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Working Party on Nuclear Emergency Matters

INEX 2000 EXERCISE EVALUATION REPORT

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FOREWORD

The Nuclear Energy Agency has a long tradition of supporting its Member countries in improving efficiency and effectiveness in nuclear emergency preparedness and management. As an integral part of this tradition, the NEA has established an international nuclear emergency exercises culture through the organisation of the INEX series of international exercises.

The INEX series of international exercises has proved successful in the testing and developing of arrangements for responding to nuclear emergencies. The first series, INEX 1 (table-top exercise) brought together participants from across the world to separately consider the issues raised by a fictitious emergency at a fictitious nuclear power plant and affecting fictitious countries. Follow-up workshops to the INEX 1 exercises were hosted by NEA and addressed common experiences and issues as well as identifying areas for future development work.

The second series of exercises, INEX 2, built upon the foundations laid from INEX 1 and permitted a number of individual countries to host simulated nuclear incidents at nuclear power plants within their borders in order to test specific aspects of both the national and international arrangements. All of these exercises considered primarily the emergency phase issues (alert and notification) and immediate countermeasure strategies available to decision makers. The INEX 2 exercises could commonly be described as 'command post' or 'command and control' exercises.

A major follow-up of the INEX 2 exercise series was the development of evolved *Monitoring and Data Management Strategies for Nuclear Emergencies* (OECD/NEA, Paris, 2000).

In order to test the evolved communication and information technologies described in this NEA report, the NEA organised the INEX 2000 exercise hosted by France at the Gravelines NPP, 22-23 May 2001. This international nuclear emergency exercise was similar to the four INEX 2 exercises as a command-post real-time notification and communication exercise, dealing with the first hours of a nuclear emergency. In addition to the new communication aspects, the exercise included for the first time an additional objective testing compensation and third party liability issues after a nuclear accident. INEX 2000 is therefore seen as a bridging exercise between the INEX 2 series and the next generation of international nuclear emergency exercises at the Nuclear Energy Agency, focusing on decision-making mechanisms in later phases of a nuclear emergency.

This report summarises the NEA evaluation of the INEX 2000 exercise with respect to the NEA objectives.

TABLE OF CONTENTS

FOREWORD	2
INTRODUCTION	4
INEX 2000 AS PART OF THE JOINT INTERNATIONAL EXERCISE JINEX 1	6
EXERCISE SCENARIO	7
IMPLEMENTATION OF NEW COMMUNICATION AND INFORMATION STRATEGIES	12
EVALUATION OF THE INEX 2000 EXERCISE	18
WORKSHOP ON THE INDEMNIFICATION OF DAMAGE IN THE EVENT OF A NUCLEAR ACCIDENT	21
SUMMARY OF CONCLUSIONS	23
REFERENCES	24
ANNEX: DETAILED TIME LINE OF THE EXERCISE SCENARIO	25

INTRODUCTION

The Nuclear Energy Agency employs an extensive programme to assist NEA Member countries in their effort to enhance effectiveness and efficiency in nuclear emergency preparedness and management, nationally and internationally. With the initiation of the first international nuclear emergency exercise INEX 1, performed in 1993, the international community could for the first time test approaches and policies in place to manage a nuclear or radiological emergency. INEX 1 with its related workshops led to a wealth of lessons learned and to an improvement in nuclear emergency management.

The INEX 2 exercise series, initiated by the NEA and performed between 1996 and 1999, established for the first time an international nuclear emergency “exercise culture” leading to a clear improvement of the international aspects of nuclear emergency preparedness and management. The most prominent outcome of INEX 2 and a major step forward in nuclear emergency management was the development of a new communication and information exchange strategy, which is described in the NEA report on *Monitoring and Data Management Strategies for Nuclear Emergencies* (OECD/NEA, Paris, 2000). Concepts and ideas in this publication have partly been implemented by NEA member countries and by international organisations.

These evolved communication and information strategies suggest the use of web technology to communicate information and to transfer data in case of a nuclear or radiological emergency. These concepts distinguish between the **alert or notification**, which must be a wake-up instrument and therefore be **pushed** to responding organisations, and any **additional data and support information** which is made available and can be **pulled** from the sources if needed.

In order to test these ideas and concepts, the NEA proposed to organise an international nuclear emergency exercise similar to the four INEX 2 exercises, as a command-post real-time notification and communication exercise, with the additional objective to test the evolved communication and information strategies.

At the same time, it became clear that several international organisations have well defined obligations in case of a nuclear emergency, and that the international nuclear emergency exercise culture should be structured, co-ordinated and institutionalised. The INEX 2 series helped to identify a workable procedure for regularly testing the notification and communication processes in the very early stages of a nuclear or radiological emergency. In order to co-ordinate and harmonise the efforts of various international organisations to initiate and perform international nuclear emergency exercises, the Inter-Agency Committee on Response to Nuclear Accidents (IACRNA) developed a formal mechanism for this purpose. This formal mechanisms, as laid down in a “Joint Plan” is co-sponsored by its member organisations EC, FAO, IAEA, ICAO, NEA, PAHO, UN-OCHA, UN-OOSA, WHO, and WMO.

In 2001, France offered a national nuclear emergency exercise, based on a simulated accident at the Gravelines nuclear power plant, to be used for a joint international nuclear emergency exercise co-ordinated through the IACRNA. The exercise was organised, similar to the four INEX 2 exercises, as

a command-post real-time notification and communication exercise, dealing with the first hours of a nuclear emergency.

The Nuclear Energy Agency developed its objectives in the tradition of the INEX 1 and INEX 2 series to offer the NEA Member countries the opportunity to improve their national nuclear emergency preparedness and management. Under the auspices of the NEA Committee on Radiation Protection and Public Health (CRPPH), the Working Party on Nuclear Emergency Matters developed the following objectives for the INEX 2000 exercise:

- To test features of the “Monitoring and Data Management Strategies for Nuclear Emergencies” such as
 - the effectiveness of the developed data matrix;
 - the effectiveness of proposed communication strategies employing new technologies;
- To test the co-ordination of media information between various participants;
- To identify how participants incorporated the lessons learned from INEX 2 exercises; and
- To test the mechanisms for the implementation of the Conventions on Third Party Liability.

The fourth objective of INEX 2000 was addressed in the context of an NEA *Workshop on the Indemnification of Damage in the Event of a Nuclear Accident* which was held in Paris, 26 - 28 November 2001.

The French host organisations, together with the NEA, organised an INEX 2000 Preparatory Meeting, 16 - 17 January 2001, in Dunkerque, France, to inform participants about the scenario of the exercise and the NEA objectives.

The exercise took place on 22 - 23 May 2001 based on a French national nuclear emergency exercise at the French Gravelines nuclear power plant. The NPP is located in the north of France not far from the Belgian border. This exercise was similar in scope to the INEX 2 command-post exercises and lasted approximately 24 hours.

The following fifty-five countries participated in the first joint international nuclear emergency exercise – JINEX 1: Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, Croatia, Cuba, Czech Republic, Denmark, EL Salvador, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea (Republic of), Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mauritius, Mexico, Netherlands, Norway, Philippines, Poland, Portugal, Romania, Russia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, the Syrian Arab Republic, Tunisia, Turkey, Ukraine and the United Kingdom. In addition, the following five international organisations participated: EC, IAEA, NEA, WHO, WMO.

The NEA organised an INEX 2000 Evaluation Meeting in Paris 16 - 17 January 2002 to summarise the lessons learned with respect to the NEA INEX 2000 objectives. This document presents a summary of the experience and lessons learned as a result of the exercise, structured around the NEA INEX 2000 objectives.

INEX 2000 AS PART OF THE JOINT INTERNATIONAL EXERCISE JINEX 1

Over the past several years, many international nuclear emergency exercises have taken place, and much experience has been gained in the important fields of accident preparedness and management. In order to more efficiently plan, implement, analyse and share the results of future international nuclear emergency exercises, it has been agreed that the Inter-Agency Committee on Response to Nuclear Accidents (IACRNA), for which the IAEA provides the Secretariat, should serve as a co-ordination point for these activities. The IACRNA is made up of representatives from international and intergovernmental organisations involved in the preparedness for and/or management of nuclear emergencies, including the European Commission (EC), Food and Agriculture Organisation of the United Nations (FAO), International Atomic Energy Agency (IAEA), Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (NEA/OECD), Pan-American Health Organisation (PAHO), United Nations Office for the Co-ordination of Humanitarian Affairs (OCHA), United Nations Office for Outer Space Affairs (OOSA), World Health Organisation (WHO), and World Meteorological Organisation (WMO). The *Joint Radiation Emergency Plan of International Organisations (EPR-Plan, IAEA, 2002)* describes the interagency framework for the preparedness for and response to an actual, potential or perceived nuclear or radiological emergency. The Joint Plan is updated every 2 years.

Part of the arrangements in this Joint Plan include the co-ordination and harmonisation of international nuclear emergency exercises. It was agreed that the French Gravelines nuclear emergency exercise in 2001 should be used for the first joint international nuclear emergency exercise (JINEX 1) co-ordinated through the IACRNA. The exercise was organised, similar to the four INEX 2 exercises, as a command-post real-time notification and communication exercise, dealing with the first hours of a nuclear emergency. Each international organisation involved, namely the EC, IAEA, NEA, WHO and WMO, developed its own objectives and offered these objectives to its constituency.

An IACRNA working group was established to define the general JINEX 1 objectives and to co-ordinate the specific objectives of each participating international organisation. A representative of the French National Controllers Team was assigned to assist the working group in the planning and co-ordination. The work of this IACRNA working group is summarised in the documents JINEX 1 Exercise Manual, and JINEX 1 Guide for Players.

Each of the international organisations involved has performed its own evaluation of the exercise with regard to its specific objectives. The IAEA has published their evaluation in a report called International Nuclear Emergency Exercise JINEX 1 IAEA Evaluation Report (IAEA, 2002). The evaluation from the EC and the WMO are available as internal reports only.

This report summarises the evaluation of JINEX 1 with regard to the objectives developed by the NEA, called INEX 2000.

EXERCISE SCENARIO

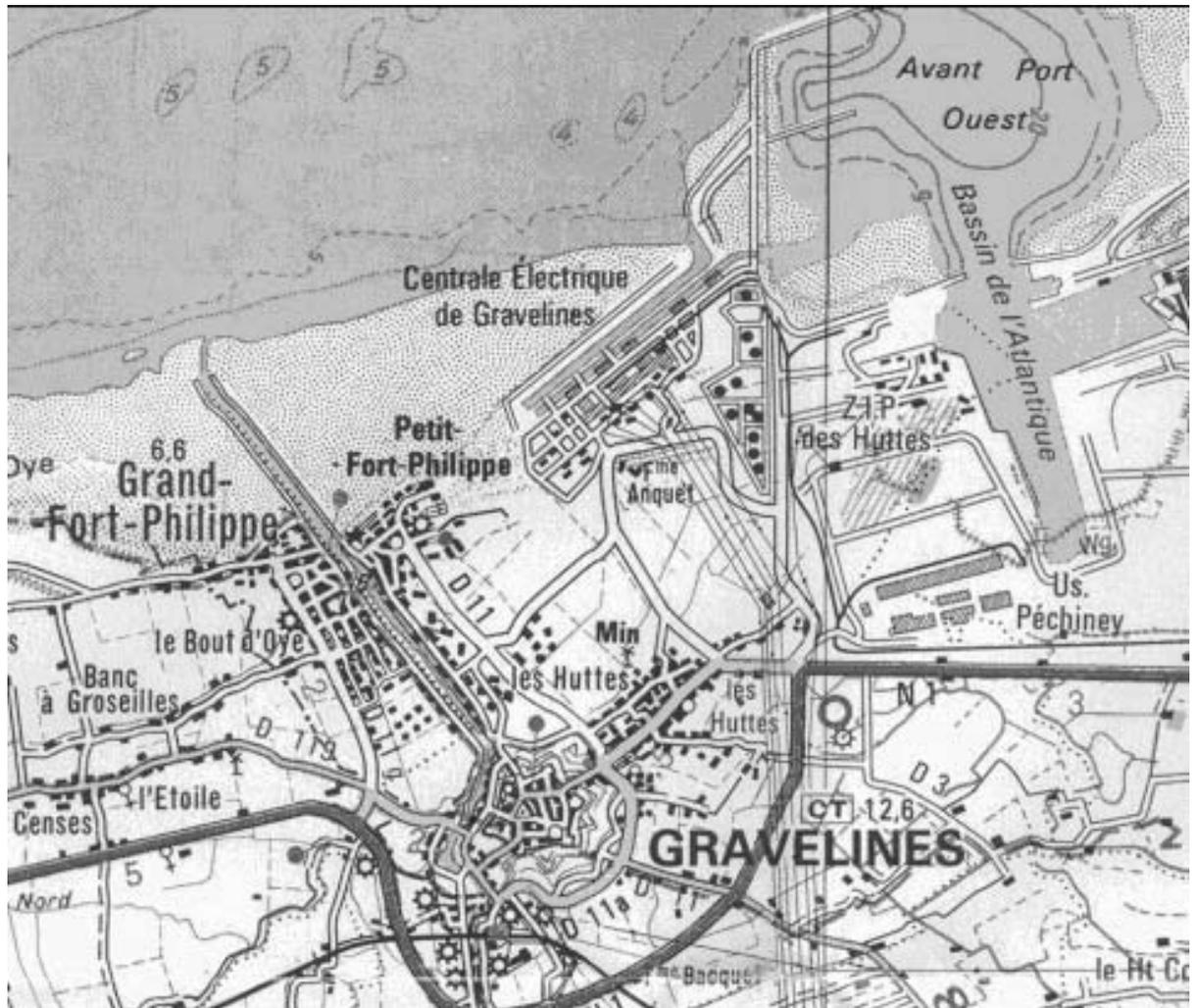
The INEX 2000 exercise took place on 22 - 23 May 2001 based on a French national nuclear emergency exercise at the French Gravelines nuclear power plant. The power plant is located in the north of France not far from the Belgian border. This exercise was similar in scope to the INEX 2 command-post exercises and lasted approximately 24 hours.

Location

The Gravelines NPP site contains six units. Units 1 to 4 entered into commercial operation during 1980 – 1981 and units 5 and 6 in 1985. Each unit is a pressurised water reactor (PWR) of 920 MWe. The core is cooled by 3 loops. Around the site, there are 67500 people living in the 10 km radius emergency planning zone, including all or part of 14 communities. The site is located on the sea shore, North of the town of Gravelines. Figures 1 and 2 show the location on two different scales.

Figure 1: Location of the Gravelines nuclear power plant in the North of France



Figure 2: Detailed map of the Gravelines area

Exercise Scenario

The scenario for the exercise was prepared by Electricité de France (EDF) in collaboration with the French Institute for Protection and Nuclear Safety (IPSN).

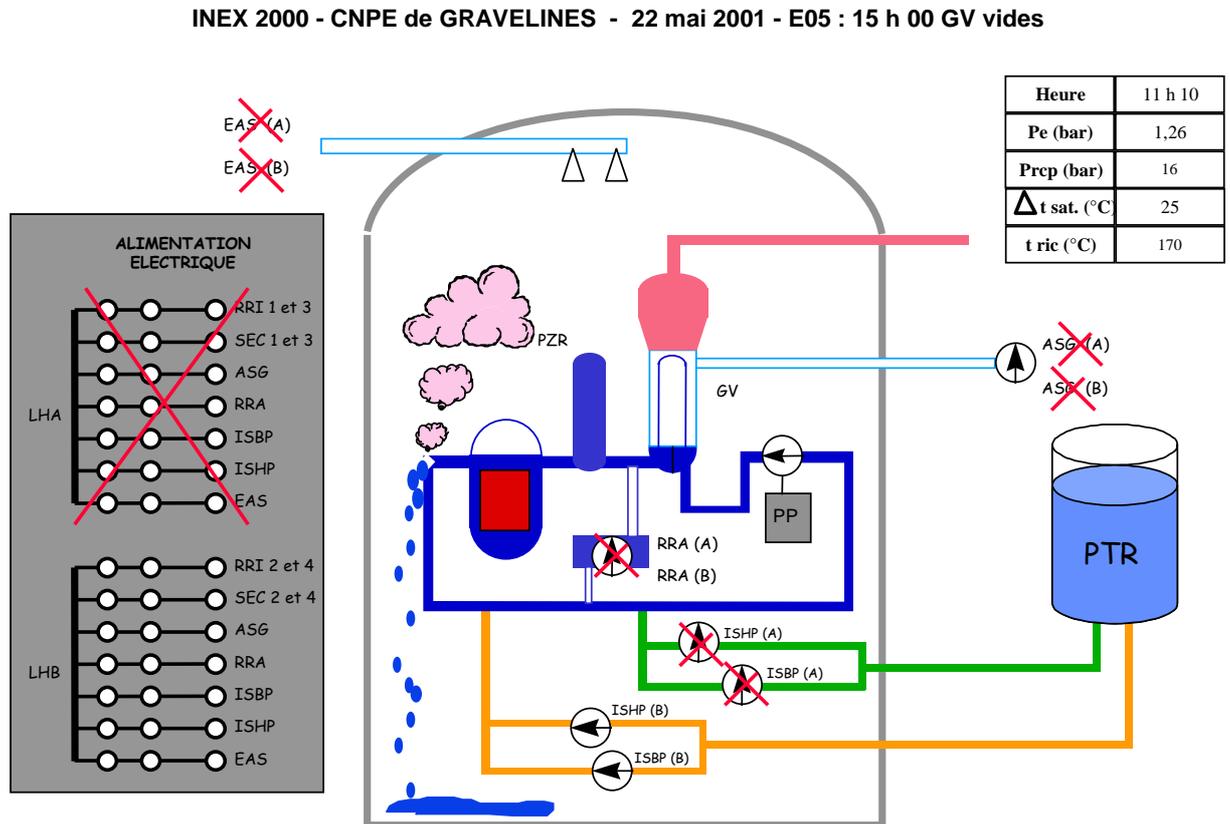
The simulated accident occurred at a fictitious “Unit 11” of the Gravelines Site, using Unit 1 for technical references. The initial status was as follows:

- The plant was running at 100% of nominal power;
- The containment spray system (EAS) B train was unavailable;
- Primary activity (I-131 equivalent) was equal 0.7 GBq/Ton (metric).

The accident process was designed to be a slow one. It included releases beginning about 10 hours after the initial event. The first event (at 05:00 UTC) would be a small primary leak (1.8 cm in diameter). This event would induce a scram and safety injection.

A series of additional events including loss of feed water in steam generators (+ 1h15min) and a second major event, loss of high pressure safety injection (+4h) would induce the high probability of core melting event. Figure 3 summarises graphically, in a schematic way, the events leading to the accident.

Figure 3: Schematic overview on the events leading to the exercise scenario at Gravelines NPP



The core would start to become uncovered at 14:50 UTC (+9h50min after the initial event). Ten minutes later (15:00 UTC) core degradation would begin inducing the initiation of releases. Core melting was planned to start at 15:20 UTC. The proportion of core melted would be 3% to 5%. The steady status would be reached by an increase of the initial leak (the size of the leak will grow from 1.8 cm to 10 cm).

The release pathway would be the authorised leakage from the reactor containment. The accumulated release activity was expected to be as follows:

Activity in Bq	
Noble gases	1.5×10^{14}
Caesium isotopes	4×10^{11}
Iodine isotopes	5×10^{12}

Under the prevailing, forecasted weather conditions (5 m/s wind speed, normal diffusion, no rain), the projected emergency doses (external dose due to plume, deposition and inhalation) to the populations were estimated as presented in Table 1.

Table 1: Foreseen emergency doses to the population

	Prognosis	Real
effective dose (1 km)	90 mSv	1 mSv
effective dose (5 km)	7 mSv	
thyroid dose (1 km)	400 mSv (adult)	15 mSv (child)
thyroid dose (5 km)	30 mSv (adult)	1 mSv (child)

The European Commission limit for milk contamination of 500 Bq/l was expected to be reached at about 20 km from the plant under the same weather conditions.

The French Emergency Planning Criteria

The French Emergency Planning defines three emergency planning zones (EPZ). The first zone is inside a circle of 3 km radius. Within this zone, the population may be requested, by the local authority, to shelter and to listen to the radio in the case of a quickly evolving accident or very early releases. In such situations, the local authority (the Prefect), is responsible for decisions regarding the implementation of protective actions. The Prefect did not wait for national support, and activated the off-site emergency response plan on an instructive basis.

The second EPZ is inside a circle of 5 km radius. In this zone evacuation of the population is foreseen if the intervention level of 50 mSv averted dose can be reached.

The remaining EPZ is inside a circle of 10 km radius. This is determined for the purpose of sheltering of the population on the basis of an intervention level of 10 mSv. This EPZ is also used for pre-distribution of stable iodine to the population. Regarding this protective action, the associated intervention level is 100 mSv to the thyroid.

Events and release during the exercise:

During the course of the actual exercise, the core started to be uncovered at 15:45 UTC (+ 11 h after the initial event). Fifteen minutes later (16:00 UTC) core degradation began inducing the initiation of releases. Core melting started at 16:20 UTC and stopped at 16:30 UTC. The proportion of core melted was 3%. Safety status was reached by recovering first low pressure safety injection possibilities then all emergency safety injections systems. A detailed schedule of events is given in the Annex.

The release pathway was from the reactor containment. The accumulated released activity was as follows:

	Activity in Bq
Noble gases	4.3×10^{13}
Caesium isotopes	1.8×10^{11}
Iodine isotopes	2.7×10^{12}

Real weather, 22 May 2002

According to information provided by METEO France, the real weather conditions on 22 May 2002 were rather steady and can be summarised as presented in Table 2.

Table 2: Real weather conditions on 22 May 2002 at the Gravelines site

Real weather conditions on 22 May 2002 at the Gravelines site		
	Time of the day	Real weather condition
Diffusion	All day	Normal
Precipitation	All day	No rain
Wind direction and speed	Until 6:30 UTC	From 70°; 7 – 8 m/s
	6:30 – 7:30 UTC	From 60°; 7 – 8 m/s
	7:30 – 9:00 UTC	From 50°; 7 – 8 m/s
	9:00 – 12:00 UTC	From 50°; 9 m/s
	12:30 – 19:00 UTC	From 30°; 9 m/s
	19:00 – 19:30 UTC	From 30°; 8 m/s
	After 19:30 UTC	From 50°; 8 m/s

Doses to the public (retrospective calculation)

Based on the actual accumulated released activity and the real weather conditions on 22 May 2001, the following emergency doses to the populations were retrospectively calculated.

	Retrospective Calculation
Effective dose (1 km)	1.4 mSv
Effective dose (5 km)	0.009 mSv
Thyroid dose (1 km)	3.1 mSv
Thyroid dose (5 km)	0.2 mSv

Countermeasures taken during the exercise

As the simulated accident at Gravelines developed, the threat from a potential release of radioactive substances led to the decision, at the level of the local authority (the Prefect) to evacuate a population of 8000 inhabitants downwind of the release in the municipality of Dunkerque:

On 22 May 2001, at 14:15, the Prefecture decided to implement evacuation in a zone located in the direction of the wind and its 5 km radius. A total of 8000 people were affected including 4500 people of school age in 22 schools and 500 disabled people. At 16:34 the evacuation was nearly completed and 8000 people evacuated. In addition, 700 people from the neighbouring department Pas-de-Calais were also evacuated. No other countermeasure had been decided to be implemented.

The stable wind coming from north-east during the entire exercise did not require decisions on short-term countermeasures in neighbouring countries.

IMPLEMENTATION OF NEW COMMUNICATION AND INFORMATION STRATEGIES

Background

Efficient and effective nuclear emergency management requires solid and reliable information in a very short time period after an emergency occurs. International communication and information strategies have to be developed and agreed upon to ensure that communication and information exchange capabilities best serve responding organisations in case of an emergency. In 2000, the NEA published *Monitoring and Data Management Strategies for Nuclear Emergencies*, which proposes, *inter alia*, the use of the world wide web technology to enhance communication and data exchange capabilities during a nuclear or radiological emergency.

In the above mentioned publication, the NEA proposes to use two different modes to communicate accident related information:

- **Push mode:** Information considered important and urgent should be actively sent from the sender to the receiver. The sender should be responsible for the transmission.
- **Pull mode:** Information considered to be of interest to others, but not urgent, should be made available to potential receivers. The receiver should be responsible for fetching the information needed, and should be responsible for the transmission.

Accident Notification and urgent, new developments (such as unexpected releases, sudden status degradation, or the implementation of significant countermeasures) should be actively sent, or pushed, by the accident country's authorities, and should have a "wake-up" function to assure that they are recognised as being important by receiving organisations.

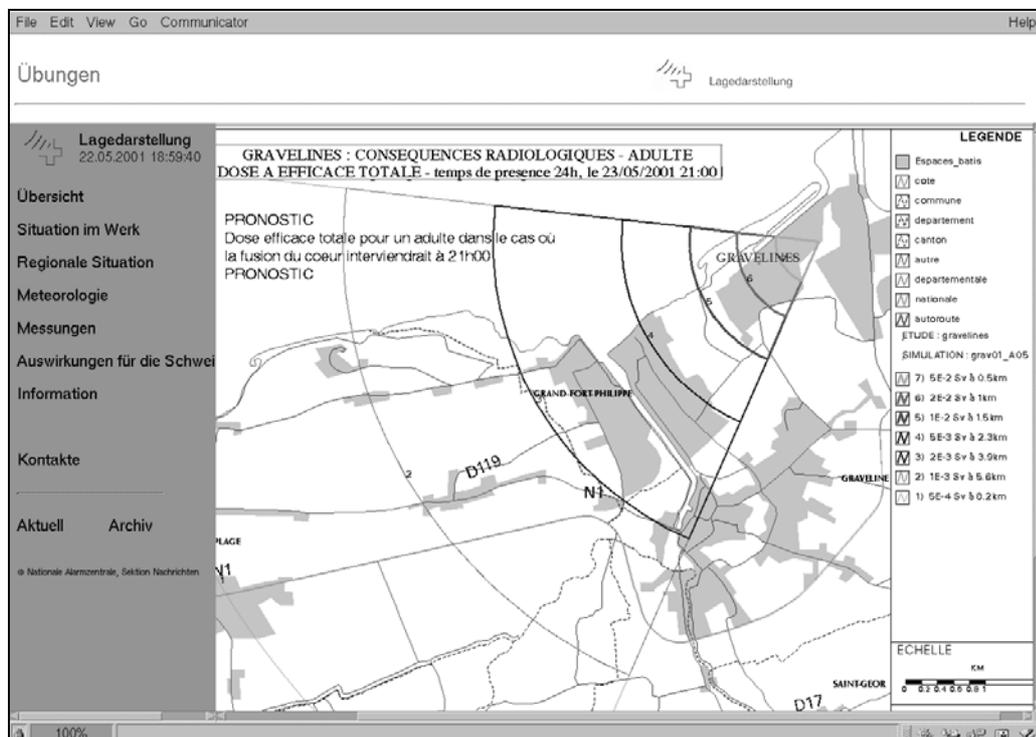
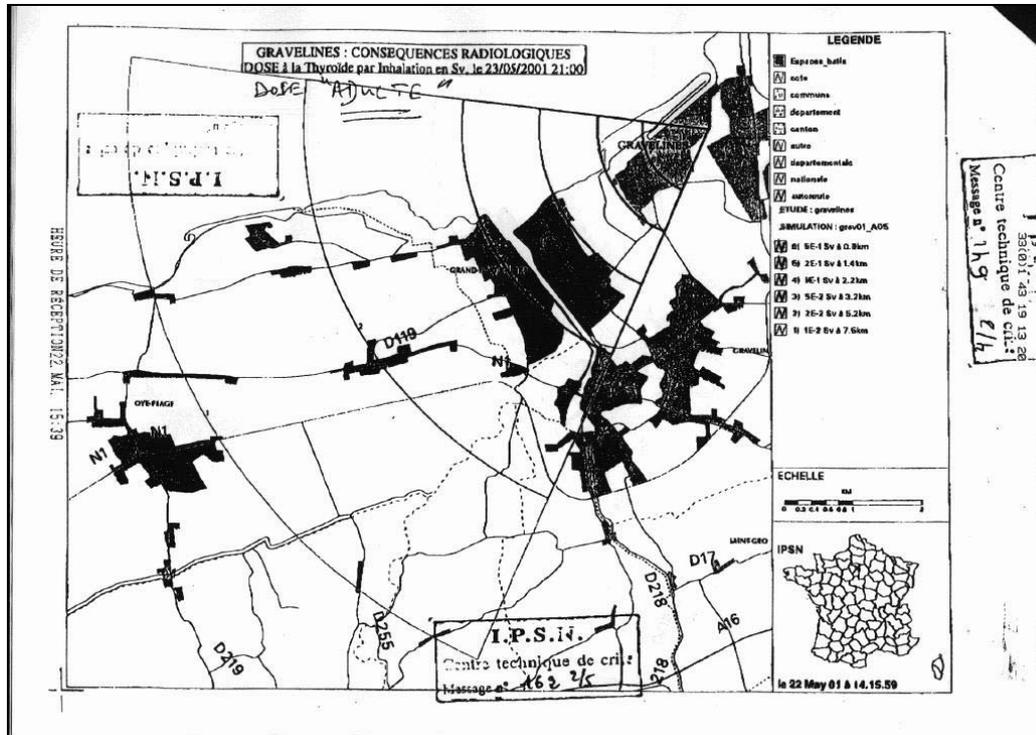
For all other accident-related information, a data server approach should be used. This would make information available for interested and authorised parties to come and retrieve it as needed. Because each agency and organisation will have different needs during the various phases of an emergency situation, information servers should be flexible enough to address all these needs at the same time.

Use of the world-wide web during INEX 2000

One of the objectives of the international nuclear emergency exercise at the Gravelines nuclear power plant was to test the new monitoring and data management strategies. Some countries, such as Switzerland, have already established web sites dedicated to communication and information transfer in case of a nuclear or radiological emergency. Other countries and international organisations established prototype web sites for the INEX 2000 exercises to gain experience with the implementation of such information strategies.

To illustrate one of the advantages of information exchange using web technology, Figure 4 compares a prognosis of the radiological consequences of the Gravelines simulated accident, one transferred classically via fax, the other as posted on the web page of the Swiss National Emergency Operations Centre.

Figure 4: Comparison of prognosis of the radiological consequences of the Gravelines simulated accident: a) transmitted via fax; b) posted on the Swiss National Emergency Operations Centre web page



In general, France and some other countries invested great efforts to establish prototype web sites for INEX 2000, which are seen as a good basis to enhance the use of new technologies. Many lessons were identified. However, it also became clear that the international community was not yet prepared as of the time of the exercise to fully use the new technology.

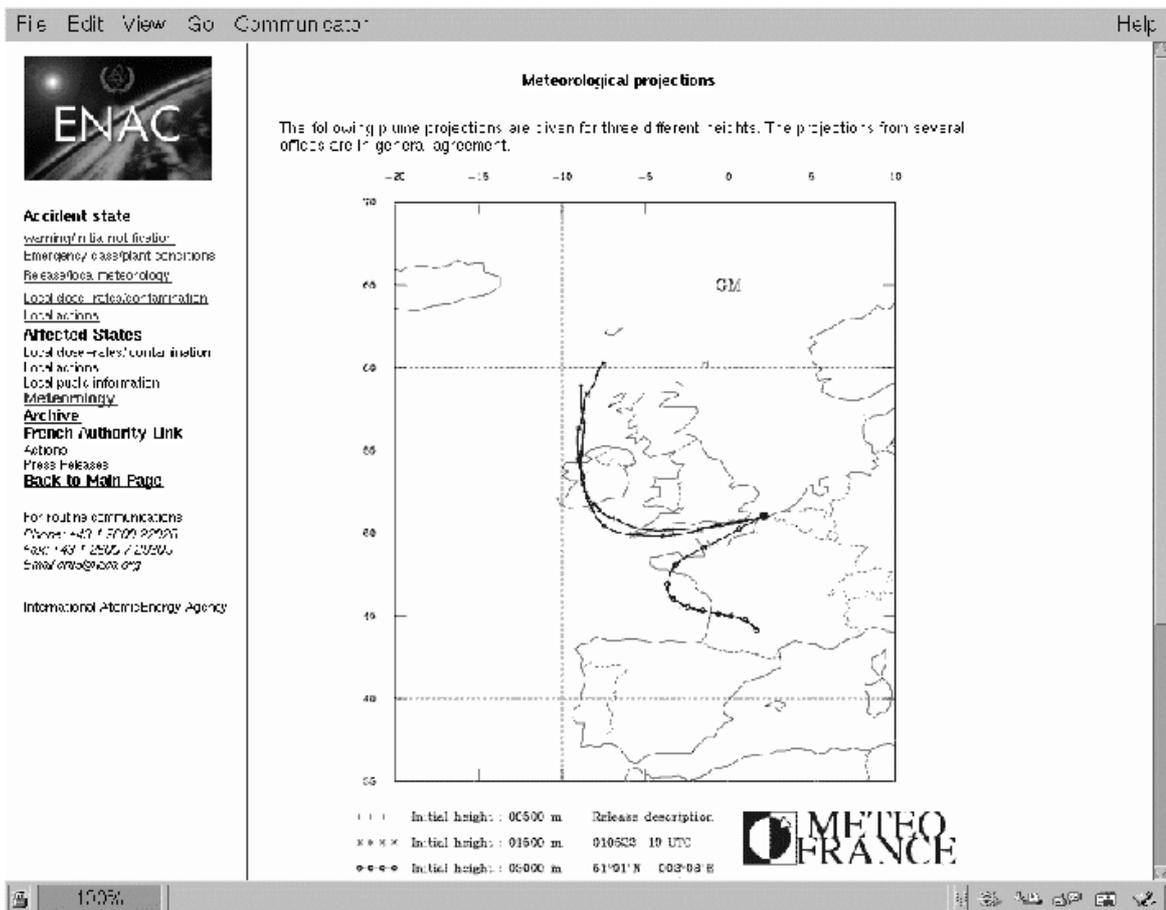
This chapter summarises some of the national and international prototype web sites established and used for INEX 2000.

Emergency Notification and Assistance Convention (ENAC) web page at the IAEA

The Emergency Response Centre of the International Atomic Energy Agency established a secure Emergency Notification and Assistance Convention (ENAC) web site with protected web pages. The access to this web site is restricted to official Contact Points regarding the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in Case of a Nuclear Accident of Radiological Emergency.

During INEX 2000, the ENAC web page was used to post EMERCON messages which were received via fax from the “accident” country, and information from METEO France, as illustrated in Figure 5. Since the exercise, the ENAC web page has undergone many modifications and improvements.

Figure 5: The Emergency Notification and Assistance Convention (ENAC) web site of the IAEA during INEX 2000



Prototype web site for the Gravelines nuclear emergency exercise JINEX 1

The host country France, in close collaboration with the Dutch Ministry for Housing, Spatial Planning and the Environment (VROM) and the International Atomic Energy Agency (IAEA), invested great efforts to establish a prototype web site for the Gravelines nuclear emergency exercise.

VROM, in co-operation with the IAEA, has developed a graphical data dictionary (GDD) to communicate key nuclear emergency information using graphical elements. VROM has also developed a Graphical Information Generator (Neige-GIG) to assist users in converting text based information from the IAEA notification forms into graphics-based information on a map overlay. This graphical representation can be posted on the web for fast access by the international community.

On 10 May 2001, the French authorities conducted a pre-JINEX exercise involving a simulated accident at the St-Alban nuclear power station, during which Neige-GIG was tested. Some modifications to the software, to the GDD and to the working environment (the French web site) were made and an updated version of the Neige-GIG was installed on the French system.

Based on the previous success of the GDD concept in the St-Alban accident, the French authorities (DGCISN) stated their commitment to the concept of communication by graphical elements using Neige-GIG and requested the further assistance of VROM for information management during JINEX 1/INEX 2000.

During the Gravelines exercise, the following lessons were identified:

- Neige-GIG and GDD performed well to communicate key emergency information;
- Two persons were required for information management using Neige-GIG;
- No restrictions for additional information (e.g. ENAC-forms);
- The French Web site was effective for information management;
- Neige-GIG can automatically convert local time to UTC;
- Neige-GIG requires a proper working place (maps, clocks etc.);
- Neige-GIG can also be used to record a log of events;
- Information flow in Emergency Co-ordination Centre is key for proper operation of Neige-GIG; and
- Maps to display information by Neige-GIG should be dynamic.

The Gravelines exercise provided the second full-scale trial of the capabilities of the GDD and Neige-GIG. The results were very positive. Lessons learned indicate that this concept provides a sound basis for improving the current international protocols for information exchange in a nuclear emergency. Further discussions will have to focus on the results of this exercise and on the use of Neige-GIG or similar concepts to enhance current ENATOM procedures. The demonstration of the GDD during JINEX-1 provided a credible basis for the continued promotion of the concept of graphical representation of key emergency data.

European Commission

The European Commission (EC), represented by Unit Environment C.4, Radiation protection, (ENV C.4) participated in the exercise, addressing primarily its own exercise objectives, which included, *inter alia*, two specific objectives on the use of modern communication technologies:

1. Test the ECURIE urgent radiological message transmission using the CoDecS software (Legal basis: Council Decision 87/600/Euratom);

2. Test the EURDEP radiological measurement data exchange in emergency situations (Voluntary action between the participating Member States).

The new CoDecS system was not the official system for ECURIE communications at time of the exercise, but the ECURIE Representative Meeting 2000 agreed to use the new software in the exercise. ENV C.4 ECURIE duty officers were assigned to use CoDecS in four-hour shifts in Luxembourg in order to receive and retransmit all the ECURIE messages. Mr Gerhard de Vries from JRC Ispra was present in order to assist the duty officers in using the system.

EURDEP radiological measurement data exchange was tested by intensifying the data exchange. JRC presented an evaluation of the results in a separate report.

Details on the results can be found in *Assessment of the European Commission INEX 2000 Objectives*, an internal report of the Commission.

Swiss National Emergency Operations Centre

Switzerland is already using web technology on a regular basis for secure national communication and information exchange between responding national emergency organisations in case of a nuclear or radiological emergency. The Swiss implementation of modern communication and information exchange strategies is a good example for a successful use of web technologies. Figure 6 shows an example of the web site run by the Swiss National Emergency Operations Centre.

Figure 6: Example of the web site run by the Swiss National Emergency Operations Centre.



Conclusions

During and after the INEX 2000 exercise, most participating countries and international organisations were convinced of the need to establish and use new technologies for information exchange in case of an emergency.

The potential of the web technology was not fully used during INEX 2000 and goes far beyond posting fax messages on the web or retyping their contents. Detailed strategies have to be developed to take full advantage of the potential uses of internet technology.

There has been extensive use of background information posted on the web.

It should be noted that information has to be posted on the web page in parallel with the dissemination by fax.

INEX 2000 indicated the following need for action, nationally and internationally:

- Need for action on a national level:
 - There has to be a decision in principle on whether or not to use internet technology for information exchange in case of a nuclear or radiological emergency;
 - If the use of internet technology in information exchange during an emergency is agreed upon, it has to be an integral part of national emergency management procedures;
 - New technical and organisational procedures for posting information on a web site have to be established and implemented.
- Need for action on an international level:
 - International organisations should agree to offer one official platform for information exchange;
 - Internationally agreed guidelines on the use of web technology have to be established.

EVALUATION OF THE INEX 2000 EXERCISE

For the evaluation of the exercise, the NEA Working Party on Nuclear Emergency Matters developed a questionnaire to be answered by exercise participants. Twenty four countries and one international organisation responded to the NEA questionnaire. For a detailed analysis of the exercise, the NEA organised an INEX 2000 Follow-up meeting, which was held 16 - 17 January 2002 at the OECD Headquarters in Paris.

The following paragraphs summarise the lessons learnt regarding the NEA objectives for the exercise.

- Effectiveness of Communication Strategies,
- Co-ordination of Media Information, and
- Incorporation of INEX 2 lessons learnt.

The results from the *Workshop on the Indemnification of Damage in the Event of a Nuclear Accident* are briefly summarised in the following chapter, and can be found, in greater detail, in the publication *Indemnification of Damage in the Event of a Nuclear Accident, Workshop Proceedings, Paris, France, 26 – 28 November 2001*, OECD, Paris 2003.

Effectiveness of Communication Strategies

The experience gained during the INEX 2 exercise series led *inter alia* to the development of a new *Monitoring and Data Management Strategies for Nuclear Emergencies* which was published by the NEA in February 2000. This strategy suggests the improvement of communication and information transfer already in the early phase of a nuclear emergency by employing internet technology. The approach described in the strategy has been partly implemented by national and international organisations and agencies, responsible for such communications.

One of the major objectives of the INEX 2000 exercise was to test the effectiveness of communication strategies which were suggested in the above mentioned NEA document.

As a general result, the INEX 2000 exercise showed that many countries, including the accident host country France, have made great efforts to develop and implement modern communication techniques for the exchange of emergency information, nationally and internationally. However, at the time of the exercise, the expectations could not fully be met, and the international community as a whole was not yet ready to make full use of the proposed technology. At the same time INEX 2000 offered many lessons, which will help to further enhance the good basis for implementation of new technologies in many countries:

- Most participating countries underlined the need for information exchange using new technologies;
- The use of web technology offers more than just the posting of retyped fax forms; and
- The potential of internet technology offers additional features which would be beneficial for emergency communication and information exchange.

However, stability, safety and security of net communications still leave room for improvement and require consolidation. There was general agreement that information exchange through web technology should be backed up by information dissemination with conventional fax.

On a national level, countries have to decide whether or not to employ web technologies for emergency communication and information exchange within the country. An efficient use of web technology internationally will only be achieved when the technology is also part of national emergency management procedures and used on a regular basis. This will require the implementation of modified technical and organisational procedures for information exchange in case of an emergency.

On an international level, having only one official platform for the exchange of emergency information is essential. This platform will act as the primary interface among countries, between international organisations and countries, and among international organisations. Regarding the organisation of such a system, clear procedures and guidelines are needed.

Co-ordination of Media Information

The co-ordination of media information between various participants, countries, and international organisations has already been discussed during the INEX 2 Exercise series, and is still seen as an open and important issue during nuclear emergencies.

There was little co-ordination of information provided to the media. The exercise has shown that the importance of issuing co-ordinated press releases is still underestimated by the responsible staff, in spite of the fact that conflicting information might cause confusion of the population and lead to a loss of confidence in the authorities. Any loss of confidence can lead to an impaired effectiveness of countermeasures.

A press release was produced, in a co-ordinated fashion before the exercise and issued by the IAEA and the NEA through their respective public information officers. The international organisations did not use the exercise to test the co-ordination of media information during the exercise.

In conclusion, it is essential to avoid the “information disaster” during the management of the disaster, by adequately informing the public. The publication of conflicting information has to be avoided and each organisation should restrict its information to its own area of competence and responsibility.

Finally, as media information was not really tested during this exercise, the issue of co-ordinating media information on a national and especially on an international level should be kept on the list of possible objectives for future nuclear emergency exercises.

Incorporation of INEX 2 lessons learnt

After finalising the INEX 2 exercise series, the NEA published the report *Experience from International Nuclear Emergency Exercises: The INEX 2 Series, OECD/NEA 2001*, summarising the wealth of lessons identified and learnt during all four INEX 2 exercises, performed 1996 - 1999. Many countries and international organisations used the INEX 2 series to improve their emergency preparedness and management. Whether and to what extent the INEX 2 lessons were incorporated, became therefore an interesting objective for the INEX 2000 exercise. The INEX 2 lessons learnt can

be grouped into lessons learnt in emergency planning, preparedness and management, and lessons learnt regarding exercise preparation, conduct and evaluation.

Regarding emergency planning, preparedness and management, many countries used the opportunity of INEX 2000 to successfully test their national plans, procedures, and organisations which had been updated following the INEX 2 series experience. A few countries tested, in addition, arrangements between their national contact points and national warning points as well as liaison with the IAEA.

The INEX 2 series tested decision making based on limited information, such as criteria and preparations for early and medium term countermeasures. During INEX 2000, the focus was still on communication and information exchange. Only the Nordic countries reported that they tested co-ordination and harmonisation of “international” countermeasures, such as travel, trade, traffic, etc.

The INEX 2 objective of testing the real time information exchange led, *inter alia*, to the development of *Monitoring and Data Management Strategies for Nuclear Emergencies*. The major objective of these new communication and information exchange strategies is to meet and manage information demands effectively. During INEX 2000, the broadcasting of accident information via the web allowed simultaneous access for all exercise participants. Many countries used e-mail and web-based information tools, which considerably improved the information management and exchange, including information retrieval, processing, and analysis, although some problems were reported and further development is needed. The selection of data for critical decision making is improving but this area needs further work. Some countries contacted their embassies in France to receive additional information. The use of English as the common “emergency” language seems to have improved.

Testing public information and the media, the INEX 2 series revealed that working together with the media as partners, from the very beginning, is essential for satisfying media and public information demands. During INEX 2000, some countries tested the posting of public information, for example, via web technology. Some countries reported improvements in co-operation with the media regarding information dissemination to the public.

Regarding exercise preparation, conduct and evaluation, INEX 2 suggested a better documentation in the process of exercise planning, the use of real systems during the exercise and a regular evaluation of progress in the implementation of identified lessons. During INEX 2000, countries tested existing but improved communication procedures with positive results. Some countries took advantage of the 24 hour duration of INEX 2000 to test procedures for shift changes and to update emergency plans accordingly. Many countries had stated progress since INEX 2.

In conclusion, the INEX 2 lessons are valuable for improving state of readiness and management capabilities. Many INEX 2 lessons remain to be acted upon, and future exercises could be structured to incorporate lessons learnt from previous exercises and to evaluate progress in implementing these lessons.

Experience with the organisation of the exercise

The NEA objectives of this Joint International Emergency Nuclear Emergency Exercise were developed with and tailored for the participating countries. Participating countries welcomed the organisation of a preparatory and a follow-up meeting for experience exchange.

Any large scale international nuclear emergency exercise involving the activation of national emergency plans should be based on a national exercise.

WORKSHOP ON THE INDEMNIFICATION OF DAMAGE IN THE EVENT OF A NUCLEAR ACCIDENT

The INEX 2000 exercise was performed in two separate parts: the INEX 2 type command post exercise, dealing with the first 24 hours of a nuclear emergency, and a workshop addressing compensation and third party liability issues arising from a nuclear accident. The NEA *Workshop on the Indemnification of Damage in the Event of a Nuclear Accident* was held on 26 - 28 November 2001 in Paris, involving the participation of 82 lawyers, civil servants, and insurers from 30 countries.

The objectives of the workshop were to:

- test the mechanisms which apply to the compensation of potential victims of a nuclear accident such as the accident simulated at Gravelines, both in the accident country and in affected neighbouring countries, and
- investigate how the Paris Convention on Third Party Liability in the Field of Nuclear Energy and the Brussels Supplementary Convention would be applied in practice.

Using a “round table” format, the workshop explored the following relevant issues:

- the respective roles of the competent bodies
- decision-making on preventive measures
- intervention of the nuclear operator’s insurer
- iodine distribution
- shelter/evacuation decisions
- emergency assistance payments
- dissemination of information concerning the rights of potential victims and compensation claims
- compensation claims handling
- administration of compensation claims over time
- heads of damage subject to compensation
- inventories of victims
- evaluation of damage
- compensation regime in force for radiation workers
- interface between the accident State and the international nuclear third party liability regime; and
- questions related to jurisdiction, such as the competent court and recognition and enforcement of judgements.

The discussions at the workshop were very timely after the revision of the Vienna Convention and adoption of the new Supplementary Compensation Convention in 1997, plus the imminent revision of the Paris and Brussels Conventions. Participation was diverse, including representatives of countries party to the Paris, Brussels and Vienna Conventions and participants from non-Convention states; from both EU Member and non-Member States and covering states with both limited and unlimited liability regimes. An important role was played by nuclear insurers.

To summarise some preliminary results from this “round table” discussion, it may be stated that significant differences became apparent between nuclear liability arrangements in neighbouring countries. In addition, depending on the applicable legal regime, similarly-affected victims might be treated differently according to their country of residence, with the political consequences that could ensue from such discrepancies. Discussions revealed procedural differences amongst states: e.g. some regimes provide for the possibility of direct action against insurers (rather than against the nuclear operator); others allow class actions before the courts. It became apparent during the course of discussions that indemnification of farmers and industry for losses suffered may lead to large costs.

Exchanges further revealed that there is a lack of interface between decision- and policy-makers and lawyers. It would therefore be of great value to incorporate third party liability elements into the INEX programme, especially if future INEX exercises are to focus on later phases of a nuclear accident. It would be useful, in the context of such exercises, to bring together national representatives of the civil authorities involved in the emergency response. The question of whether and how to harmonise countermeasures should be explored. Further collaboration between the NEA Committee on Radiation Protection and Public Health and the Nuclear Law Committee will be established to pursue this objective.

The results of the workshop can be found in greater detail in the publication *Indemnification of Damage in the Event of a Nuclear Accident, Workshop proceedings, Paris, France, 26 – 28 November 2001*, OECD, Paris 2003.

SUMMARY OF CONCLUSIONS

The INEX 2000 exercise, in the tradition of the INEX exercise series, allowed participating countries to test and further improve their national emergency procedures.

Great efforts have been made to develop and implement modern communication techniques for the exchange of emergency information, nationally and internationally. The first steps towards taking full advantage of the web technology have been taken but much remains to be done.

It is very important that information dissemination via fax will be maintained as necessary back-up system for information exchange via web-technology.

An efficient use of web technology internationally will only be achieved when the technology is also part of national emergency management procedures and used on a regular basis. Countries therefore have to decide whether or not to employ web technologies for emergency communication and information exchange within the country and implement modified technical and organisational procedures in their emergency plans.

On an international level, having only one official platform for the exchange of emergency information is essential. This platform will act as the primary interface among countries and between international organisations and countries.

The issue of co-ordinating media information on a national and especially on an international level remains very important and should be kept on the list of objectives for future nuclear emergency exercises.

The lessons learnt during the INEX 2 exercise series are still very valuable for improving the state of readiness and management capabilities. Many INEX 2 lessons remain to be acted upon, and future exercises could be structured to incorporate lessons learnt from previous exercises and to evaluate progress with these lessons.

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ANNEX: DETAILED TIME LINE OF THE EXERCISE SCENARIO

Plant initial status:

100% of nominal power, end of life core. Containment Spray System (EAS) B train unavailable and primary activity (I-131 equivalent) = 0.7 GBq/Ton. Failures not detected on the electrical command at two (out of three) of the pressure release valves and on the valve RRA 021 VP, what implies the impossibility to operate the Residual Heat Removal System.

Time (UTC)	Event
04:45	EXERCISE START <ul style="list-style-type: none"> • Small primary leak (d=18mm) • Reactor scram and safety injection begins
04:52	<ul style="list-style-type: none"> • Short-circuit on the electrical supply of the high pressure safety injection pump A train • All emergency safety injection systems A train unavailable • Prognosis for repair 14 hours
04:55	<ul style="list-style-type: none"> • Applying A 1.1 and I LHA procedures • Request for activation of on-site emergency plan • (56°C/h)
07:55	<ul style="list-style-type: none"> • Loss of Auxiliary Feedwater System (ASG) • Cooling of the primary circuit continues, but steam generators are emptying out
13:00	<ul style="list-style-type: none"> • The steam generators are empty. • Pressure and temperature in the primary circuit are rising (no more secondary cooling)
13:50	<ul style="list-style-type: none"> • Loss of pump RCV/02PO • Loss of the high pressure safety injection pump B train • The pressure in the primary circuit is too high to operate the low pressure safety injection pump.
15:20	<ul style="list-style-type: none"> • Pressure and temperature in the primary circuit continue to rise • Application of the U1 procedure (according to this procedure, it is necessary to wait until the core is uncovered to open pressure release valves of the primary circuit)
15:45	<ul style="list-style-type: none"> • Core begins to be uncovered • Opening of the sole pressure release valve of the primary circuit (remaining under operation) • Pressure in the primary circuit begins to decrease
16:00	<ul style="list-style-type: none"> • Beginning of core degradation • Beginning of radioactive releases to the environment
16:01	<ul style="list-style-type: none"> • Opening of the two other pressure release valves of the primary circuit (after repairing their electrical command) • Primary circuit pressure decrease is speeding up.
Time (UTC)	Event

16:20	<ul style="list-style-type: none">• Beginning of core melt• Releases continue
16:30	<ul style="list-style-type: none">• Low pressure injection pump is operated (the pressure in the primary circuit is low enough to do so)• Core again covered• Releases continue
17:30	<ul style="list-style-type: none">• Repairing of the electrical supply of the A train emergency safety injection systems completed• All train A safety injection systems are available and operating• Pressure in the containment building decreases
18:30	<ul style="list-style-type: none">• Pressure in the containment building reaches 1.4 bar.• Radioactive releases nearly stop.
20:10	<ul style="list-style-type: none">• Steam generators available.• Plant is operated in a safe mode• Plant under control