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NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

NEA/CNRA/R(2003)3
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WORKING GROUP ON INSPECTION PRACTICES

INSPECTION OF FUEL CYCLE FACILITIES IN NEA MEMBER COUNTRIES

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), Korea (12th December 1996) and the Slovak Republic (14 December 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full Member. NEA membership today consists of 28 OECD Member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) of the OECD Nuclear Energy Agency (NEA) is an international committee made up primarily of senior nuclear regulators. It was set up in 1989 as a forum for the exchange of information and experience among regulatory organisations and for the review of developments that could affect regulatory requirements.

The Committee is responsible for the NEA programme, concerning the regulation, licensing and inspection of nuclear installations. The Committee reviews developments that could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them or avoid disparities among member countries. In particular, the Committee reviews current practices and operating experience.

The Committee focuses primarily on power reactors and other nuclear installations currently being built and operated. It also may consider the regulatory implications of new designs of power reactors and other types of nuclear installations.

In implementing its programme, the CNRA establishes co-operative mechanisms with the NEA Committee on the Safety of Nuclear Installations (CSNI), responsible for co-ordinating the activities of the Agency concerning the technical aspects of design, construction and operation of nuclear installations insofar as they affect the safety of such installations. It also co-operates with the NEA Committee on Radiation Protection and Public Health (CRPPH) and the NEA Radioactive Waste Management Committee (RWMC) on matters of common interest.

ABSTRACT

This report by the Working Group on Inspection Practices provides information and perspectives on how inspections of nuclear fuel cycle facilities are carried out in NEA member countries.

FOREWORD

The CNRA believes that safety inspections are a major element in the regulatory authority's efforts to ensure the safe operation of nuclear facilities. Considering the importance of these issues, the Committee has established a special Working Group on Inspection Practices (WGIP). The purpose of WGIP is to facilitate the exchange of information and experience related to regulatory safety inspections between CNRA Member countries.

In offering thanks to the members of WGIP who provided valuable time and considerable efforts towards the production of this report, the NEA Secretariat also wishes to acknowledge the special work of Mr. Yves Balloffet, Chairman of WGIP who undertook the lead role in producing the report.

INSPECTIONS OF FUEL CYCLE FACILITIES - COMPARISON OF PRACTICES AND SUGGESTION OF COMMENDABLE PRACTICES

1. Introduction

This task originated from discussions held at WGIP the meeting, which followed the event at Tokai-mura in Japan. WGIP members felt it was important to look at how inspections were performed on these types of facilities in addition to the work carried out on NPPs and research reactors. CNRA approved the task at its June 1999 meeting.

2. Questionnaire

The task group issued a small questionnaire (see appendix) in late 2000 and analysed the responses received. The questionnaire was based on a similar one developed for inspections on research reactors and was structured in a checklist format. The first part covered legal and license inspection requirements and the regulatory inspection programme. The second part looked more in detail at the inspection programme requirements. This included information on what types of inspections are performed, manpower requirements, etc.

Ten member countries responded to the questionnaire; Belgium, Canada, France, Germany, Japan, Netherlands, Spain, Sweden, United Kingdom and the United States. An analysis of the results are described in the following section of the report and depicted in the accompanying tables. Because of the nature of this type of questionnaire, completed versions of the individual country responses are not available, but more information can be obtained by contacting the Secretariat.

3. Analysis of Responses

3.1 General

All countries with facilities of this nature have answered: France, United Kingdom, Germany, Belgium, Spain, Sweden, Canada, Japan and the United States.

The results are given in overall tables (1 to 6), which emphasise on the inspection activities.

They show average figures for a plant of the considered type.

In most cases, the figures refer to Regulatory Body inspections carried out on site, although sometimes (like for Germany, Netherlands) the figures include inspection activities dealt with by other bodies.

3.2 Inspectors

In **some countries** (like Netherlands, Spain, United Kingdom), **they are not fully dedicated to fuel cycle plants** (in other words, they also inspect NPPs).

In others (France, Germany, Sweden, Japan), **they are dedicated to a fuel cycle plant**; they can even be resident inspectors like in Japan (for their so called "safety" quarterly inspections, that have started in 2000), or in the United States (only for enrichment plants, and highly enriched uranium plants).

3.3 Inspection frequency and inspection manpower

It is very difficult to compare, especially between the 3 types of fuel cycle plants. There are more or less 3 or 4 inspection types, related to inspection frequency and inspection manpower:

- **frequent routine site visits or inspections** with no pre-planned topics (like in Sweden/Belgium – once/twice a month per fuel manufacturing plant- or pre-planned topics like in Germany (twice a month for criticality, radiation protection and plant safety),

- **routine inspections on pre-selected inspection topics**, to be chosen from a list of topics (to be covered every 3 years in the United Kingdom, 3 years in France, 1 year in the United States - where criticality is inspected 2 o 3 times a year, and fire protection each year - they average to about 15 inspections of that type per year, for a fuel manufacturing plant,

- **"special" inspections**, with reinforced inspector and expert manpower, like in Germany (1 on radiation protection and 2 on criticality each year), Japan (1 quarterly for each facility, which is called "safety inspection"), the United States (only in response to events or generic issues), Sweden (1 or 2 per year) and France (1 per year).

In addition, in some countries, the inspectors (or experts acting on their behalf) witness functional and in service tests, performed on the plant (this represents nearly 2/3 of inspection manpower in Germany, see table 2).

3.4 Inspection topics

The range is the same more or less, and covers the following:

1. Under operation
2. At shutdown
3. Emergency planning
4. Ext. Hazards (incl. fire protection)
5. Safety issues (incl. criticality)
6. Radiation Protection
7. Environment

8. Organisation

9. Event reporting

10. Other

For the **criticality issue** (item 5), it is hard to tell exactly, because some countries have specific dedicated criticality inspections, others not, **but it seems that Japan, Germany, United Kingdom and the United States do emphasise this topic**.

Item 7 (environment) is sometimes dealt with by other governmental bodies (e.g., Netherlands, Sweden).

Item 8 (organisation) is mostly covered by United Kingdom, and not at all by France.

3.5 Contribution to reviews and assessments

The answers vary, but **there is a natural trend to enforce such contribution in the near future** (like in France, with the new "yearly reports"). It is done in the United States.

3.6 Other Issues

INES Reporting - Several countries do report: France, United Kingdom, Germany, Netherlands, Spain, Sweden. The United States have just started to report.

4 Conclusions

This review of inspection practices shows that the comparison is especially valuable for the fuel manufacturing plants, since their number is larger than the fuel enrichment and fuel reprocessing plants consequently, the statistics are more representative.

Nevertheless, the set of commendable practices below apply to all of these types of facilities

Commendable Practices

1. The Regulatory Inspector Body inspects the plants through a structured and updated inspection program.

2. The Regulatory Inspector Body regularly performs dedicated inspections on radiation protection and, if applicable for the plants, on criticality.

3. The Regulatory Inspector Body develops further dedicated inspections on plant and company organisation.

4. The Regulatory Inspector Body reviews the totality of inspection results in order to contribute to the overall plant safety assessment.

5. The Regulatory Inspector Body develops international exchanges on inspection practices.

List of Tables:

Table 1 – Fuel Manufacturing

Country		France	United Kingdom	United States
Plants		(4) SICN, FBFC Romans, COGEMA Melox and COGEMA-CFCA	(1) Springfields, BNFL	(7) LEU / HEU
Reporting to the Authority		Twice per year		Yes (new)
INES Reporting		Yes	Yes	Yearly[1]
Inspection Programmes		Yes	Yes	17[2]
Average number of Inspections / year / plant	Announced	9	12	
	Unannounced	1	2	
	Special	0	2	
	Total	10	16	17
Average number of inspectors (person x day) / year / plant		20	16 x ?	47 to 96
Use of additional experts (person x day) / year / plant		10	?	
Average number of Inspections / topic and / year	Under Operation	10	2	2
	At Shutdown	0	1	1
	Emergency Planning	2	2	1
	External Hazards[3]	4 (4)	1	1
	Safety Issues[4]	5 (2)	1	3.5 (2.5)
	Radiation Protection	1	1	1
	Environment	5	2	2
	Organisation	4	1	1
	Event Reporting	1	0	0
	Other	0	0	0
	Total	10	12	17
Contribution to Periodic Safety Reviews		Annual Review (started in 2000)		Annual or Biannual Performance Review
Regular contact with licensees' management		Yearly meetings	Yes	
Miscellaneous				

1 . 4 month to 3 year topic frequency

2 . In addition to resident inspector effort (only for HEU plants)

3. Including fire protection

4. Including criticality

Table 1 – Fuel Manufacturing (continued)

Country		Germany	Belgium	Spain
Plants		(1) ANF-Lingen	(1) Dessel	(1) Juzbado
Reporting to the Authority		Yes	NO	Yes (monthly)
INES Reporting		Yes	Yes	Yes
Inspection Programmes		Recurrent (monthly) General (yearly)	Standard	Annual
Average number of Inspections / year / plant	Announced	50[5]	24[6]	12
	Unannounced	24[7]	0	0
	Special	4	0	1[8]
	Total	78	24	13
Average number of inspectors (person x day) / year / plant		82	60	30
Use of additional experts (person x day) / year / plant		TUV experts[9]		
Average number of Inspections / topic and / year	Under Operation	40	To be covered twice per year	4
	At Shutdown			0
	Emergency Planning	2		1
	External Hazards[10]	4 (2)		1 (1)
	Safety Issues[11]	6 (2)		2 (1)
	Radiation Protection	4		1
	Environment	8		2
	Organisation	4		
	Event Reporting	5		1
	Other	10		1
	Total	78		13
Contribution to Periodic Safety Reviews		No	Yes	No
Regular contact with licensees' management		Yes	Yes	Yes
Miscellaneous		Use of foreign experience feedback (reported events)	No enforcement power (only recommendations)	

5 . UV

6 . 2 per month

7. 2 per month – Regional Regulatory Body

8. Event investigation

9. Used for general inspections (criticality, RP)

10 . Including fire protection

11 . Including criticality

Table 1 – Fuel Manufacturing (continued)

Country		Canada	Japan	Sweden
Plants		2	(4) MNF, GNF-J, NFI (Tokai, Kumatori)	(1) Vasteras
Reporting to the Authority		Yes (quarterly/annually)	No	Yes
INES Reporting		No	Yes	Yes
Inspection Programmes		Quarterly (5 year license)	Facility (yearly) Safety (quarterly)	Yes (yearly)
Average number of Inspections / year / plant	Announced	4	1	12
	Unannounced	0	0	0
	Special	2	4	1
	Total	6	5	13
Average number of inspectors (person x day) / year / plant		10	72	30[12]
Use of additional experts (person x day) / year / plant		18		
Average number of Inspections / topic and / year	Under Operation	All	Check points of each inspection: Facility Inspection: under operation, at shutdown, external hazards, safety issues, radiation protection and environment Safety Inspection: all topics from 'under operation' to 'other' of left column.	Site visits cover event reporting, QA audits, changes in organisation, modifications Special inspections cover some safety-related issues.
	At Shutdown			
	Emergency Planning			
	External Hazards[13]	1		
	Safety Issues[14]			
	Radiation Protection	2		
	Environment	2		
	Organisation			
	Event Reporting			
	Other	1		
	Total	6		
Contribution to Periodic Safety Reviews		No	Yes	Yes (possibly)
Regular contact with licensees' management		Yes		Yes (SKI Forum (yearly)
Miscellaneous		Inspections frequency depends on risk of licensees activity and inspection resources	Importance of inspections on safety training	Importance of inspections on licensees ability to perform independent safety reviews.

12 . Not including inspections from the Swedish Radiation Protection Institute

13. Including fire protection

14. Including criticality

Table 2 – Fuel Enrichment

Country		France	United Kingdom	United States
Plants		(1) Eurodif	(2) Capen Hurst and Urenco	2
Reporting to the Authority		Twice per year		No
INES Reporting		Yes	Yes	Yes (new)
Inspection Programmes		Yearly	Yearly[15]	Yearly[16]
Average[17] number of Inspections / year / plant	Announced	7	24	14[18]
	Unannounced	1	2	
	Special	0	1	
	Total	8	27 (for 1 or 2 plants)	47
Average number of inspectors (person x day) / year / plant		16	27	?
Use of additional experts (person x day) / year / plant		8	?	?
Average number of Inspections / topic and / year	Under Operation	2	1	1
	At Shutdown	1	2	1
	Emergency Planning	¼	4	1
	External Hazards[19]	1 (1)	1	1
	Safety Issues[20]	2 (1)	2	3 (2)
	Radiation Protection	¼	1	1
	Environment	½	4	3
	Organisation		5	0
	Event Reporting		1	0
	Other		3	3
	Total	7	24	14
Contribution to Periodic Safety Reviews		Annual (started in 2000) Overall 10 year safety re-assessment	Annual review and rating of inspection findings	Annual or bi-annual performance review
Regular contact with licensees' management			Vital requirement (?)	
Miscellaneous		Pressure check of UF6 Flasks		

15 . Covers all License Conditions every 3 years

16 . 4 month to 3 year topic frequency

17 . Average for all plants

18 . In addition to resident inspector effort

19. Including fire protection

20. Including criticality

Table 2 – Fuel Enrichment (continued)

Country		Germany	The Netherlands	Japan
Plants		(1) Urenco-Gronam	(1) Urenco	(2) JNC, JNFL[21]
Reporting to the Authority			6 monthly	No
INES Reporting		Yes	Yes	Yes
Inspection Programmes		Recurrent (monthly) General (yearly)	Standard	Facility (yearly) Safety (quarterly)
Average number of Inspections / year / plant	Announced	46	4	1
	Unannounced	20	0	0
	Special	4	0	4
	Total	70	4	5
Average number of inspectors (person x day) / year / plant		74		58
Use of additional experts (person x day) / year / plant		TUV experts[22]		
Average number of Inspections / topic and / year	Under Operation	36	0.4	Check points of each inspection: Facility Inspection: under operation, at shutdown, external hazards, safety issues, radiation protection and environment Safety Inspection: all topics from 'under operation' to 'other' of left column.
	At Shutdown			
	Emergency Planning	2	0.2	
	External Hazards[23]	4 (2)	1	
	Safety Issues[24]	6 (2)	1	
	Radiation Protection	4	2[25]	
	Environment	6	0.8	
	Organisation	4	0.4	
	Event Reporting	3	0.2	
	Other	5		
	Total	70	6	5
Contribution to Periodic Safety Reviews		No	No	Yes
Regular contact with licensees' management		Yes	Yes (started in 2001)	
Miscellaneous		Use of foreign experience feedback (from reported events)		Importance of inspections on safety training

21 . Categorised as fabrication under regulation.

22. Used for general inspections (criticality, RP)

23. Including fire protection

24. Including criticality

25. Includes extra environmental inspections

Table 3 – Fuel Reprocessing

Country		France	United Kingdom	Japan
Plants		(1) La Hague Cogema	(1) Sellafield BNFL	(2) JNC, JNFL
Reporting to the Authority		Half yearly		No
INES Reporting		Yes	Yes	Yes
Inspection Programmes		Yearly	Yearly (2 year frequency)	Facility (yearly) Safety (quarterly)
Average number of Inspections / year / plant	Announced	52	380	1
	Unannounced	3	30	0
	Special	1[26]	180	4
	Total	56	590	5
Average number of inspectors (person x day) / year / plant		130	590	82
Use of additional experts (person x day) / year / plant		68	?	
Average number of Inspections / topic and / year	Under Operation	25	90	Check points of each inspection: Facility Inspection: under operation, at shutdown, external hazards, safety issues, radiation protection and environment Safety Inspection: all topics from 'under operation' to 'other' of left column.
	At Shutdown	1	90	
	Emergency Planning	2	47	
	External Hazards[27]	6 (6)	12	
	Safety Issues[28]	12 (3)	100 (47)	
	Radiation Protection	3	47	
	Environment	4	95	
	Organisation	2	60	
	Event Reporting		12	
	Other		12	
	Total	55	565	
Contribution to Periodic Safety Reviews		Annual (started in 2000) Overall 10 year safety re-assessment	Annual review and rating of inspection findings	Yes, periodical licensees self inspection
Regular contact with licensees' management				
Miscellaneous		Yearly meeting	Vital requirement (?)	Importance of inspection on safety training

26 . Criticality in 2000.

27. Including fire protection

28. Including criticality

Appendix QUESTIONNAIRE ON INSPECTION IN FUEL CYCLE FACILITIES

Reminder: This questionnaire covers the safety of the facilities, together with the radiation protection and environmental issues.

This questionnaire is fully relevant to the fuel manufacturing plants as well; but in that case, it does not cover the quality control of the produced fuel elements (which, in some countries is also an inspection topic for the regulator).

1. Legal Requirements

	YES	NO	COMMENTS
Acts, Decrees valid?			
License needed?			
Safety report needed?			
Reporting on INES system?			
Waste disposal regulations?			
Emergency Preparedness?			
Decommissioning?			
Enforcement?			

2. License Requirements

	YES	NO	COMMENTS
Limits for Radioactive releases?			
Operational License Conditions?			
Quality Assurance System?			
Incident reporting system?			
Maintenance / test program?			
Grading materials?			
Confinement functions?			
Safety Review Committee?			
Qualification of personnel?			
Radiation control supervision?			
Monthly/quarterly reporting of operation performance ?			
Periodical Assessment?			

3. Regulatory Body

	YES	NO	COMMENTS
Same inspection authority as for NPPs?			
Use of resident inspectors?			
Same inspectors as for NPPs?			
Inspection plan/program available?			
Inspection procedures available?			
Training/qualification of inspectors?			
Regular contact on management level with licensee?			
Reporting system to public / Parliament?			

4. Inspection Programme

Please complete full questionnaire for each type selected:

Fuel enrichment Fuel manufacturing Fuel reprocessing

4.1 Determination of inspection program

4.1.1 Yearly

4.1.2 Choice of inspection topics, and their frequency

4.1.3 Inspection type (announced, unannounced, routine, special, …)

See tables 1 and 2 attached; table 2 should be filled up whenever possible (at least the "total" values)

4.2. Inspection results

4.2.1 Do they contribute to any periodical overall safety assessment of the plant?

4.2.2 Give examples of noteworthy inspection practices (with enforcement)?

4.2.3 Do they help making states of the art reviews, per plant type, or whatever?

4.2.4 Are there any other inspection-related issues, to be mentioned in your country?

Table 1: number of inspections / per year / per plant type

Inspection topic	Linked to plant condition					
	Operation (Tech. Spec., Periodic Test, etc..)		Shutdown (Maintenance, modifications, etc..)		Emergency preparedness	
Number						

Inspection Topic	Hazards		Main Safety Issues			Environment		
	Earthquake	Fire protection	Confinement and Ventilation	Criticality	Other	Radiation Protection (incl. contamination)	Releases	Waste
Number								

Inspection Topic	Organisation / Safety Culture	Event Reporting	Others
Number			

TOTAL (*)	
A	
U	
S	
Total	

* - Total of inspections/year: Please specify as A = Announced inspection (routine); U = Unannounced; or S = Special

Table 2 : Inspections person x days / per year / per plant type

Inspection Topic	Linked to plant condition					
	Operation (Tech. Spec., Periodic Test, etc..)		Shutdown (Maintenance, modifications, etc..)		Emergency preparedness	
Person x day						

Inspection Topic	Hazards		Main safety Issues			Environment		
	Earthquake	Fire protection	Confinement and Ventilation	Criticality	Other	Radiation Protection (incl. contamination)	Releases	Waste
Person x days								

Inspection Topic	Organisation / Safety Culture	Event Reporting	Others
Number			

TOTAL (*)	
A	
U	
S	
Total	

* - Total of inspections/year: Please specify as A = Announced inspection (routine); U = Unannounced; or S = Special