 Bq/l	Ban on milk from grazing cattle or cattle using fresh fodder	Ban on milk from cattle in areas with >150 nSv/h (Recommended by SSI)
Sports, tourism, sea transport etc.	No restrictions	No restrictions	No restrictions	No restrictions	No restrictions

	Denmark	Finland	Iceland	Norway	Sweden
Other interventions	Check of imported foodstuffs and vehicles from abroad	Ban on travels <100 km from NABO; Protect fodder supplies and wells; Save fodder and water for domestic animals	Restrictions on imported foodstuffs	None	Use protective mask when changing ventilation filters

# Nordic Nuclear Emergency Exercises

Should a nuclear emergency situation arise, the responsible authorities in each country concerned will react by taking those measures that they deem appropriate. In order not to lose public confidence it is important that authorities in neighbouring countries react in a coherent manner when facing similar conditions.

Two joint exercises have been carried out in the Nordic countries in order to verify whether reactions on a nuclear threat would be similar. The outcome confirms that contacts need to be established routinely, and that regional exercises are both useful and necessary, if different paths of action are to be avoided in case of a future emergency situation.

The Nordic Committee for Nuclear Safety Research - NKS organizes pluriannual joint research programmes. The aim is to achieve a better understanding in the Nordic countries of the factors influencing the safety of nuclear installations. The programme also permits involvement in new developments in nuclear safety, radiation protection, and emergency provisions. The three first programmes, from 1977 to 1989, were partly financed by the Nordic Council of Ministers.

## The 1990 - 93 Programme

Comprises four areas:

- |                             |                     |
|-----------------------------|---------------------|
| * Emergency preparedness    | (The BER-Programme) |
| * Waste and decommissioning | (The KAN-Programme) |
| * Radioecology              | (The RAD-Programme) |
| * Reactor safety            | (The SIK-Programme) |

The programme is managed - and financed - by a consortium comprising the Danish Emergency Management Agency, the Finnish Ministry of Trade and Industry, Iceland's National Institute of Radiation Protection, the Norwegian Radiation Protection Authority, and the Swedish Nuclear Power Inspectorate. Additional financing is offered by the IVO and TVO power companies, Finland, as well as by the following Swedish organizations: KSU, OKG, SKN, SRV, Vattenfall, Sydkraft, SKB.

ADDITIONAL INFORMATION is available from  
the NKS secretary general, POB 49, DK-4000 Roskilde, fax (+45) 46322206



## The Nordic Council of Ministers

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