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REPORT

OF THE

TECHNICAL COMMITTEE MEETING

ON

1996 ANNUAL WORKSHOP ON ASSET EXPERIENCE

IAEA HEADQUARTERS, VIENNA
25-27 June 1996

THE ASSET SERVICE

EXPERIENCE, FEEDBACK AND DEVELOPMENT

- **Development of the ASSET service since 1995 Workshop**
- **Assessment of feedback from plant Self Assessment and the associated ASSET Peer Review process**
- **Conclusions and recommendations**

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NOTE

CONTENTS

Executive Summary

The 1996 Technical Committee meeting brought together 27 participants from 18 countries and hence provided an excellent international forum to review the progress of the ASSET methodology. The decisions of the 1994 and 1995 ASSET Technical Committee workshops recommending the development of self assessment by Nuclear Power Plants has now been shown to be the correct decision. The IAEA ASSET service has implemented the ASSET workshop recommendations in this respect. This workshop supports the continuation of ASSET Peer Review missions.

All countries represented at the workshop gave a verbal or written presentation, the main themes being:

> Nuclear Plants are interdependent on each other and need to learn from each other. ASSET provides an example of how this may be achieved.
>
> That the ASSET Peer Review service is applicable to today's conditions at most NPPs. However, the ability to respond to specific requests, from the Member States, should be maintained.
>
> ASSET missions in themselves provide good training for the operators and regulators at the NPP site.

This workshop's task was to review the results of the Forsmark, Leningrad and Smolensk Nuclear Power Plants self assessment and associated Peer Review ASSET missions. The significant conclusions reached from this analysis are detailed below;

> ASSET should continue to promote Plant Self Assessment on a continuing basis and that such an assessment should be peer reviewed annually by the Utilities/Plant Department responsible for safety.
>
> ASSET should address means by which mission participants, lacking in previous ASSET experience, can be made familiar with the ASSET methodology. Note this does not imply a requirement for a lengthy course on the ASSET methodology or the exclusion of possible expert candidates from a mission because of lack of ASSET experience.
>
> ASSET should consider amending the time scale of the Peer Review type missions to provide more flexibility as suggested by the working groups. [see 4.5]
>
> ASSET should provide guidance to NPPs on information required by team members in preparation for the mission. This should include information on management structure, event analysis criteria and the methodology adopted to identify safety culture events.

1. Introduction

The 1996 ASSET workshop was attended by 27 participants representing 18 countries. This level of support demonstrates the continued interest in the ASSET methodology and in particular the benefit of an International perspective in the analysis of the events at Nuclear Power Plants. Agenda of the meeting and list of participants are included in this report as Attachments 1 and 5 respectively.

Papers and/or presentations were made by all countries represented and provided a wide range of views on the use of the ASSET methodology. In general the views of the delegates were positive but inevitably some were critical. The areas of criticism included the perennial problem with the use of the INES ranking procedures to assess event consequences, a perception by some delegates that ASSET is difficult to use and manpower intensive and that the programme for the Peer Review missions is very tight. With the exception of the INES use, the other criticisms were addressed within the working parties that form part of this workshop.

The workshop was divided into three task groups to analyse missions at three NPPs, Forsmark, Sweden, Leningrad, Russia and Smolensk, Russia. Although the value of the last mentioned report was limited to the plant's self assessment as the ASSET peer review mission was postponed to later in 1996.

Short presentations were made by Mr. B. Thomas and Mr. P. Bliselius to remind delegates of the ASSET methodology and to provide broad guidance to the working groups. [Attachment 2]

2. Points from Presentations

Copies of the written presentations made by participants are included in this report as Attachment 4. The significant points presented in these reports being;

2.1 That the ASSET Peer Review service is applicable to todays conditions at most NPPs, however the ability to respond to specific requests should be maintained.

2.2 The NPPs are dependant on each other by means of type, manufacturer, country, regulatory regime and experience.

2.3 There is a perception, in some cases, that ASSET is a difficult methodology to apply and that preparing for a Peer Review mission is very demanding in terms of manpower.

2.4 Adoption of a suitable scale for the events falling below level 0 in the INES system needs developing. [see 5.5]

2.5 ASSET service should respond to the needs of the requesting plant/nation. In the event that this is not possible then ASSET service should provide reasons why the service cannot be provided.

2.6 The event classification system used in Self Assessment should be included in the report sent to ASSET service to enable mission team members to appreciate the methodology adopted by the plant/nation.

2.7 ASSET missions in addition to their primary objective provide a disciplined form of training for the operators and regulators at the NPP site. This in turn encourages further improvement in safety performance.

2.8 ASSET methodology could be used at other nuclear facilities, eg. research reactors and reprocessing plants.

3. Working Group Reports

This is a synopsis of the full reports which form Attachment 3 of this report.

3.1 GROUP "A" Mr. K. Ingemarsson, Leader
FORSMARK

Task 1. Population of Events Considered.

The Group considered that Forsmark had made a representative selection of events that reflect safety. However coverage of "near misses" was not so well demonstrated. It was noted that Forsmark considered INES as a tool that assisted them and that a more plant based system should be developed.

Task 2. Identification of Pending Safety Problems.

The Group considered that the information in the Forsmark self assessment report was not detailed enough and the selection process was not defined. Selection of pending safety problems was by engineering judgement.

Task 3. Thoroughness of the Action Plan.

Although the decision making process is defined in the Forsmark report, the subsequent plan lacks sufficient information and does not provide for prioritisation of actions.

Task 4. Working Schedule of the ASSET Peer Review.

With a well developed reporting and feedback system, such as Forsmark, then the Group considered that one week was sufficient for a Peer Review mission. However, the length or scope of the mission schedule must be tailored to reflect the plant situation.

The Group recommended that the Plant self assessment report should be made "user friendly".

3.2 GROUP "B". Mr. T. Ganchev, Leader
SMOLENSK

Task 1. Population of Events Considered.

The Group found that the population of events were atypical to those normally found at NPPs. It would appear that "below scale" events are not evaluated.

Task 2. Identification of Pending Safety Problems.

It was identified that some significant events included in the listing were not selected for Root Cause Analysis, hence selection criteria needs to be improved. Corrective actions were not identified in the self assessment report.

Task 3. Thoroughness of the Action Plan.

The Action Plan selection criteria was not clear. This resulted in general statements being included as actions and lack of prioritisation.

Task 4. Working Schedule of the ASSET Peer Review.

The group recommended that the working schedule of the ASSET mission be extended to 6 days. This should reduce the workload on the experts and ensure standards of ASSET missions are maintained. It is important that Plant staff are familiar with the Plant's Self Assessment report.

3.3 GROUP ''C". Mr. C. Rudy, Leader
LENINGRAD

Task 1. Population of Events Considered.

The Group found that the population of events were atypical to those normally found at NPPs. It would appear that "below scale" events are not evaluated.

Task 2. Identification of Pending Safety Problems.

20 pending safety problems were identified of which 12 were subjected to analysis. The Group considered that the 12 events were representative and valid.

The Plant staff considers that additional guidance to identify pending safety problems would be of benefit to them.

Task 3. Thoroughness of the Action Plan.

The Group found this Action Plan comprehensive in terms of quantity but lacked a system of prioritisation.

The Group feels that ASSET could provide guidance on this point.

Task 4. Working Schedule of the ASSET Peer Review.

The Group considered that the time on site of the ASSET personnel should be extended. A proposed plan is included in the Group's report. [Attachment 3.3]

4. Conclusions of Working Groups

4.1 The ASSET Peer Review of plant Self Assessment mission is a logical development of ASSET methodology and is now a proven technique.

4.2 Leningrad and Smolensk, requested guidance for on-site events. [see 5.5]

4.3 More guidance on the criteria for selecting safety culture events is required.

4.4 ASSET to be advised on plant management and reporting structure prior to mission.

4.5 Duration of the ASSET mission should be commensurate with the projected workload. Working group "C" plan is a suggested method. [see Attachment 3.3]

5. Recommendations of the Workshop Meeting

5.1 ASSET should continue to promote Plant Self Assessment on a continuing basis and that such an assessment should be peer reviewed annually by the Utilities/Plant Department responsible for safety.

5.2 ASSET should address means by which mission participants, lacking in previous ASSET experience, can be made familiar with the ASSET methodology. Note this does not imply a requirement for a lengthy course on the ASSET methodology or the exclusion of possible expert candidates for a mission because of lack of ASSET experience.

5.3 ASSET should consider amending the timescale of the Peer Review type missions to provide more flexibility.

5.4 ASSET should provide guidance, to NPPs on information required by team members in preparation for the mission. This should include information on management structure, site event analysis criteria and the methodology adopted to identify safety culture events.

5.5 That future workshops should encourage participating countries and/or plants to develop their own system for prioritising lower level events (below scale on INES).

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ATTACHMENT 1

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ATTACHMENT 1

ANNUAL MEETING OF
THE ASSET SERVICE USERS
WORKSHOP ON ASSET EXPERIENCE
IAEA Vienna Headquarters
Conference room V, C07
25-27 June 1996

AGENDA

Tuesday 25 June 1996

9:30 Opening remarks

- Welcome address by Mr. J. Hashmi, Acting Head, Safety Assessment Section
- Chairman of the meeting
- Scientific Secretary

10:00 IAEA report on developments of the ASSET service since 1995 ASSET users meeting by Mr. B. Thomas.

- The ASSET procedures for
  - + Training missions: Seminars
  - + Analysis missions: Peer Review of Plant Self-Assessments of
    - * operational events reflecting safety performance problems
    - * operational events reflecting safety culture
- Experience and feedback (requests, trends and future developments)

10:45 Coffee break

11:15 Presentation by participants

- Experience with the ASSET service
- Observations and suggestions

12:30 Lunch break

14:00 Presentation by participants (continued)

17:00 Preparation for the working group sessions

- Working group A
  "Assessment of feedback from self-assessment carried out by Forsmark NPP"

- Working group B
  "Assessment of feedback from self-assessment carried out by Smolensk NPP"

- Working group C
  "Assessment of feedback from self-assessment carried out by Leningrad NPP"

17:30 Wine and cheese party

.../.2p

Wednesday 26 June

9:00 - 15:00

- Working group A
  "Assessment of feedback from self-assessment carried out by Forsmark NPP"

  1. Population of operational events considered
  2. Identification of the pending safety problems
  3. Thoroughness of the "Action Plan"
  4. Recommendations to the IAEA ASSET service for further improvements of the Plant Self Assessment and the associated ASSET Peer Review process.

- Working group B
  "Assessment of feedback from self-assessment carried out by Smolensk NPP"

  1. Population of operational events considered
  2. Identification of the pending safety problems
  3. Thoroughness of the "Action Plan"
  4. Recommendations to the IAEA ASSET service for further improvements of the Plant Self Assessment and the associated ASSET Peer Review process.

- Working group C
  "Assessment of feedback from self-assessment carried out by Leningrad NPP"

  1. Population of operational events considered
  2. Identification of the pending safety problems
  3. Thoroughness of the "Action Plan"
  4. Recommendations to the IAEA ASSET service for further improvements of the Plant Self Assessment and the associated ASSET Peer Review process.

15:00 Plenary session

15:00 - 15:40 Presentation of the conclusions of working group A - Discussions

15:40 - 16:20 Presentation of the conclusions of working group B - Discussions

16:20 - 17:00 Presentation of the conclusions of working group C - Discussions

17:00 Drafting of the working groups reports

Thursday 27 June

08:00 - 10:00 Drafting and typing

10:00 - 12:00 Review of the working groups reports

12:30 Closing of the meeting

ATTACHMENT 2

ATTACHMENT 2

GUIDANCE FOR THE WORKING GROUPS

Overall objective:

Based on the review of feedback from Self Assessment carried out by the Forsmark, Smolensk and Leningrad NPPs the three Working Groups

* should draw conclusions and give recommendations to the IAEA ASSET service for further improvements of the Plant Self Assessment and the associated ASSET Peer Review process,

* and also draw conclusions on the quality of the self assessment work carried out by the three NPPs (Forsmark, Smolensk and Leningrad). Were the seven basic questions satisfactorily answered? Please see Attachment 1 of the guidance.

Task 1

Review experience and feedback from **"Population of operational events considered"**. Please see **Attachment 9,Section 2** of the Forsmark and **Section 1.2** of the Smolensk and Leningrad plant Self Assessment report. See also attached Figure 1.

* What could be learned from this review to further improve the ASSET Self Assessment process?
  - are the population of operational events a good representation of what happened at the plant?
  - are there any missing events?
  - were there any difficulties for the plant in assessing this task?
  - anything else?

Task 2

Review the experience and feedback from **"Identification of the pending safety problems"**. Please see **Attachment 9,Section 3** of the Forsmark and **Section 1 of** the Smolensk and Leningrad plant Self Assessment report.

* What could be learned from this review to further improve the ASSET Self Assessment process?
  - are you satisfied with the events reflecting operational safety performance (Forsmark)/safety culture issues (Smolensk and Leningrad)?
  - are you satisfied with the selected events for root cause analysis?
  - were there any difficulties for the plant in assessing this task?
  - anything else?

Task 3

Review the experience and feedback from **"Thoroughness of the Action Plan"**. Please see **Attachment 9,Section 6** of the Forsmark and **Section 4** of the Smolensk and Leningrad plant Self Assessment report.

* What could be learned from this review to further improve the ASSET Self Assessment process?
  - are you satisfied with the listed actions for implementation?
  - were there any difficulties for the plant in assessing this task?
  - anything else?

Task 4

Review the **"Working schedule of the ASSET Peer Review"**. Please see **Attachment 4** of the ASSET Peer Review Report of Forsmark and Leningrad NPPs.

* What are your comments on this Working Schedule?
  - the number of days?
  - the content of the programme calendar?
  - anything else?

P. Bliselius 1996-06-24

POPULATION OF OPERATIONAL EVENTS AT NUCLEAR INSTALLATIONS

- **GOOD EVENTS** resulting from "DEFICIENCIES" discovered by routine surveillance testing and inspection

- **BAD EVENTS** resulting from "FAILURES" during operation

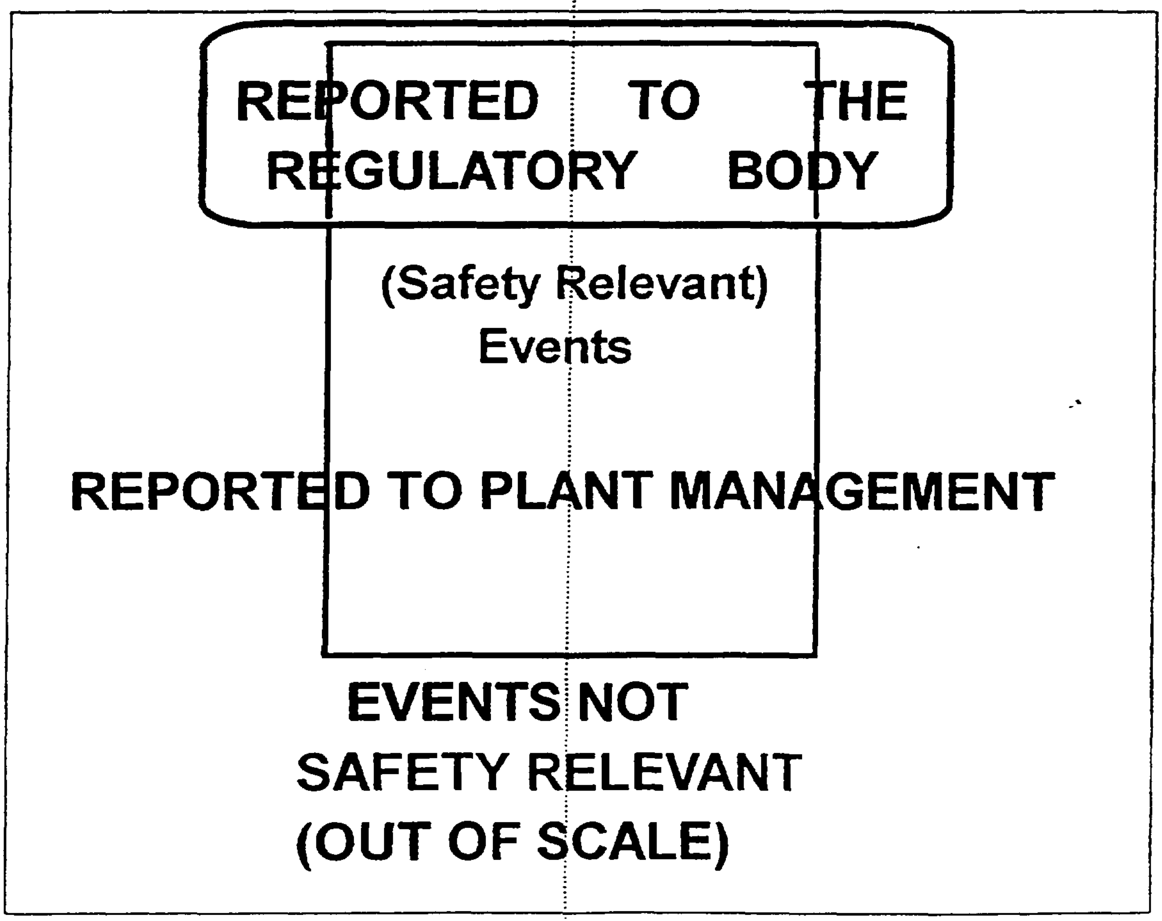

Figure 1

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Attachment 1

GUIDANCE for SELF ASSESSMENT

I) WHAT ARE THE PENDING SAFETY PERFORMANCE OR SAFETY CULTURE PROBLEMS?

II) HOW IMPORTANT?
(Significance to safety, reliability, etc...)

III) WHY DID THEY HAPPEN?
(Direct Cause)

IV) WHY WERE THEY NOT PREVENTED?
(Root Cause)

V) HOW TO ELIMINATE THE SAFETY PERFORMANCE OR SAFETY CULTURE PROBLEMS? (Repairs)

VI) HOW TO PREVENT THEIR RECURRENCE?
(Remedies)

VII) WHAT CORRECTIVE ACTIONS SHOULD BE IMPLEMENTED?
(Action Plan)

ATTACHMENT 3

3.1 WORKING GROUP "A"

Conclusions and Recommendations drawn by Group "A" dealing with the Forsmark self assessment and its peer review.

Group A consisted of:

Mr. Misak
Mr. Rannila
Mr. Stejskal
Mr. Francelet
Mr. Piirto
Mr. Hirano
Mr. Maqua
Mr. Serbanescu
Mr. Ingemarsson (Chairman)
Mr. Diaz Francisco (IAEA)

Four tasks were identified as follows:

Task 1. "Population of operational events considered"

- The Group considered that the population of events was a good representation of what happened on the plant.

  The Group concluded that the events represented the Forsmark plant safety status which responded to technical safety but they did not cover information from "nearmiss" events or managerial aspects.

  "Are there any missing events"?

  The group concluded that no missing events relevant to safety were missing. That conclusion was drawn from the reporting criteria for LER. LERs and scram reports were assessed by the self assessment team at Forsmark.

  "Were there any difficulties for the plant in assessing this task"?

  The group concluded that the problems which the use of INES classification in Forsmark was because no national or company practice were developed at the time of the self assessment activity.

  There was a strong position in the Group that nation wide practice of the utility internal reporting criteria should be prepared for the selection process of safety significance and INES is only one area where a qualified company internal reporting system is lacking.

Task 2. Identification of the pending safety problems

"What could be learned from the review to further improve the self assessment process"?

"Are you satisfied with the events reflecting operation safety performance"?

The group concluded that to cover this specific question the report was not detailed enough. The conclusion was underlined, that the selection of the safety problem should be based on engineering judgement made by well experienced people that have good insights in the plants actual activities. There is a need for external readers that the self assessment report describes the selection process used by Forsmark to understand why certain events were classified as pending.

"Are you satisfied with the selected events for root cause analysis"?

The group had no objection to what Forsmark had done, but it was considered that the report did not give guidance information in a clear way to understand this question. Nevertheless, the selected events for root cause analyses were chosen so that they would support to solve the most important latent weaknesses not only technical safety significant events.

"Were there any difficulties for the plant in assessing this task?

The group concluded after supplementary information given by the representative from Forsmark that there was not a problem with selection of relevant pending events. For external readers of the Self Assessment report there is certainly a need for better explanations and descriptions.

Task 3. Thoroughness of the Action Plan

"Are you satisfied with the listed actions for implementation"?

The Action Plan was considered to be weak in identifying what was recommended on equipment related problems, personnel, procedures and prevention of latent weaknesses.

One thing that should be included in the report is a description of the decision making process for prioritization used by Forsmark assessment team.

The Group noted that the self assessment report should describe how the decision making based or preferably that this information should be sent to the ASSET service in advance of the mission.

Task 4. "Working schedule of the ASSET Peer Review"

"The number of days used for the Peer Review".

The Group concluded that one week is sufficient for a Peer Review mission and it is essential that the attraction for this type of missions is high. It was also discussed and concluded by the group that the Peer Review should be considered as an international supported review after a long company internal work with the self assessment. The time frame should match the scope of the work schedule to complete a Peer Review of the self assessment process.

The Group concluded that it is important for the Peer Review team to be familiar with managerial structures, goals and objective decision making processes, etc. to be able to verify the accuracy of the self assessment report.

The Group found it essential to clarify the objectives for the Peer Review team so that it is not only a verification of the procedure used, the peers should be able to get an opinion of the work done by the power plant whether it contributes to development of the safety management and that there is a willingness to answer the question "Why was it not prevented'?

The Group found it important to address key issues for review by both parties, the review team and power plant, it could be possible at the end of the mission to see if the objectives are met.

The Forsmark Self Assessment report was found to be hard to read by the group. It was noted that this might be clear enough for use at the power plant. Considering it is also an experience feedback report to the international nuclear community it would be useful to organize the report in a more user friendly way. A summary of most important observations, suggestions and conclusions should be given not only at the Peer Review but also in the self assessment report.

General Conclusions

- To make a self assessment according to the procedures was found to be very useful to develop safety management and to be able to answer the question "why was it not prevented"?

- The self assessment report should be considered also to be an experience feedback report to other than the participants in the self assessment and peer review and therefore to be more organized in this respect.

- It was found to be a good practice at Forsmark to peer review yearly the event analysis process using root cause methodology.

- It is essential that adequate representation from the operating organization participates in the self assessment process.

- The success of root cause analyses with ASSET methodology strongly depend of insight of top management in the respective company.

3.2 REPORT OF WORKING GROUP "B"
SMOLENSK NPP

1. POPULATION OF OPERATIONAL EVENTS CONSIDERED

1.1 POPULATION OF EVENTS REPORTED

During the time period from July 1993 to the end of December 1995, a total of 95 events were reported to have occurred at all three units of Smolensk NPP. 42 of these events were categorised out of scale (INES) while 53 were considered to be relevant to safety: 52 at INES level 0 and 1 INES level 1.

Population of events is in good compliance with reporting criteria (both for internal reporting and reporting to the Regulator).

Screening of the population of events was satisfactory carried out by the plant. The results of the screening are tabled in Annex 11 of the Smolensk NPP Self Assessment Report. The last column of Table of Assessment entitled "Corrective Actions/Sufficiency" is not completed by the plant.

1.2 COMMENTS ON THE REPORTING CRITERIA

The regulatory reporting criteria have adequate scope to cover all events which have off-site impact, on-site impact or which cause degradation of defence in-depth. They therefore satisfactory cover all safety significant events.

The present internal reporting criteria is applicable to all NPPs in Russia with RBMK type reactors. These criteria do not fully cover all safety relevant deviations and the need for some improvement and clarification. The number of internally reported events, which is relatively small, comparing with international practices, is also an indicator of the deficiencies of the plant reporting criteria. Possible areas of improvement are: more precise formulation of the criteria; review in order to include reporting of failures discovered during testing or surveillance; fuel handling events and common mode failures.

2. IDENTIFICATION OF THE PENDING SAFETY PROBLEMS

2.1 COMMENTS ON EVENTS REFLECTING SAFETY CULTURE

Table 3 of the Plant Self Assessment report shows families of events and the safety culture problems associated with these families. Families are divided into three groups, representing equipment, personnel and procedure failures. From the population of 95 events, 10 events reflecting aspect of safety culture were selected by Smolensk NPP. According to the Plant Self Assessment report all 10 events are indicative of problems of attitude towards the safety culture.

Basically, the events are properly selected from the safety culture point of view, with some exceptions. For example, the event entitled "Violation of Operational Limits and Conditions by personnel while working at reactor protection system" 19/08/93, Unit 3, INES level 1, was not selected by the plant for root cause analysis.

In the short description of the event, it is mentioned that the event has shown deficiency of safety culture in identification of plant safety issue. Our understanding is that, this is the most representative event of the safety culture. Another, example is the event "Unit unloading due to personnel erroneous actions", 28/07/93, Unit 1, out of scale.

2.2 COMMENTS ON THE CORRECTIVE ACTIONS DEFINE BY THE PLANT

The assessment of plant corrective actions appropriateness, comprehensiveness and status of implementation is left for coming ASSET peer review mission. The relevant positions in Table of Assessment (Annex 11) and in the Event Root Cause Analysis Forms (ERCAFs) are not completed. This is not acceptable because one of the criteria for defining the pending safety problems is the status of corrective actions implementation. This is the basis for proper identification of the pending safety problems.

2.3 COMMENTS ON THE ROOT CAUSE ANALYSIS OF SELECTED EVENTS

After the review of Event Root Cause Analysis Form (ERCAF), it was confirmed that the majority of the ERCAFs were completed properly in compliance with ASSET root cause analysis methodology. In the Plant Self Assessment report all occurrences are analysed. There is no clear identification of dominant occurrence, which represent the pending safety culture problem.

2.4 COMMENTS ON EVENTS RATING FORMS

In many cases the narratives are too short, there is a lack of safety related details and a lack of thorough justification of the INES rating.

3. THOROUGHNESS OF THE "ACTION PLAN"

The plant Action Plan was defined in the three areas of overriding priority described in the safety culture definition. The plant Action Plan contains all the corrective actions defined in the ERCAF of all occurrences (related or not to safety culture issue). The following deficiencies of the plant Action Plan could be mentioned:

a) The logic for establishing the Action Plan is not clear due to the fact that the status of corrective actions implementation is not defined.

b) Some items of the plant Action Plan are not related with the three safety culture aspects. These items require replacement or repair of equipment, which is visibly not a safety culture issue.

c) Some items of the Action Plan are too general, for example, "Improve quality control", Improve safety culture training programme, etc...".

d) The items are not prioritised in order administrative solutions to be made in a short term and engineered solutions to be considered in the longer term. The deadline for completion of the tasks is not defined.

4. RECOMMENDATIONS TO THE IAEA ASSET SERVICE FOR FURTHER IMPROVEMENTS OF THE PLANT SELF ASSESSMENT AND THE ASSOCIATED PEER REVIEW PROCESS

4.1 Working schedule should be changed in order to increase the number of working days to 5 or 6 days. It will allow to reduce the expert's working load and to increase the quality of the peer review.

4.2 It is desirable that the nuclear power plant performs self assessment of safety culture on a yearly basis.

3.3 WORKING GROUP "C" **LENINGRAD NPP**

Task 1. Population of operational events considered.

The population of events considered was 51 and in general provided a fair representation of safety important events at the plant. A relatively small population of on-site reported events may show a lack of detail in the on-site reporting criteria. That puts out of safety analysis and feedback procedure a large family of events that are recorded on logs but not reported in the event system.

It is difficult to identify which events are missing because of the above mentioned problem, but we could assume that some common cause failures, internal floods and externally induced events could be missing.

Lack of guidance on implementation of on-site reporting criteria. A more uniform on-site reporting criteria, for different plants of the same type, needs to be developed. (RBMK, WWER).

Task 2. Identification of the pending safety problems.

Twelve events were chosen by the plant to represent safety culture problems and provided a good family of such events. A good confirmation of this fact is that all events with flow-rate problems came into the "safety culture" family, though their ratings were underestimated by the plant.

One fuel handling event (No.7 of 26.05.93 in the list of on site reported events) could have been represented in this family for consistency reason, because plant included additional absorber mishandling in the safety culture family..

ASSET is required to provide a more detailed and clear guidance for selection of safety culture events.

Task 3. Thoroughness of the Action Plan

The Action Plan is comprehensive and contains many essential details with respect to corrective actions on equipment failures.

Still, there are some comments:

- Prioritization of the corrective actions is needed with respect to their safety significance and urgency. ASSET should provide a simple and clear guidance on the prioritization of corrective actions. It is reasonable to provide NPP with reference to existent IAEA recommendations on the prioritization of corrective actions;

- There is a lack of concrete requirements where corrective actions deals with procedural modifications: no definite requirement on quality control of maintenance procedures, management policy to be established, etc.

Task 4. Working Schedule of the ASSET Peer Review (5 days)

-1	0	1	2	3	4	5	6	7
SA	SU	MO	TU	WE	TH	FR	SA	SU
	TRAVEL	PLANT TOUR	CH. 2+3	CH.4	COUN-TERPART BRIEF	REPORT	TRAVEL	SCHEDULE NOW 5+2 DAYS
	BRIEFING	CH.I	MEETING	MEETING	MEETING	EXIT		
TRAVEL	BRIEFING CH.I CH.2	PLANT TOUR CH.3	CH.3 CONTN'D	CH.3 CH.4	COUN-TERPART BRIEF CH.4 CONTN'D	EXIT	REPORT	IMPROVED SCHEDULE 7+2
						REPORT	EXIT	
		MEETING	MEETING	MEETING	MEETING			TRAVEL

It was recognized tht 5 days for reviewers is too short period, and it may affect the quality of work in some cases. Extensions to 7 working days is judged optimal. In that case missions could start to work on Tuesday (Monday for travel) and work till Monday next week, weekend included into the working agenda. (see Table)

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ATTACHMENT 4

PRESENTATIONS BY PARTICIPANTS

BRAZIL

THE SELF ASSESSMENT AT ANGRA 1 NPP IN BRASIL

ANNUAL WORKSHOP ON ASSET EXPERIENCE

VIENNA, AUSTRIA

25 TO 27 JUNE 1996

AUTHOR: HUMBERTO WERDINE JUNIOR
PLANT MANAGER

ANGRA I NUCLEAR POWER PLANT

FURNAS CENTRAIS ELÉTRICAS S.A.
RIO DE JANEIRO - BRAZIL

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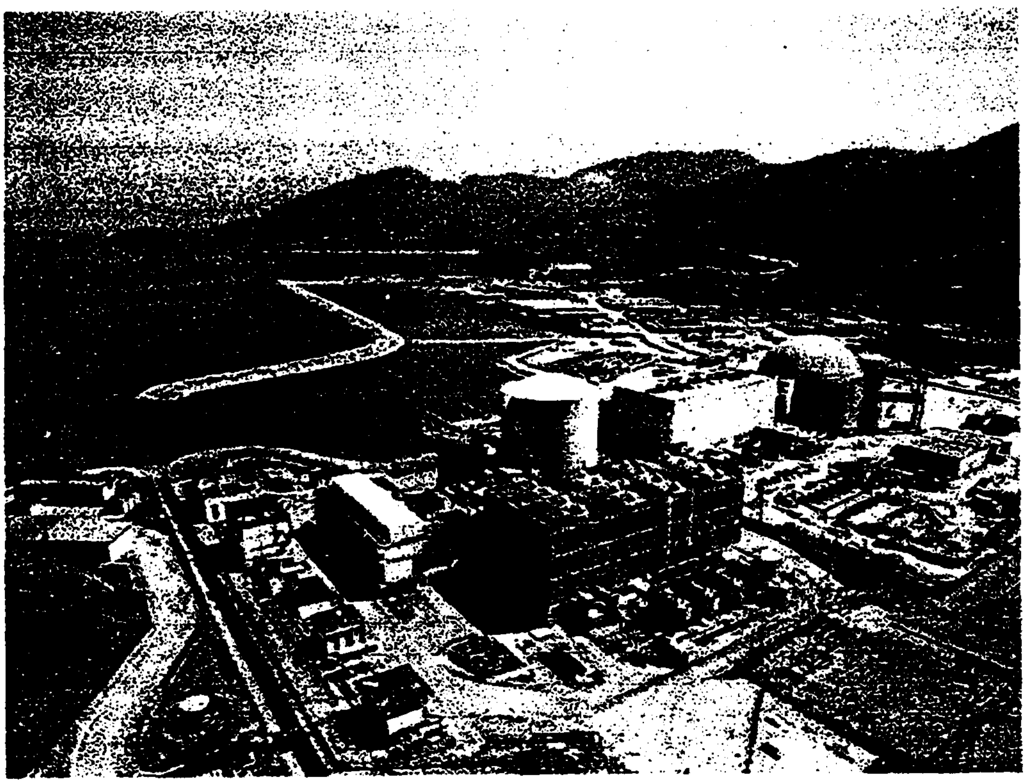
THE SELF ASSESSMENT AT ANGRA 1 NPP



ANNUAL WORKSHOP ON ASSET EXPERIENCE

VIENNA, AUSTRIA - 25 TO 27 JUNE 1996

1.0 **Introduction**

Angra 1 is a 657 Mw PWR located in Brasil, South America, operated by FURNAS CENTRAIS ELÉTRICAS. FURNAS is essentially a hydro power company with a total installed capacity of 8123 Mw and with the responsability to transport 120000 Mw from the ITAIPU Hydro Plant. Thus a total of 20123 Mw is FURNAS responsability. Angra 1 has a percentage of 3% in this value. Only to compare, Brasil has a total installed capacity of 61000 Mw. Angra 1 is the only one operating power reactor in Brasil. Furnas is also building a second NPP, a 1300 Mw - KWU designed plant, which is scheduled to be in commercial operation by the end of 1999. A third plant, twin with Angra 2 and located in the same site is scheduled to be in commercial operation by 2005.

Angra 1 is the only one PWR in the South America. Our neighbour and friendly country Argentina has two power reactors in operation with completely different design, Atucha 1 and Embalse NPP's. Although differents we are having several programs in common and some of them are being supported by the IAEA.

In order to acquire international PWR experience and not trying to "reinvent the wheel"and as such not repeating other one's errors, we decided to associate with the institutions such as INPO in the USA and WANO in Europe and also to participate more intenselly with the services offered by the Agency. In this direction we keep one engineer in each one of these institutions. Furnas considers INPO, WANO and the Agency, centers of excellence.

2.0 **Missions at ANGRA** 1

Since 1985, when we entered commercial operation, until 1995 (10 years), Angra 1 received 15 visits, seven of them from the IAEA with the OSART , ASSET Services and Special project for Latin America. The remaining were basically from INPO and one from WANO and EDF. And in 1996, we have already received two missions from INPO and in the next September a "full scope" WANO Peer Review will arrive at our plant. We are also co-sponsoring with WANO in next november an international workshop on Material Management.

3.0 International Participations and related results

FURNAS understands that the most our personnel participate in those Missions, the more experience can be fed-back into our organization. Thus, we have an agressive program envisaging participations in OSART, ASSET, WANO Peer Review and INPO Avaliations.

As example, we are in the tenth position in the number of experts and observers in OSART Missions, considering 40 participating countries. FURNAS is a state owned company in a developing country that is fighting against inflation (two years ago it had two digits monthly) and a relative high unemployment rate. These factors led to a severe budget constraint policy and almost nothing was directed towards those international participations. In simple words we had no money for that. In this point, the financial support from those institutions was necessary and fundamental. And we did received this support from WANO, INPO and specially from the IAEA.

Those participations gave us several ideas in order to enhance our safety policy and our performance indicators. Good practices and Tec-docs, procedures and routines from other plants with similar problems were analysed and adaptated to our environment and culture. Three "new" policies or methodologies were found extremely useful:

- the Safety Culture Policy,
- the Self-Checking Methodology and
- the Self- Assesment Methodology.

The concept of Safety Culture as found in INSAG-4 was analysed and a formal policy was writen and approved by the CEO. The policy and the dissemination of Safety Culture is being implemented with good and sound results at our Plant. The number and the consequences of incident reports (with root cause methodology implemented) and the above average PI's give us confidence in our affirmative.

The Self-Checking Methodology was developed and implemented in the Chemistry Section with excellent results and is now in the process of implementation in the Operations Section and in the Maintenance Division.

Now we are moving in the direction to develop the third philosophy, the Self - Assessment methodology. When analysing the related documentation we found that we had already implemented a good portion of it, with other names. Let me be more specific. A sound Self- Assessment methodology should encompass, but not limited, to the following factors:

- the correct use of in-house experience, through internal control procedures,
- the use of Performance Indicators (PI's), with goals clearly estabilished,
- the use of results of external (corporate) audits recomendations,
- the use of good practices and standards from top performance plants,
- the use of international "audits" results, such as ASSET, OSART,ASCOT, WANO,INPO,etc.
- a formal commitment from the Plant Manager.

At Angra 1, we have a series of performance indicators, whose follow-up is continuosly monitored and goals are estabilished for most of them. Those PI's are generated in each department of the plant and the tendency is analysed by the affected managers monthly.

Every three months a general meeting takes place to analyse the whole plant PI's, when corrective directions are discussed and a program for implementation is established. The use of such PI's was result of a certain kind of self- assessment since they are generated within a specific department by people from this department using guidance procedures. In this case, it is not an independent safety review.
Below are listed some of those PI's:

- number of lit alarms,
- number of controlers in Manual,
- total monthly time operating within LCO's,
- number of deficiency reports not attended due to material, design or engineering support,
- attendance of corrective versus predictice maintenance,
- number of temporary modifications installed,
- hours or percentage of time in training,
- amount of QA findings and the related rate of attendance

Another portion of Self-assessment we already do is related with the QA audits and inspections. The program of such audits is previously discussed with the plant personnel and if there is some specific area or process needed to be searched, it is included in the program and in-house and corporate experts are recruited to participate in the audit or inspection. The resulted report is discussed and the findings are tracked. Such audits are more likely considered an independent review, although there could be a heavy participation of in-house experts on them.

There is also another process- the root cause annalysis of incident reports- that fits under the umbrella or blanket of "self-assessment". When a comprehensive investigation is done, and in order to achieve this we use both techniques, from IAEA (ASSET methodology) and from INPO, weak points certainly would appear. Corrective actions are taken. And this is the spirit of a self assessment approach.

Furnas, as a whole, began last year a comprehensive program in order to implement a Total Quality Program. In order to achieve the actual diagnosis, a pilot area was chosen - Angra 1 NPP voluntarely presented itself- and a formal questionnaire with guidance procedures that covered broad range of management aspects, developed by the corporate Total Quality Group, was then sent to our plant. When answering those questions, we found out that with some modifications, this could be the model we were searching for in order to have a formal method, with guidance procedures and rating criteria.

4.0 **Conclusions**

Angra 1 considers the Self- Assessment concept a extremely valuable tool to enhance plant safety and plant performance. A formal guidance procedure to apply this methodology does not exist at our plant and should be developed and implemented as soon as possible.

Some portions of this methodology already exist with different names. The root cause analysis of in-house incident reports is a heavy portion of a sound self-assessment approach. International related experience from top performance plants should be used. International meettings, such as this one, should be convened and formal guidance from the IAEA should be written.

3 P

BULGARIA

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ANNUAL MEETING OF THE ASSET
SERVICE USERS

WORKSHOP ON ASSET EXPERIENCE
I A E A Vienna Headquarters
25 - 27 June 1996

ROLE OF THE REGULATORY AUTHORITY IN PREPARATION OF THE NPP SELF ASSESSMENT OF SAFETY CULTURE

Tinko Gantchev

Committee on the Use of Atomic
Energy for Peaceful Purposes,
Sofia, Bulgaria

1996

ROLE OF THE REGULATORY AUTHORITY IN PREPARATION OF THE NPP SELF ASSESSMENT OF SAFETY CULTURE

Tinko Gantchev
Committee on the Use of Atomic Energy for Peaceful Purposes
Sofia, Bulgaria

The Bulgarian Regulatory Authority has invited on behalf of the Bulgarian Government an ASSET Analysis Mission (Peer Review of the Kozloduy NPP Self Assessment of Operational Events reflecting Safety Culture) to be carried out at units 5 and 6 of Kozloduy NPP in September 1997. ASSET Training Mission is foreseen 5 months before the Peer Review Mission.

The Bulgarian Regulatory Authority has an intention to play a leading role during the preparation of the NPP Self Assessment Report. As it is well known the Self Assessment Report should answer the following questions:

1.) What are the pending safety culture problems?
2.) How important are they?
3.) Why did they happened?
4.) Why were they not prevented?
5.) How to eliminate the safety culture problems?
6.) How to prevent recurrence of the safety culture problems?
7.) What are the corrective actions that should be implemented?

Under the **first** item the Regulatory Body's reporting criteria should be presented and assessed. In Bulgaria criteria for reporting operational events to the Regulatory Body were established in 1983 and updated in 1987 on the basis of existing Nuclear Law. Both safety significant and safety relevant events should be reported. Initial plant reporting criteria should be reviewed and amended in order to cover all safety relevant deviations, discovered during surveillance and preventive maintenance.

In the opinion of the Bulgarian Regulatory Body the success of the plant self assessment strongly depends on the event assessment methodology which is currently implemented for analysis of all the safety relevant events. It means obligatory use of INES rating procedure for assessment of safety significance of events and ASSET root cause methodology for defining the root causes of events and relevant corrective actions. That is why the Regulatory Body prescribed to Kozloduy NPP to develop event investigation and assessment procedure based on the above mentioned methodologies. Such procedure is implemented since August 1993. The plant is obliged to report all safety related events to the Regulator, strictly following the INES procedure and ASSET root cause analysis methodologies. We believe that it will help for common understanding between the plant staff and international experts during the Peer Review of Self Assessment. The Plant Self Assessment Report should be prepared by the plant staff well aquainted with INES and ASSET. Involvement of external experts should be limited.

Other important item related with the proper identification of pending safety problems is the correct definition of the appropriateness and comprehensives of the corrective actions implemented. It will provide a basis for identification of the problems, which are still pending. This is one of the most important stages of the self assessment because later effective action plan should be established in order to eliminate pending safety culture problems and avoid their recurrence.

When the pending safety culture problems are properly defined, **their significance should be assessed** (how important) in terms of plant safety and plant reliability. We expect that the plant staff shall not have big difficulties at this stage. Usually the next step, which is the prioritization of the pending problems, is the most difficult, because there is lack of clear guidance.

No organisation can face all problems, therefore an important aspect of planning is determining what the true priorities are. The following criteria could be useful for prioritazation purposes:

a) the importance to nuclear safety, which is difficult to measure, but the impact on the safety functions availability could be assessed;

b) the amount of time and the resources required to eliminate the problem;

c) public perception(to address problems which are not very important but help the public to understand better the safety culture issues of the NPP);

d) expire dates (to reprioritize the problems and assign more manpower and resources, if necessary).

The next item - **identification of the direct causes,** in our opinion should be successfully completed, if the ASSET root cause methodology is strictly followed. It should be clear statement why the particular events are selected for root cause analysis. The dominant occurrences that have been selected for root cause analysis by the plant should represent the pending safety culture problems.

The contributor to the existence of the latent weakness must be clearly defined in the area of qualify control prior to operation or preventive maintenance during operation.

The same logic and methodology are valid for next item - **root cause identification.** It is important that the deficiency to timely eliminate the latent weakness is properly defined in the field of detection or restoration and the contributor to the existence of the deficiency is always inadequate policy for surveillance or feedback.

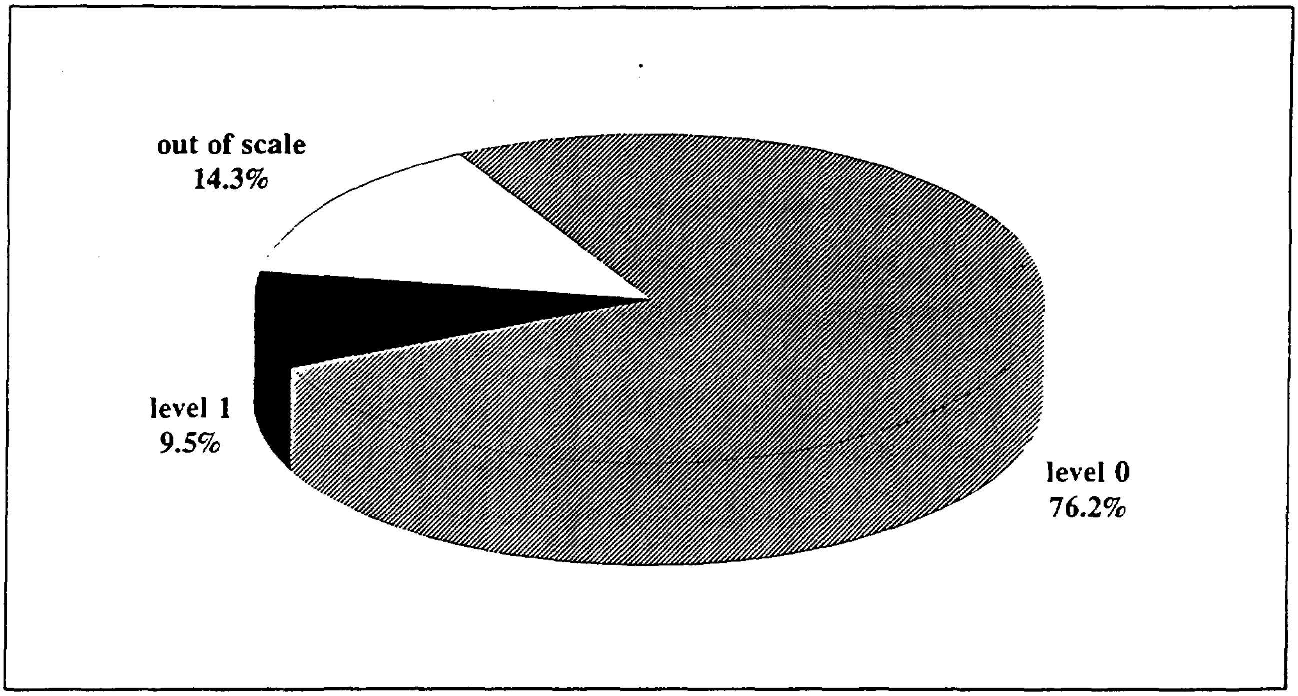
The answer to the questions: **how to eliminate the pending safety culture problems** and **how to prevent recurrence of the pending problems** strongly depends on accuracy of identification of the plant corrective actions(if they are appropriate, comprehensive and implemented).

The last item of the plant self assessment is **the Plant Action Plan to enhance Safety Culture** (corrective actions that should be further implemented), which should have the final goal to increase the effectiveness of the plant programme for prevention of incidents. The action plan should be carefully defined in the short term and in the long term. The areas of the action plan should be in compliance with the INSAG-4 Safety Culture Definition , namely:

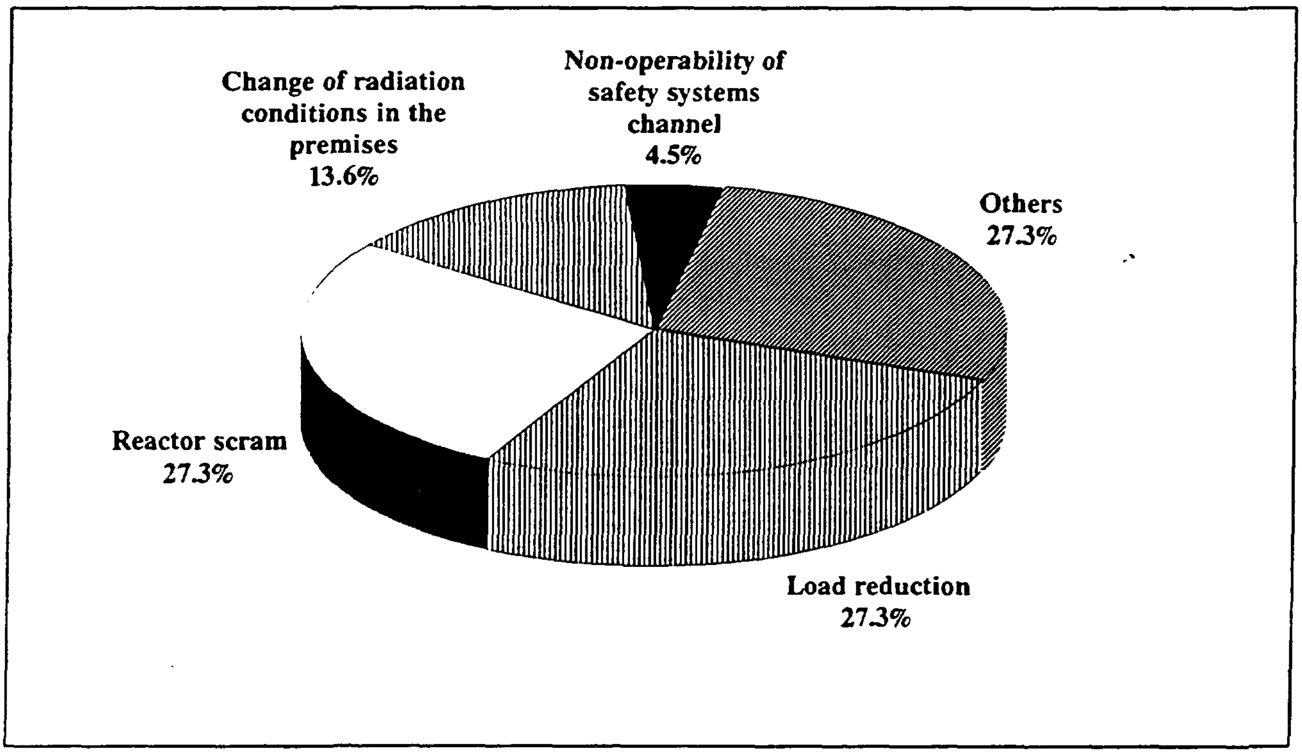
- the capability of identifying the plant safety issues
- the capability of assessing their significance
- the capability of learning the lessons

CONCLUSION

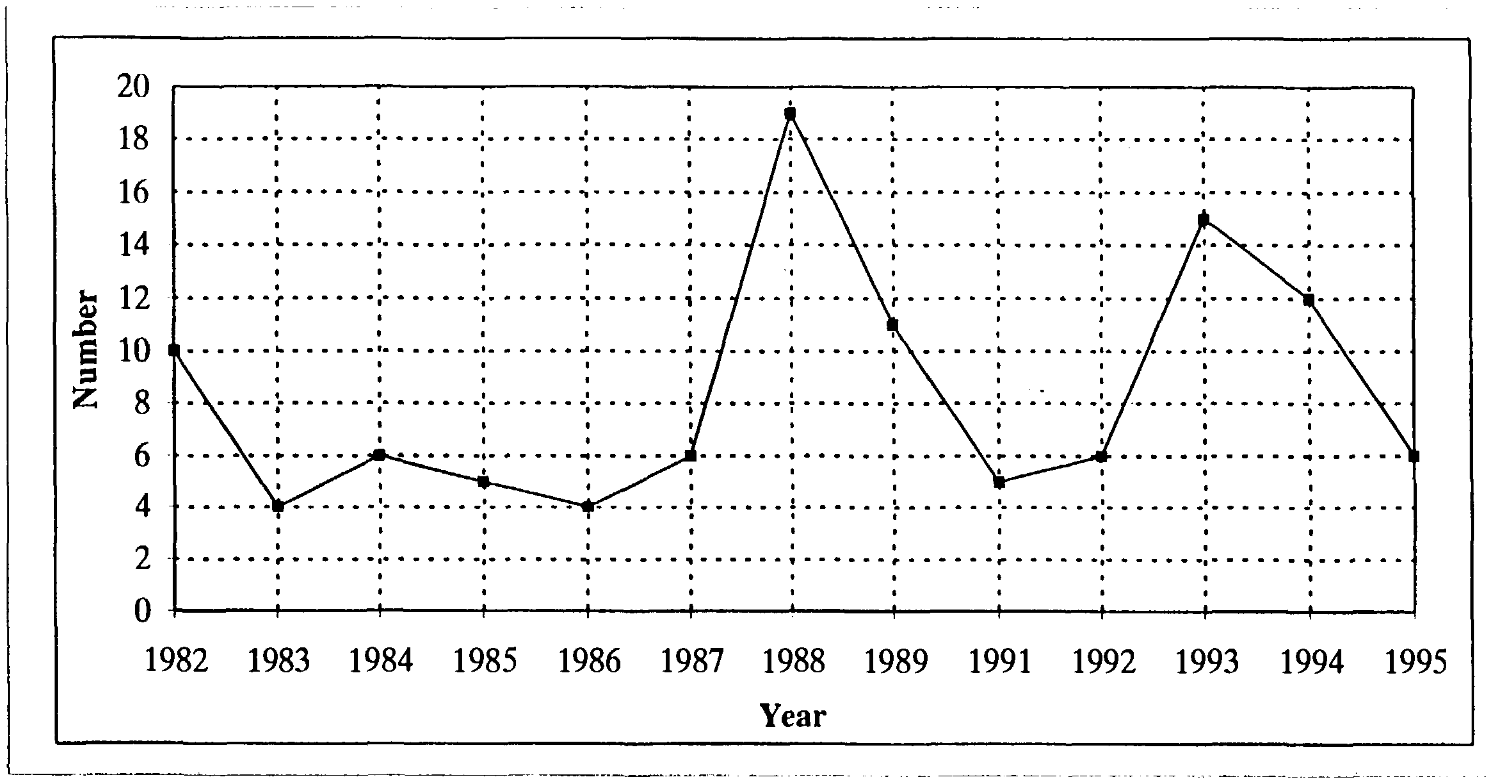
We believe that with the assistance of the IAEA(ASSET Training Mission) the plant personnel will be able to prepare high quality Self Assessment Report. The main role of the Regulatory Body is to ensure correspondence with the IAEA requirements and to provide clear guidance for the most important items of the Plant Self Assessment Report. The involvement of the Operating Organisation is also desirable in order to ensure the necessary resources for the implementation of the action plan.



Safety significance of events (INES)

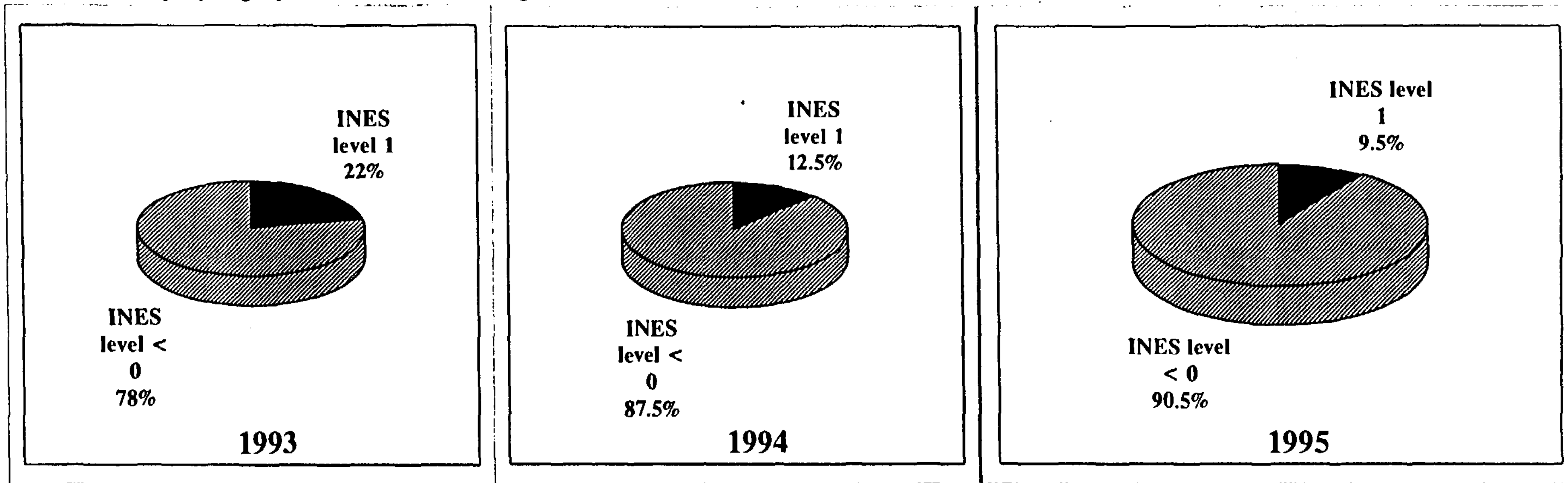


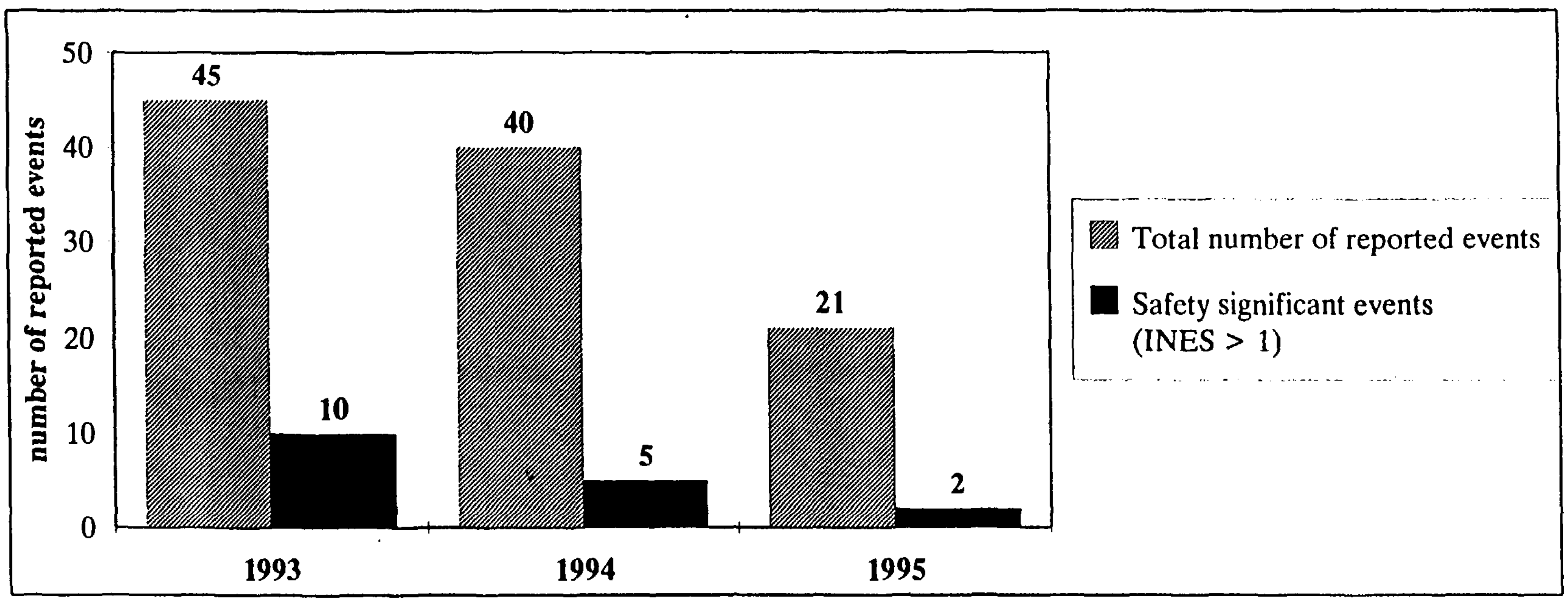
Effect of the events on NPP operation



Reactor scrams during 1982 - 1995

Safety significant events during 1993 - 1995





ASSET Activities in Bulgaria

1. ASSET Review Misson to Kozloduy NPP, Units 1 - 4, November 1990

2. ASSET Seminar - Sofia, March 1992

3. ASSET Implementation Mission to Kozloduy NPP, Units 1 - 4, June 1992

4. ASSET Seminar - Kozloduy NPP, September 1992

5.ASSET Follow - up Review Mission to Kozloduy NPP, Units 1 - 4, September 1993

6. ASSET Review Mission to Kozloduy NPP, Units 5 and 6, November 1994

7. ASSET Seminar - Sofia, June 1995

8. ASSET Analysis Mission (Peer Review of Plant Self - Assessment of Events, reflecting Safety Culture), Kozloduy NPP, Units 5 and 6, September 1997

ASSET GUIDANCE FOR PLANT SELF ASSESSMENT OF SAFETY CULTURE

SUMMARY

Objective: To answer thoroughly the basic questions:

1. What are the pending safety culture problems?
2. How important are they?
3. Why did they happen?
4. Why were they not prevented?
5. How to eliminate the safety culture problems?
6. How to prevent recurrence of the safety culture problems?
7. What are the corrective actions that should be implemented?

PRIORITIZATION CRITERIA:

1.Importance to nuclear safety;

2. Time and resources required;

3. Public perception;

4.Expiry dates (reprioritization)

STEPS OF EVENT ANALYSIS

* DETERMINATION OF INITIAL UNIT AND SYSTEM CONDITION;
* DETERMINATION OF THE CHRONOLOGICAL SEQUENCE OF SEPARATE OCCURENCES DURING THE EVENT;
* FORMULATION OF THE TITLE OF THE EVENT;
* CONSTRUCTION OF THE LOGIC TREE OF THE EVENT
* EVALUATION OF THE INFLUENCE OF EACH OCCURRENCE FROM THE LOGIC TREE TO THE SAFETY AND SELECTION OF THE OCCURRENCES FOR IN-DEPTH ANALYSIS;
* DETERMINATION OF THE TYPE OF EACH OCCURRENCE;
* DETERMINATION OF THE DIRECT CAUSE FOR EACH ANALYSED OCCURRENCE;
* DETERMINATION OF THE EVENT CONSEQUENCES;
* DETERMINATION OF CORRECTIVE MEASURES;
* BASIC CONCLUSIONS ABOUT PREVENTION OF RECURRENCE OF THE EVENT.

CHINA
PEOPLE'S REPUBLIC OF

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ANNUAL WORK SHOP ON ASSET EXPERIENCE
Vienna, Austria 25 - 27 June 1996
ZHANG SHANMING , DAYABAY NPP, CHINA

I come from the DAYABAY Nuclear Power Plant, which is situated in the south of China. Ihad been the Safety Technical Advisor for about five years, and now I am responsible for the licensing and nuclear safety surveillance in our nuclear power plant and will participate in a WANO peer review which is going to take place in a French nuclear power plant at the end of this year.

Our nuclear power plant has had two Pre - OSARTs : one took place in 1990 during the construction phase, and the another one occurred in 1993, just before the plant commercial operation. In October of this year, there will be an OSART in our nuclear power plant. This is the fist OSART in our nuclear power plant since its commercial operation from 1994, now , the OSART preparation is underway.

So far China hasn't requested any ASSET service , but in 1992, there was an ASSET training seminar which was given by IAEA instructors with about forty participants coming from the various nuclear power plants and other nuclear facilities of China. During this training seminar, the ASSET philosophy, the ASSET approach, and the ASSET investigation methodology were presented. I think that should be the beginning of ASSET activity in China.

The ASSET philosophy for prevention of nuclear safety incident is being implemented in our nuclear power plant as the other international nuclear power plants, and the in - depth analysis of operational events in order to find out and eliminate the root causes is considered as the prioritized work in the plant safety management. Hereafter are some observations which are made during the implementation of ASSET philosophy and the ASSET approach in our nuclear power plant:

1. The process to make the root causes analysis of operational events is also the one to improve the safety culture of plant staff.

During the event analysis, the involved people not only provided the primary informations concerning the event occurrence, but would also participate in the event analysis. This practice helps the involved people understand the significance of events to nuclear safety and learn the lessons from the operational events.

2. To make event analysis, it demands not only the work experience of safety analysis engineer, but also the good skills of safety analysis ingineer to perform the event analysis.

The real root cause of an operational event will be found out only when the event analysis methodology has been correctly implemented . Some technical exchange workshops on event analysis and human factor management are being orgnised in our nuclear power plant with the purpose to improve our event analysis skills.

3. To make the root cause analysis and implement the corrective actions, plant management support is compulsory.

4.The follow up of the implementation of corrective actions plays an very important role in the plant safety management to prevent the reccurrence of operational events.

CZECH REPUBLIC

Dukovany ASSET mission preparation

Ivo Kouklík
NPP Dukovany
Czeck Republic

We are in the final stages of the Dukovany ASSET mission 1996 preparation.
I would like to present some of our recent experiences. Maybe they would be helpful to other plants, that host ASSET missions in future.

Time schedule

Dukovany NPP started the preparation for the next ASSET mission immediately after the "1993 ASSET mission". We implemented several changes on our computer code that is used for assessment of our plant events. These innovations allowed us to produce statistics according to ASSET requirements. For example, events with safety impact, number of events recognized during surveillance, etc. Also every year we prepared short descriptions of events and their translation into English.

It was hoped to avoid time stress in the finalization of the ASSET report. Unfortunately we changed the type of mission from a "Follow up" mission to "Self assessment" mission thus many items had to be started again.

We have now prepared a "Self assessment" evaluation commencing January 1996 for the ASSET mission.

Participants for the preparation of the report.

- head of operational experience feedback section (Mr. Pleskac)
- engineer from this section (Mr. Sindler)
- computer technician from this section (Mr. Skarka)
- secretary (Ms. Jandova)
- head of nuclear safety department (Mr. Kouklik)

with some assistance from the WANO coordinator (Mr. Mandula). These people are (except Mr. Mandula) responsible for the Dukovany events assessment. It has been difficult to manage the regular daily work and ASSET self-assessment report preparation. In all it has taken seven months to reach this stage and the report is not yet completed. The man months spent cannot be specified. We must write some final comments and check translation into English.

ASSET "Self-assessment" guidelines

We tried to follow strictly ASSET "Self-assessment guidelines". But some approaches of the Dukovany operational experience feedback system are so specific, that we had to modify some little items.
We evaluated 921 events over the period 1993-95. You can be surprised, how the Dukovany NPP can operate, if it has more than 300 events per year. But the main reason for this number of events is because we have a very detailed procedure for reporting and we deal

with lot of insignificant events. For example our average number of the reactor scrams is 0.5 scrams/year/unit and 1 event rated INES 1/year/unit. Our regulatory body requires to report all these events.

We decided, after consultations with Mr. Thomas and Mr. Bliselius, to prepare all events into "Tables of assessment" and than split events into four groups:

Non safety related - solved
Non safety related - pending
Safety related - solved
Safety related - pending

After this selection we deal in our report only with the last group of events - pending safety related.

It is not possible, or necessary, to create Event Rating Forms, Logic Tree of Occurrences, Event Root Cause Analysis Forms for all of the 921 events.

The last main difference from ASSET guidelines is, that we were not able to assess recurrence of all events. We did this evaluation only for group pending safety related events.

Let me say one final comment to root cause analysis. For us it is impossible to implement corrective actions for all root causes which we provide for safety related events. Our safety committee decided on the following approach: we provide root cause analysis for all safety relevant events-rated INES 1 and 0. annually we summarized these results and with a fishbone chart and Parrrets analysis we determine the most significant root cause and we try to implement corrective actions for it.

We call this "pending problems as "Safety problem" of our Plant. Over the last three years we have chosen three "safety problems":

- need of diesel generators modernization;
- innovation of all kinds of procedures;
- release of low radioactive materials out of control area.

We were very satisfied, when results of ASSET self-assessment analysis - groups of safety related pending problems - conform very closely with our former decisions.

However, we also identified one new area of common group of pending safety problem - control of reactor power - during preparation of ASSET report. We implemented several corrective actions before this assessment, but we did not group the two or three relatively independent groups of events into one pending safety problem. Now we reassess our corrective actions from this general point of view.

Safety culture issues

Safety culture issues when identified can be very helpful to us to stimulate ideas, but we recognized very interesting results concerning different pending safety problems which highlighted that some areas would benefit more than others by use of the ASSET approach.

Conclusions

Every international mission is an excellent opportunity for improving our NPP safety and for exchange of experience. But this is at a cost, either financial or human (preparation is time consuming). NPP (or utility) should balance the many advantages of an ASSET mission with its costs. We decided to invite "Self-assessment" ASSET because we believe in positive gain for our NPP from this invitation. We have learned a lot during the preparation for this mission which will be of use to us in the future.

FINLAND

IAEA TECHNICAL COMMITEE MEETING ON
"ANNUAL WORKSHOP ON ASSET EXPERIENCE"
WIEN 25.-27.6.1996

Antti Piirto
Teollisuuden Voima Oy (TVO)
Finland

OPERATING EXPERIENCE FEEDBACK IN TVO

TVO is a power company operating with two 710 MW BWR units at Olkiluoto. For operating experience feedback TVO has not established a separate organisational unit but rather relies on a group of persons representing various technical disciplines. The "Operating Experience Group" meets at about three-week intervals to handle the reports of events (in plant and external) which have been selected for handling by an engineer responsible for experience feedback.

Reporting events

The reportation of events at the plant follows established rules. Basically, three categories of reports exist: operational disturbance report, scram report and special report. The last named category covers authority defined events including safety-related events e.g. failures to follow the requirements stipulated in the plant's technical specifications. More precisely, special events are incidents, failures, observations, shortcomings and problems which have special significance to nuclear safety of the plant, safety of the plant personnel or radiation safety in the plant's vicinty. Examples of events considered special events are

- emergencies
- events related to the actuation of safety functions
- damage to and failure of systems or components
- events related to radiation safety
- external events
- other events

It is the responsibility of the manager of the safety office to decide if an event requires to be reported.

Screening

All reports written about events at the plant are submitted to the operating experience group.

Screening events at other plants is done by an engineer who is engaged full-time with the experience feedback. As a starting point, the screening done by the Swedish KSU is utilised. This is considered suitable because TVO's plant units are Swedish ABB Atom BWRs, the same plant type which forms the majority of nuclear plants in Sweden. In the TVO's experience feedback activity the greatest emphasis is put on events at the TVO plant. The events on the same type of plants come second. Due to limited resources, somewhat less attention is paid to events on other types of plants. Independent of KSU's reporting, the event reports of WANO and the incident reports of IAEA and OECD/NEA are followed directly.

Handling

The operating experience group is put together in such a way that all important technical disciplines of plant operation, maintenance and technical support are represented in the group. This allows a quick preliminary handling of events to see if a closer study is necessary, or if the case can be dropped as having no importance to TVO. If an event is considered important, the group will send the report to the organisational unit which is responsible, and has the best expertise for taking care of problems on the corresponding field of technology. The group will add its recommendations on the further handling of the report. These may include a closer analysis of the report, a change of procedures or a structural modification at the plant. Although the operating experience group analyse the root causes of events and human performance associated with them to a certain extent, TVO has not a strictly systematic method for these purposes. TVO has adopted to develop a method which is very much alike with the method which is in use in Swedish utilities.The final decision, if the group's recommendation is to be followed, is made by the manager of the organisational unit which is nominated to deal with the case. The manager will report his decision to the group for information to be used in the follow-up.

Follow-up of experience feedback

The follow-up is performed by the plant's safety committee. Twice a year the chairman of the operating experience group will present a summary of event handling to the safety committee. The summary will contain the events, the recommendations of the group, and the corrective actions which have been initiated or completed. After the handling in the safety committee the summary is also sent as information to the national safety authority.

Scram reduction measures

The reactor scrams, which have occurred during 1988-1995, have been thoroughly analyzed. The table below shows that about 60 % of the 31 reactor scrams are due to operator error, maintenance error and inadequate procedures. Based on this result a scram reduction working group was formed in 1993. The group has listed same topics for more detailed discussion. They are

- SRM disturbances in the subcritical state
- IRM scale change
- 1/2- logic in the turbine protection system
- Tests performed after the completion of a modification work
- Operational and maintenance procedures
- Human errors
- Operating experience group work

To reduce reactor scrams during shutdown or startup it has been introduced supplementary simulator training. Each shift crew will have four days with simulator runs to supplement the standard retraining courses. For three days, the crew can define the run programme according to their individual needs; one day will be defined by the instructors. In this way, weakness in the knowledge and the skills can be cured on an individual basis.Specially, the crews, who according to the time schedule are responsible for the shutdown or startup of the plant in connection with a refuelling outage, have had extra training.

Reactor scrams at TVO I and TVO II during 1988-1995

Operational state	Process disturbance	Equipment fault	Fabrication fault	Design fault	Maintenance error	Operator error	Inadequate procedure
Reactor subcritical	1	1	0	0	1	0	5
Reactor critical, Generator not connected to the grid	1	1	0	0	3	6	1
Reactor critical Generator connected to the grid	3	3	1	2	1	1	0

The total number of reactor scrams of TVO I and TVO II still remains on the `wrong´ side of the median value for BWR´s. This gives motivation to continue with the scram reduction programme. When the number of reactor scrams at present is relatively low, the information for further reduction purposes has to be collected widely and in many ways. The reaction on `weak signals´ is important. Also the use of statistical methods is necessary.

Above all, a low scram rate also reflects quality in operation and maintenance. The past operational experience should be implemented rapidly and effeectively to achieve better results.

Recent development

A qualitative analysis of effectiveness of the work done on operating experience feedback was done in 1995. Based on results of this analysis a feasibility study was carried out in 1996. Following objectives were defined:

- create provisions to develop such a management tool, which can be used in the handling of events, supervision of the work and in setting priorities when planning corrective actions.
- create an improved version of an operating experience feedback data base according to the normal software development routine.
- take into account the needs of the operating experience group and other staff in order to serve them with relevant information.

Peer review of the Forsmark NPP self-assessment

The self-assessment was very useful for TVO because of similarity of technical design. Following ideas or suggestions to improve our performance in operation and maintenance come from the work carried out at Forsmark:

- For root-cause analysis a simple and effective method in the way applied by an ASSET should be proved
- Event classification and INES rating should be automatically included in event reports
- Event data base should be improved (as suggested above)
- Internal reporting guidelines should be written to cover also events which need not be reported to the national safety authority
- Technical improvements as control rod manouvre system etc. should be done
- Pending problem identification idea to deal with minor recurrent problems should be introduced
- Necessity to improve functions performed by operating organisation instead of solving technical problems only

HANDLING OF EVENT REPORTS IN TVO

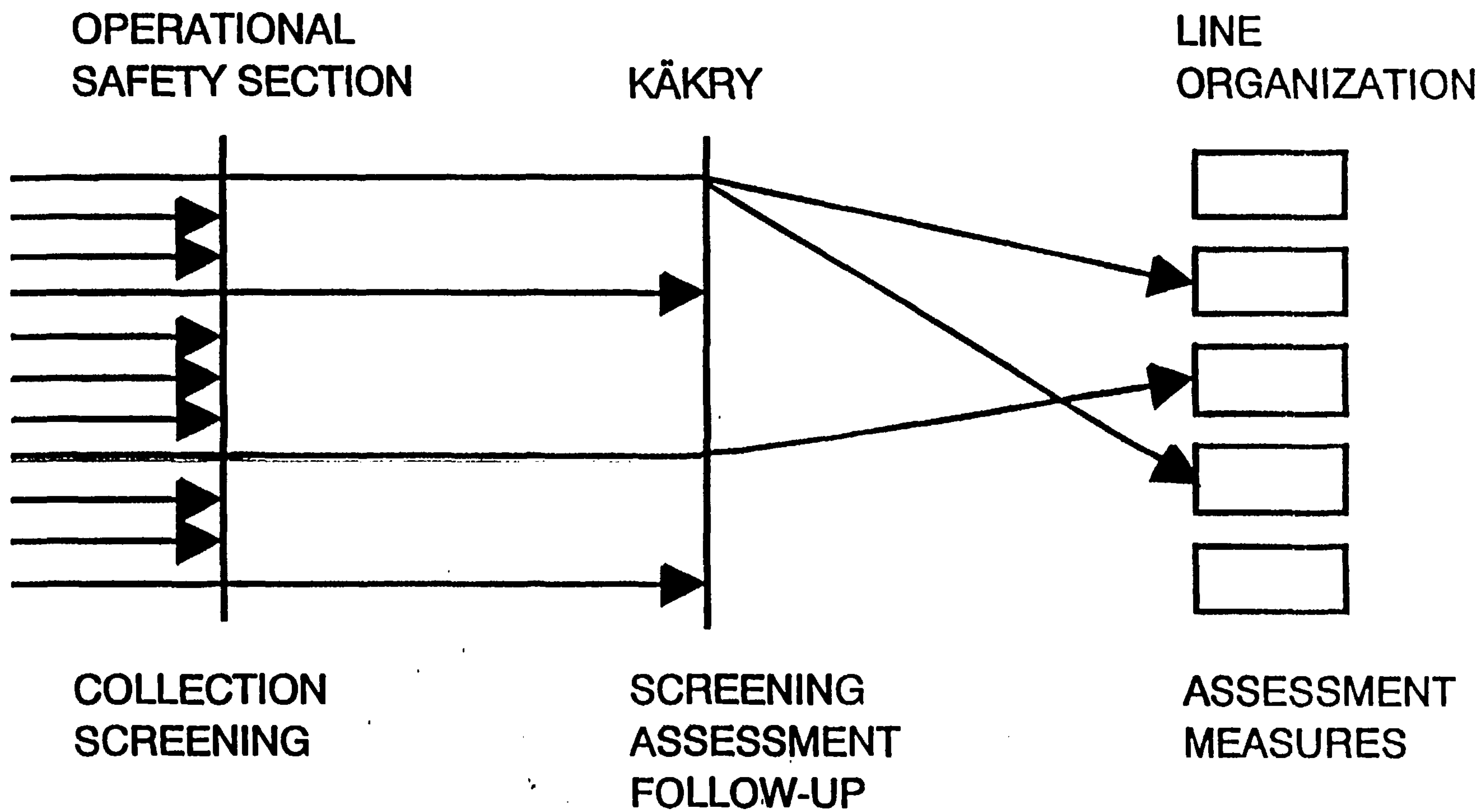
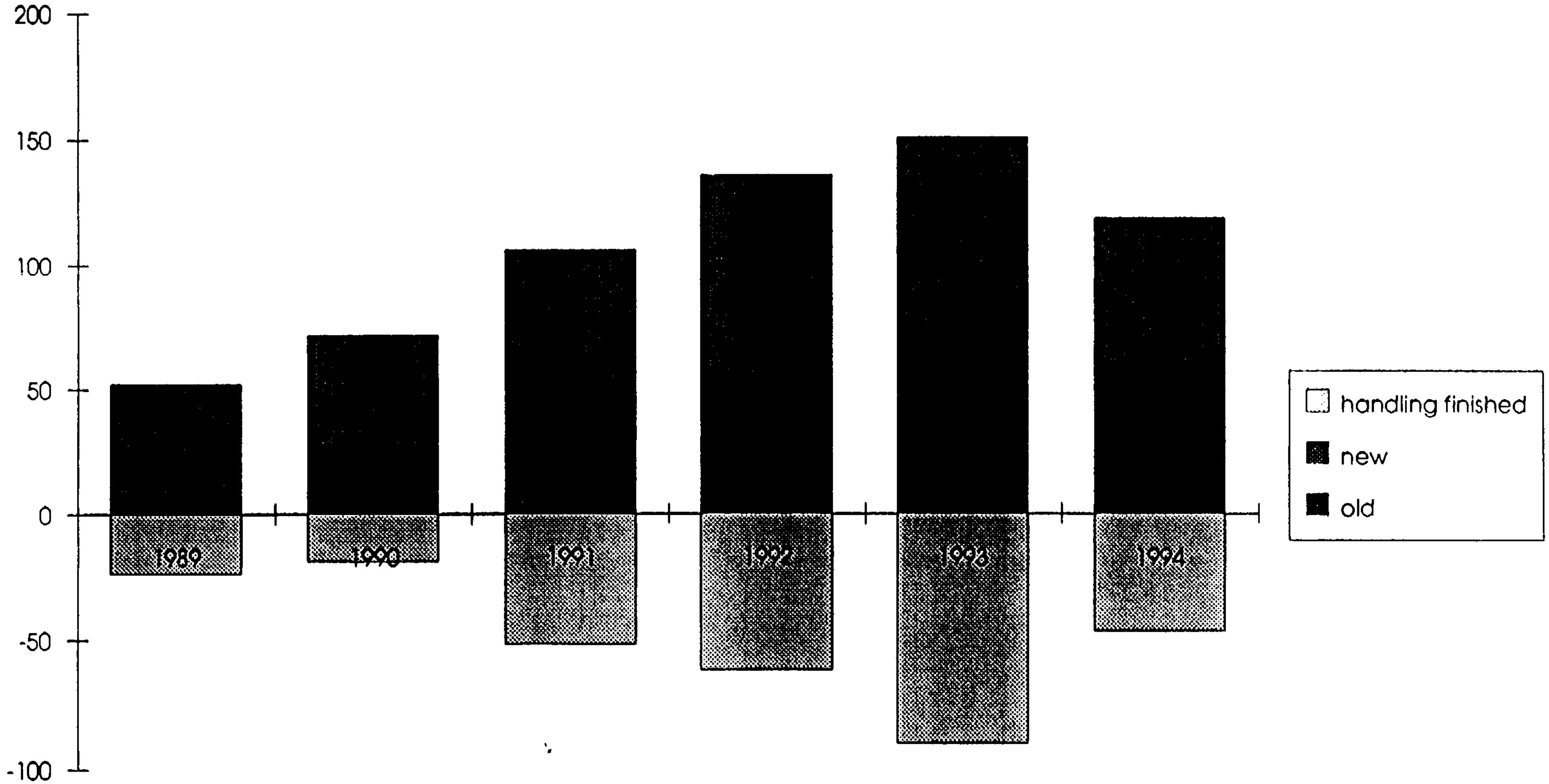
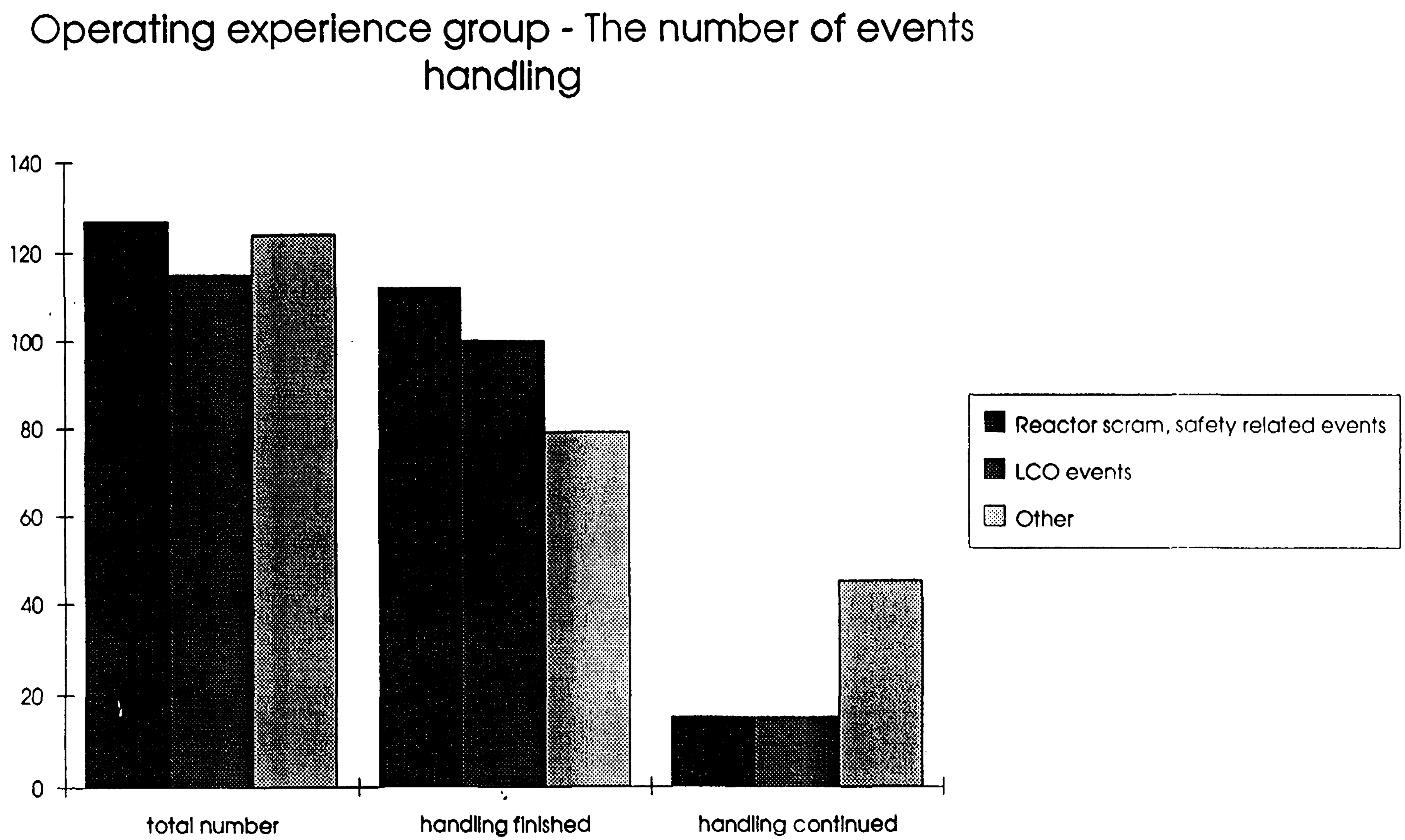


chart 5

TVO I/II - Handling of events by operating experience group

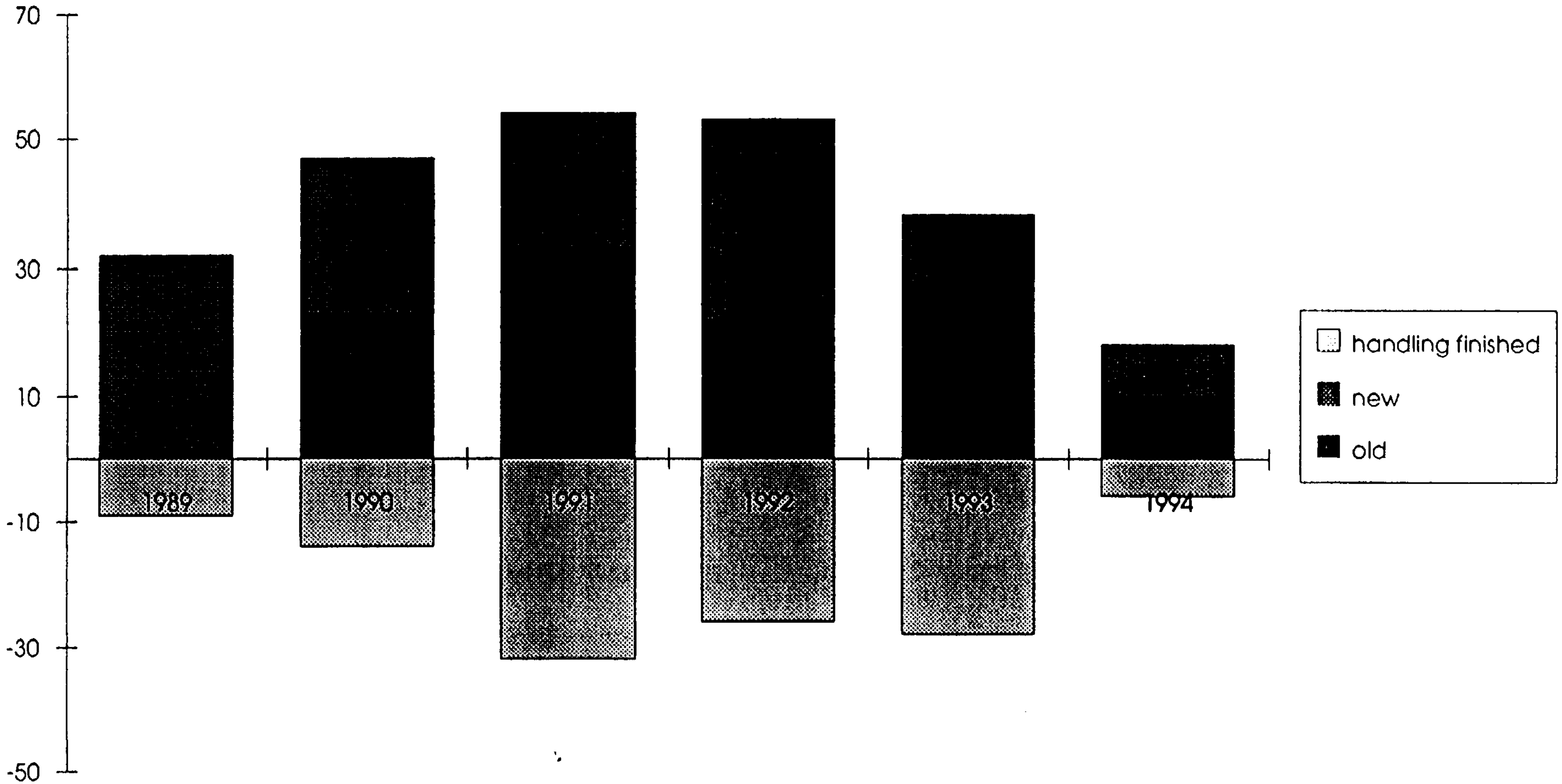




Operating experience group - The number of events handling
140
120
100
80
60
40
20
0
total number
handling finished
handling continued
Reactor scram, safety related events
LCO events
Other

chart 2

TVO I/II - Reactor scrams and safety related events



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TVO I/II - LCO events

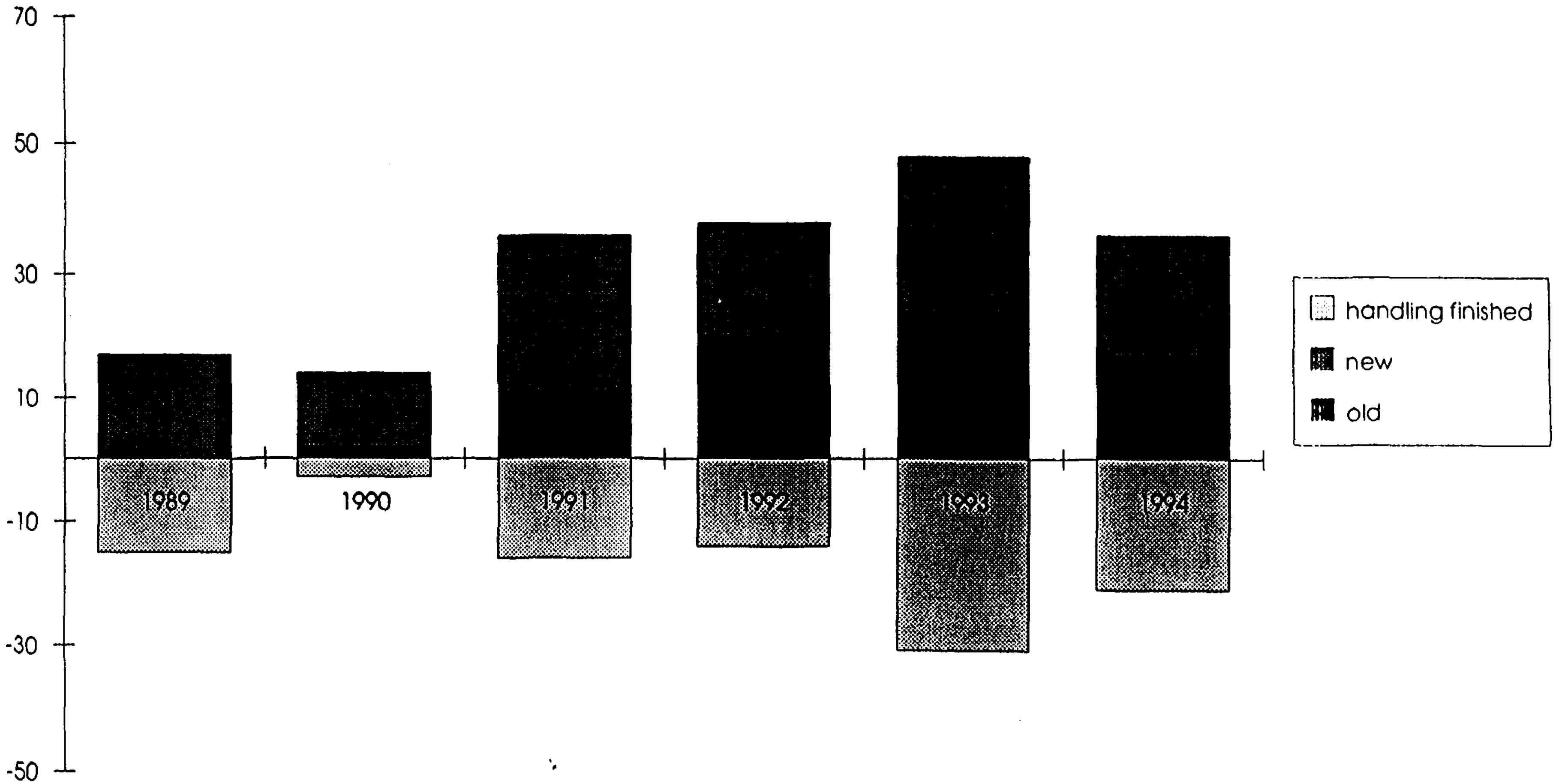
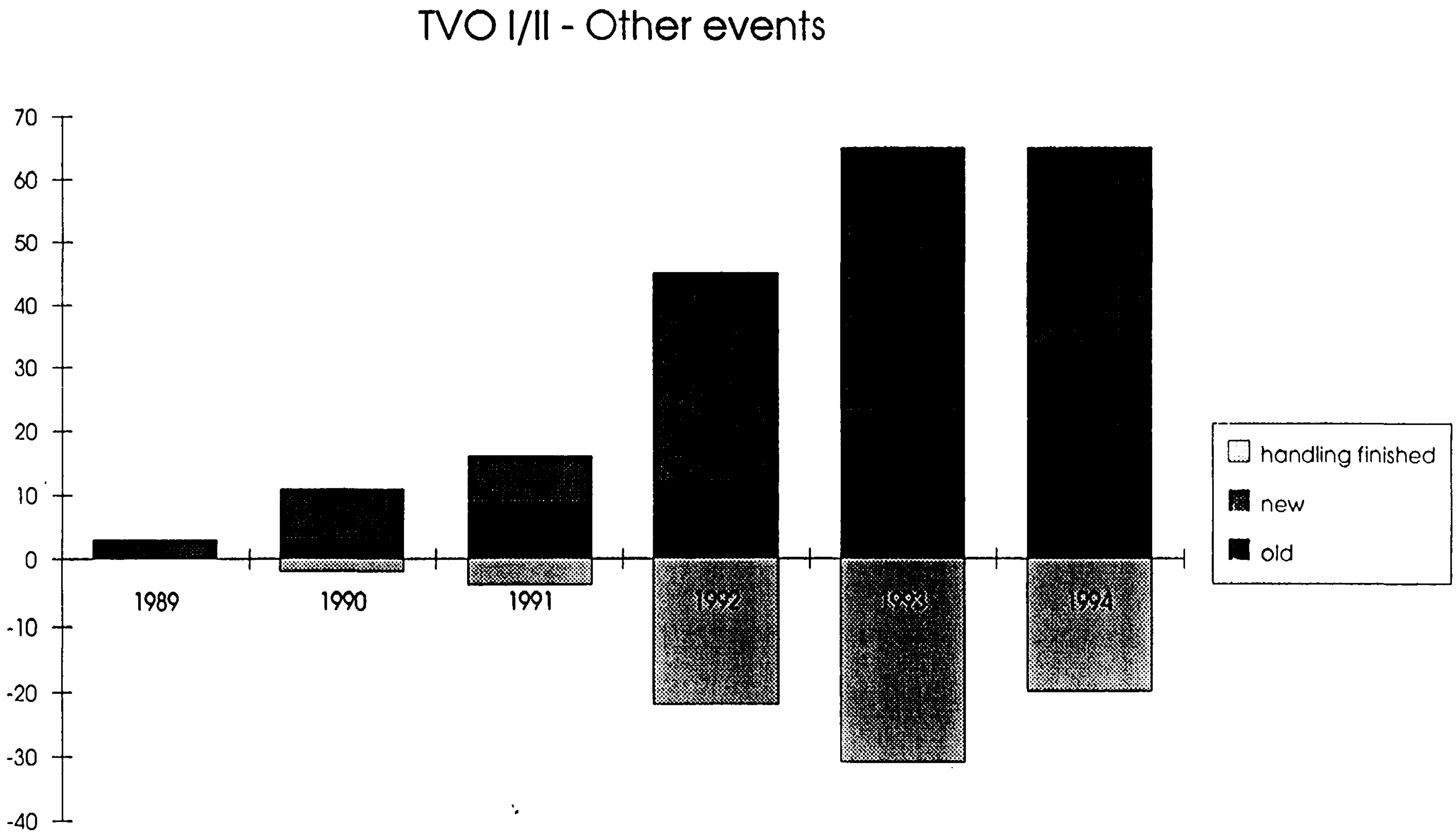


chart 4



TVO I/II - Other events
70
60
50
40
30
20
10
0
-10
-20
-30
-40
1989
1990
1991
1992
1993
1994
handling finished
new
old

47

Operating experience group - Handling time of events

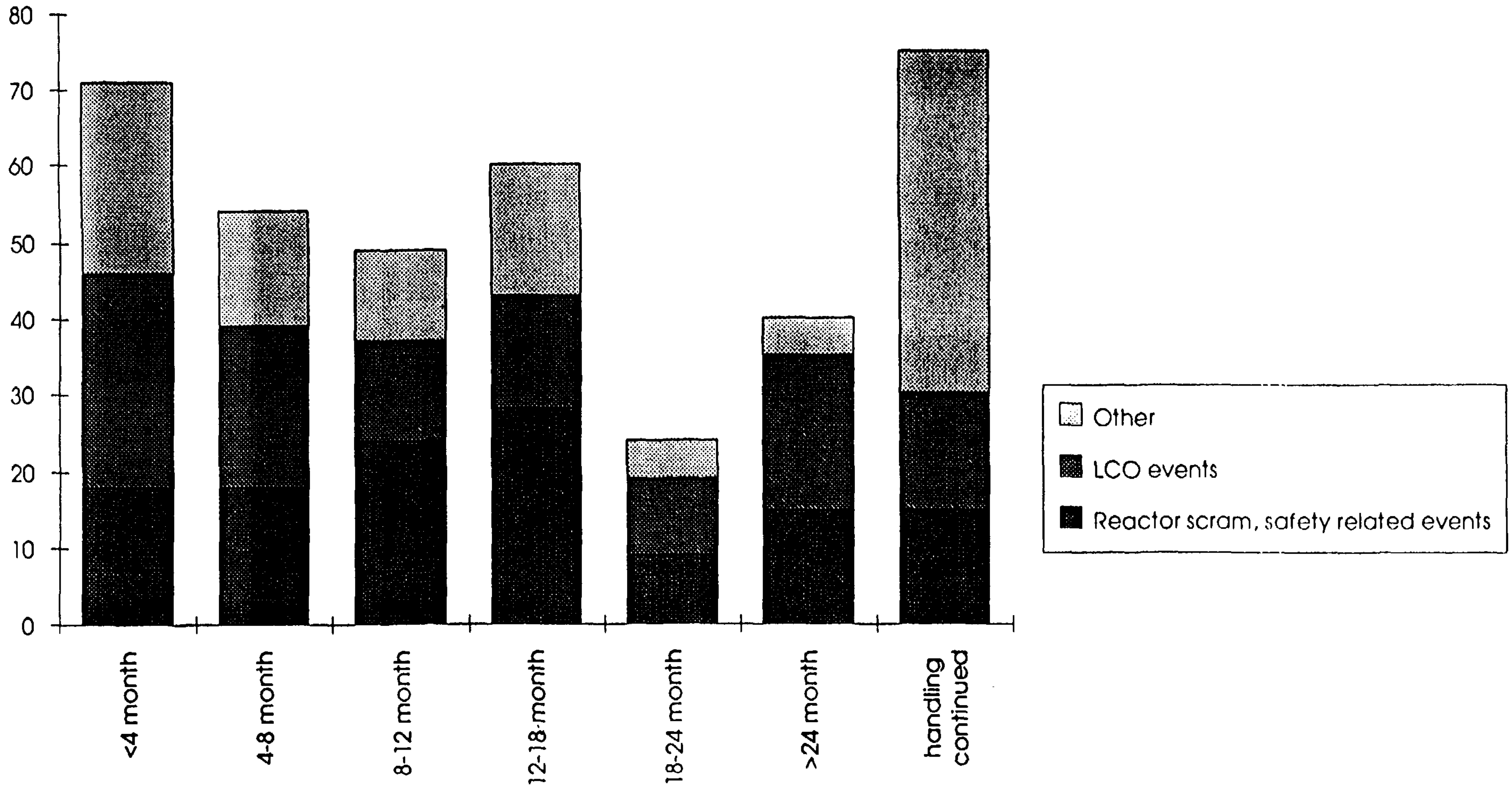
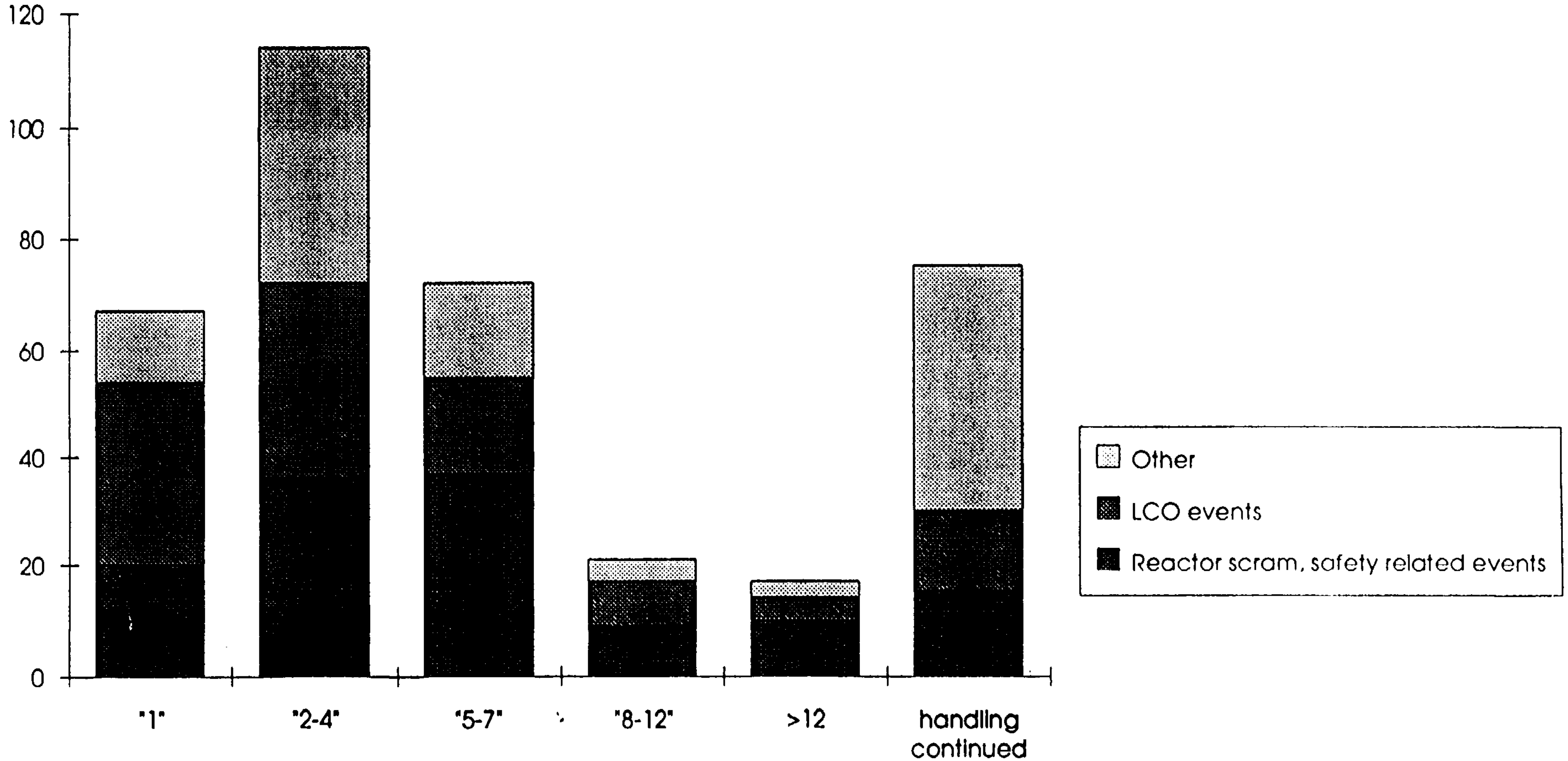


chart 7

Operating experience group - The number of follow-up meetings



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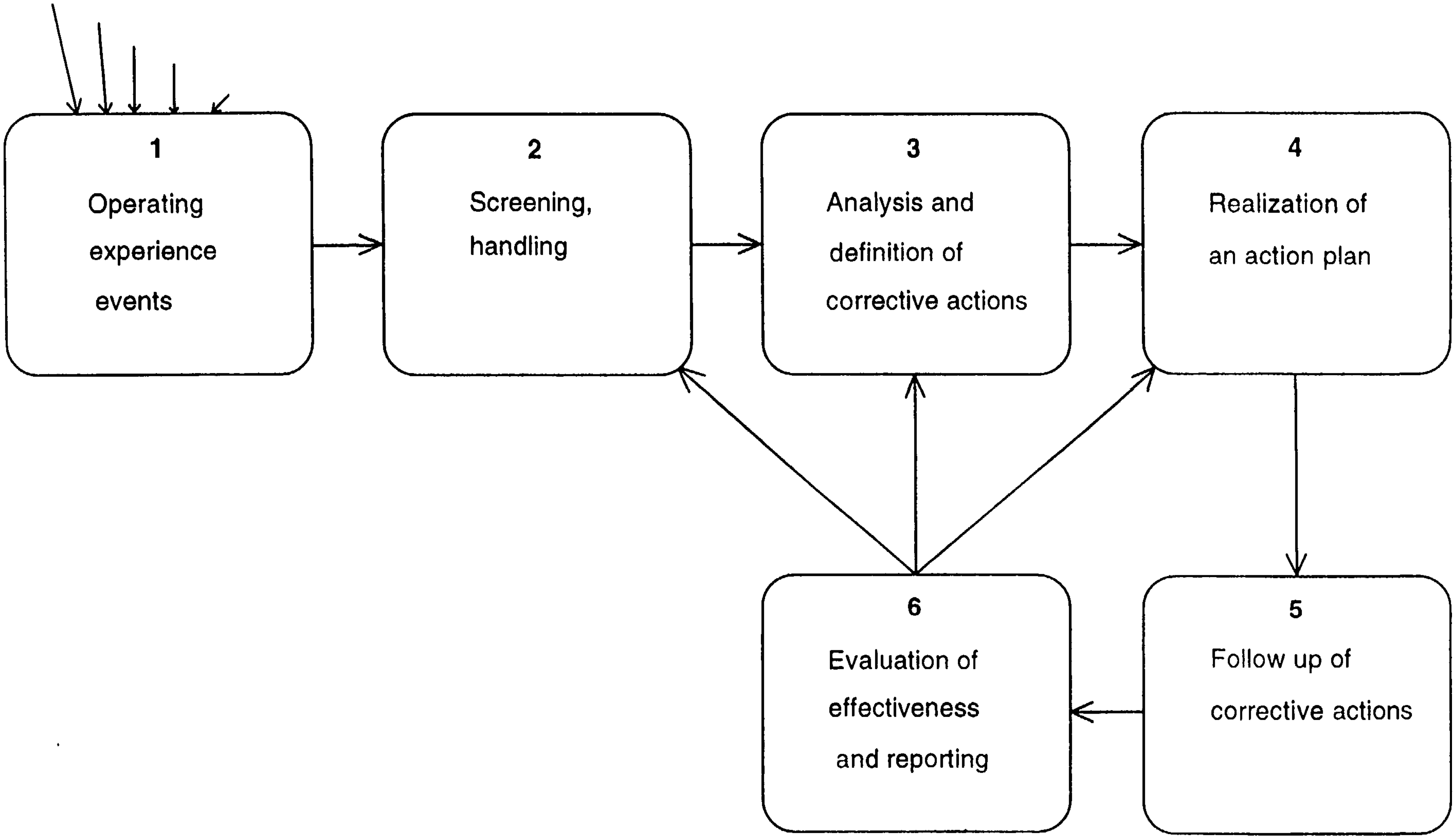
1
Operating experience events
2
Screening, handling
3
Analysis and definition of corrective actions
4
Realization of an action plan
5
Follow up of corrective actions
6
Evaluation of effectiveness and reporting

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INDIA

INVESTIGATIONS ON THE INADVERTENT POWER INCREASE IN A PHWR AN ASSET EXPERIENCE

by

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Atomic Energy Regulatory Board
Mumbai, India

ABSTRACT

Investigations were carried out using the ASSET methodology to find out the root cause of an incident involving inadvertent increase in reactor power in the Unit 1 of Narora Atomic Power Station (NAPS) in India. NAPS is a twin Unit, 220 MWe PHWR based power station. On December 4, 1992, when NAPS Unit 1 was operating at 130 MWe, the reactor power increased steadily on its own and touched 147 MWe, over a period of 14 minutes. The set (demand) power of the triplicated reactor regulating system had increased on its own and in turn has made the reactor to operate at higher power. The power was brought down to 120 MWe by manual intervention.

Since adequate system related data during the incident was not available, laboratory studies were carried out using computer simulations for the various process disturbances which could affect the reactor regulating system, for establishing the causes of the event.

The latent weakness in the Reactor Regulating System was that the 'trim-up' logic on the demand power was not adequately qualified to account for the process disturbances.

Although extensive testing was done on the micro-processor based Reactor Regulating System, the designers failed to conceive the type of disturbance that could change the reactor set power significantly.

The **root cause** of the event is thus attributed to the insufficient visualisation of disturbance conditions by the designer which could result in unlimited trim action by RRS.

The team made the following short term recommendations to eliminate the above weaknesses and prevent recurrence of similar events.

The 'trim' action on the demand power in the Reactor Regulating System should be limited to 3% full power around the set demand power and it should be delayed to account for the process disturbances.

These have been implemented.

As a long term solution, it was recommended that the reactor power control should be based on the corrected linear neutron power (Linear neutron power signal from the ion chambers continuously corrected by steam generator differential temperature signal averaged over a time). This will prevent any inadvertent change in the reactor set (demand) power due to any process disturbance. This control methodology has been employed in a reactor which was built subsequent to NAPS. It was found that in this reactor, the reactor set power does not change in response to the process disturbances.

To obviate the root cause of the event, it was recommended that operational feed back on a continuous basis from the operating stations should be provided to the designers for analysis and appropriate action to improve the system design.

Introduction

The Narora Atomic Power Station (NAPS) is a twin Unit 220 MWe Pressurised Heavy Water Reactor based power station. The reactors are natural uranium fuelled and use heavy water as moderator and primary coolant. The two Units NAPS-I and II are in operation since 1989 and 1991 respectively.

On December 4, 1992, when the Unit-1 of Narora Atomic Power Station (NAPS) was operating at 130 MWe, the reactor power inadvertently increased to 147 MWe gradually in about 14 minutes. The reactor power was brought down to 120 MWe by manual intervention. The incident was investigated by a team based on the ASSET methodology for identifying the root cause and to suggest remedial measures to prevent recurrence.

Reactor Regulating System in NAPS

In NAPS, the reactor power is regulated by a microprocessor based Reactor Regulating System (RRS) with triplicated channels (Channels A, B & C) which measures the actual reactor power and controls it with respect to the demand power set by operator. The actual power signals consist of primary coolant temperature differential across the steam generators, and Log neutron (Log N) signal with appropriate weightage. Above 20% full power, the Log N signal is smoothly limited and is completely cut off at 35% of full power. The ion chamber amplifiers also give a derivative contribution in the actual power calculation of individual RRS channels. The demand power (D.P) is set by the operators command. The control signal is generated in each channel based on the difference in the calculated actual power and the set demand power. For controlling the reactor power, the 'median' of the control signals generated by the three RRS channels is derived, so that the single channel failure criteria is met.

The RRS incorporates a self correcting feature called 'trimming', for maintaining the control signals from all the three channels of the RRS within a close tolerance band of ± 0.33% F.P. at all times, so that a bump-free transfer of the median is achieved in case of failure of any

RRS channel. If the control signal is deviating beyond ±0.66% FP range from the other two channels, the trim action is initiated on that channel to drive up or down the demand power at the rate of ± 0.1% FP/second to bring down the deviation within 0.33% FP range.

In NAPS, the differential temperature for channel A and C is derived across steam generator No. 1 and for channel B across steam generator No. 3.

Investigation of the Incident based on ASSET Methodology

The inadvertent increase in reactor power is a significant event. The event though did not lead to any unsafe situations, indicated deficiencies in the 'reactor power control scheme' and thus had a bearing on safety. Moreover, the similar scheme of reactor power control was adopted in various other reactors. Hence it was considered essential to investigate the event in detail to find out the root cause of the event. The ASSET constituted for investigation of root cause of this event included experts in various disciplines such as Design, Operation and Maintenance of Nuclear Power Plants and from the Regulatory Body.

The ASSET team visited the plant and had discussions with the plant management and the operating personnel present during the incident. The data on various parameters during the event was analysed. The team also went through the records to find whether similar event occurred earlier. Discussions were also held with the designers of RRS. The team also perused the documents relating to commissioning of the RRS.

The Event and its significance

NAPS Unit-1 was operating at 130 MWe with the steam generator differential temperature on primary coolant side (Delta T) reading as 27.5°C at 13:56 hrs. on December 4, 1992. The operators noted at 14:10 hrs. that the reactor power had increased steadily and touched 147 MWe with steam generator Delta T of 29°C. The reactor power was reduced to 120 MWe manually. Preliminary investigations showed that the 'Demand Power' in RRS channels A & C had 'trimmed up' over a period of 14 minutes. In this event, the reactor set (demand) power had increased on its own and in turn made the reactor to operate at higher power. The event did not lead to any unsafe situation. If the manual action to reduce the power was not taken, the reactor would have either tripped on parameters like 'neutron power high' or 'steam generator differential temperature high' on reaching the respective set points or would have initiated a 'set back' (reduction in power at 0.5% FP/Sec) on 'channel outlet temperature high'. However, such inadvertent reactor power could have resulted in increase in reactor power beyond the intended limit.

Chronological Sequence of the Occurrences

From the available data it was concluded that the reactor power had increased due to inadvertent increase in reactor set (demand) power.

For establishing the reasons for the increase in demand power, the team decided to carry out laboratory experiments involving computer simulation study of the reactor regulating system for probable process disturbances which could affect the R.R.S.

The studies showed that disturbances to the steam generator, from which the Delta-T signals of two RRS channels are derived, can result in changes in the demand power of the RRS, in case time constants of the RTDs used for deriving these signals are different. Any disturbance, which results in a change in steam generator Delta-T, such as steam generator level fluctuations, feed water control valve movements, etc. could affect the demand power.

The sequence, at it can occur in a simulated event is described as follows.

Initially the reactor is operating at 130 MWe with all the three RRS channelsmeasuring actual powers close to each other. A process disturbance occurs across steam generator No. 1 which results in reduction in Delta-T of this steam generator. The Delta-T signal in RRS channels A & C reduces. The time constants associated with Delta-T measurement of channel A is smaller than that of channel C. The actual power calculated for channel A comes down faster than that of channel C. The channel B which derives Delta-T across steam generator 3 does not see any change in Delta-T. Thus the median signal derived from these channels is the control signal from channel C and results increase in reactor power as the measured actual power is lesser than the demand power. At the same time RRS channel B tries to match its control signal with that of the other channels A & C by trimming up its own demand power.

As the disturbance cycle in the steam generator 1 reverses, the Delta-T signals of channel A & C start increasing resulting in increase in 'Actual power' signals to channels A & C with channel 'A' response being faster. Again channel C signal is the median and the reactor power starts reducing. During this time the actual power signal in channel A reaches a peak which initiate 'trim up' action in channel A demand power. Now since the reactor power is really coming down, the 'actual power' signal in channel B reduces, resulting in channel B demand power being brought down by 'trim down' and 'negative deviation limiting' actions.

As the disturbance on steam generator No. 1 disappears, the actual power signals on all three RRS channels and the reactor power starts settling. Now the actual power in channel C lags behind that of channel A due to its larger time-constant in Delta-T measurement and therefore demand power in channel C is trimmed upto match the control signals.

In the simulation studies it was seen that after one such disturbance cycle, the demand powers settle at 0.13% FP higher than the initial set power for channel A, 0.42% FP higher than the initial set power for channel C and 0.29% FP lower than the initial set power for channel B respectively. The reactor power show a net increase of 0.13% FP.

Based on the analysis of simulation studies and the available data on various parameters during the incident, the ASSET concluded that the above described disturbance could lead to similar event due to deficiencies in the RRS system. The event occurred due to repeated occurrence of the process disturbance to the steam generator from which the Delta-T signals are taken for two channels of RRS.

The Logic tree of Occurrences is given in fig. 4.

The ASSET identified two occurrences which are failures of RRS (equipment) to perform as expected.

The occurrences are

1. **The RRS fails to identify the spurious changes in "actual power measurements caused by process disturbances and initiates trim action instantaneously.**

2. **RRS fails to limit increase in demand power due to 'trim' action within an acceptable band around the demand power set by the operator.**

During the discussions by ASSET with designers and the plant personnel the following points were brought to light.

The Delta-T signals for RRS channels A & C are derived across the same steam generator and does not maintain independence between triplicated RRS channels. Any malfunction on failure of any common element like SG level control valve etc. on this steam generator will affect two channels and will lead to spurious changes in the 'actual power' seen by RRS.

The 'trim' logic in RRS is such that it is initiated instantaneously, if the control signals with RRS channels differs. Thus the RRS is not able to distinguish any spurious/transient changes in the signals due to any process disturbance. The trim action, though is limited for three minutes on a single occasion, repeated occurrences of trimming will change the 'demand power' significantly.

<u>Direct</u> <u>and</u> <u>Root</u> <u>Causes</u>

The **direct cause** of the occurrence of failure of RRS was a **latent weakness,** that **the trim up logic of RRS was not adequately qualified to account for the process disturbances** - a design deficiency.

The microprocessor based control of RRS was used for the first time in India at NAPS, as against the analog controls employed in earlier designs. Although extensive testing of the new system was done using the simulator, the type of process disturbance that could change the reactor set (demand) power significantly, was not conceived. Thus the design was inadequate to achieve control of reactor power independent of process disturbances.

The **root cause** of the occurrences was attributed to **insufficient visualisation of the disturbance conditions which could result in unlimited trim action by RRS,** at the time of RRS design.

The ASSET Recommendations

After considering various aspects the ASSET made the following short term recommendations [redacted] to eliminate the weaknesses in RRS design and prevent recurrence of such event:

1. In the absence of any limit on trim action, the reactor set (demand) power can change cumulatively in one direction i.e. up or down. Therefore, the cumulative trim action should be limited to ± 3% FP around demand power set by the operator.
2. The trim action should be delayed to account for the process disturbance time constants.

These modifications required only minor changes in the existing system and were implemented in short term at NAPS reactors. The performance subsequent to these modifications was found to be satisfactory.

As a long term solution to improve the system, the reactor power control should be based on the corrected linear neutron power signal instead of the Differential Temperature signal. The linear neutron power signal from the ion-chambers should be continuously corrected by a Differential Temperature signal averaged over a time. This solution will prevent any inadvertent change in the reactor set (demand) power due to any disturbance from the process, provided the averaging time of Differential Temperature signal is sufficiently large to account for the slow varying disturbances.

This control methodology has been employed in a reactor which was built subsequent to NAPS, where even though the reactor power is found to have changed in response to the grid frequency changes, the reactor set (demand) power does not change.

For eliminating the root cause of the weaknesses in the RRS design the ASSET recommended to institute a systematic process to obtain operational feed back on a continued basis from NAPS and the subsequent reactors for analysis and appropriate action for improvement of RRS Design.

Based on this recommendation, the operating organisation has set up a system for providing period operational feed back to the designer. The requirements of the information to be provided was finalised with mutual understanding of the designer and the operating staff.

Conclusion

The ASSET guidelines could be successfully applied to investigate and detect the Latent Weaknesses in the Reactor Regulating System of NAPS. The ASSET recommendation aimed at eliminating the weaknesses in RRS and for prevention of recurrence have been implemented. These measures will improve the RRS system not only at NAPS but also at the future units.

The ASSET recommendations on continued operational feed back will ensure that such latent weaknesses in the design are detected and corrected timely.

....

Root Cause Analysis Form

Event Title	Inadvertant rise in Reactor Power due to trim up of Demand Power	
Occurrence Title	RRS fails to limit increase in demand power due to trim action within an acceptable band around the demand power set by the operator.	
Nature of failure	Equipment	
	Direct Cause	Corrective action
Latent weakness	Trim up logic of RRS was not adequately qualified to account for the process disturbances	-Limit cumulative trimming action on demand power to ± 3% FP around the demand power set by the operator. -Trim action should be delayed to account for the process disturbance time constants. -Modify RRS design to use the linear neutron power to continuously correct the Delta T signal averaged over a time.
Contributor to the existence of the latent weakness	Commissioning trials and operational feed backs did not detect the above deficiency	More elaborate trials during commissioning and more detailed analysis of the data on operational experience.
	Root Cause	Corrective Action
Deficiency to timely eleminate the latent weakness	Insufficient visualisation of the disturbance conditions which could result in unlimited trim action by RRS	-Institute a systematic process for obtaining the operational feed back on a continued basis for analysis and appropriate action for improvement of RRS design.

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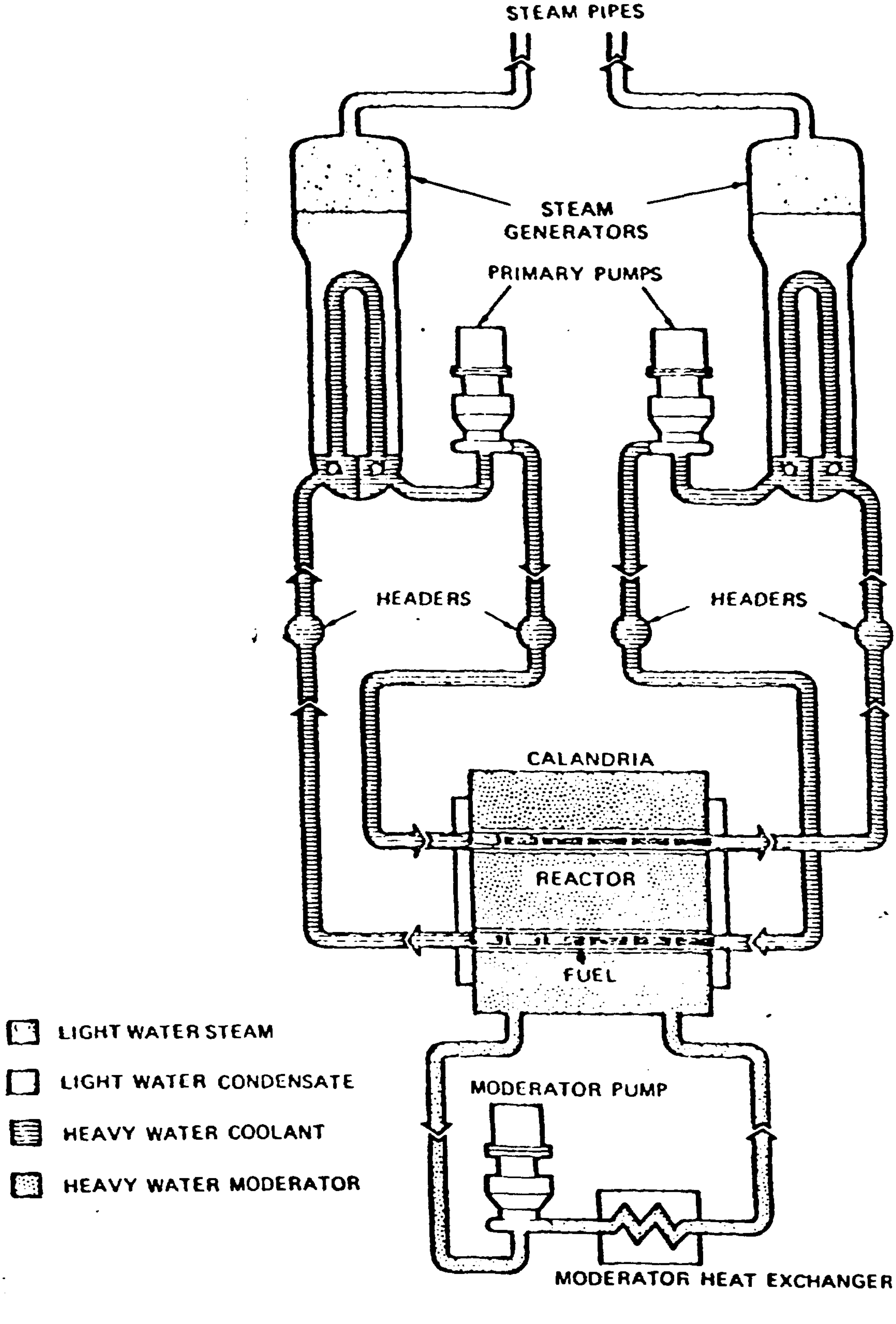

FIG-1 Simplified flow Diagram of PHWR

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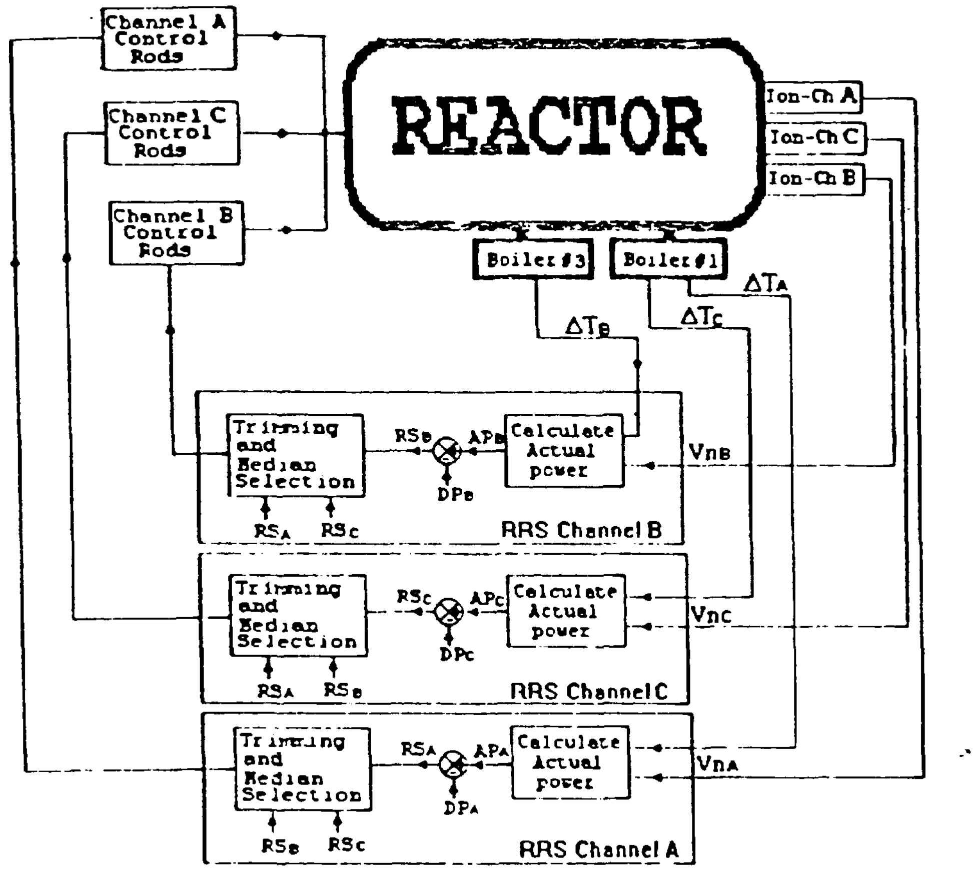


Notes: 1. AP denotes Actual Power suffixed with channel eg. AP_A for channel A

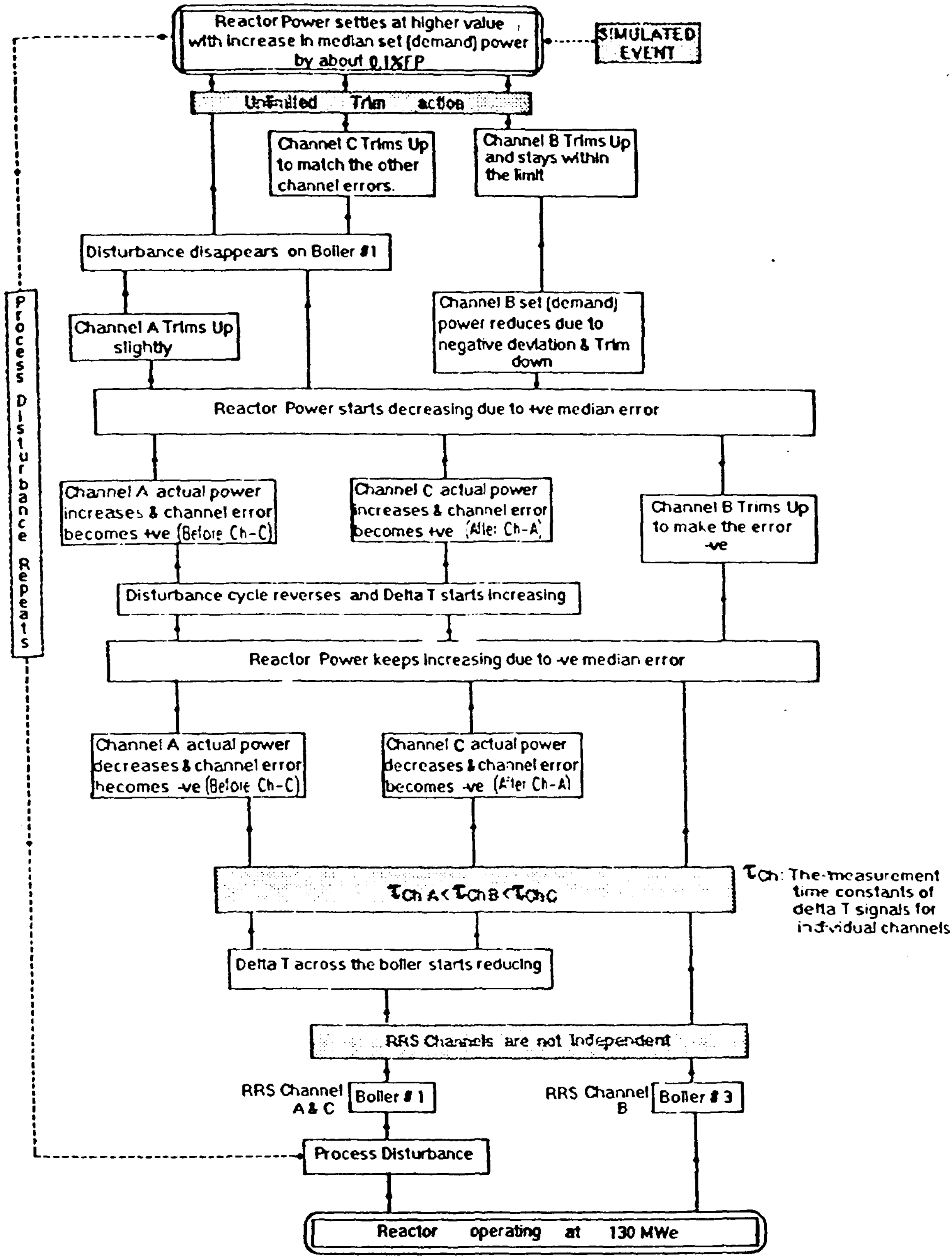
2. DP denotes Reactor Set (Demand) Power suffixed with channel.

3. RS denotes Regulating Signal (Error) suffixed with channel.

4. ΔT denotes Differential Temperature across boiler suffixed with channel.

5. Vn denotes the Neutronic Power suffixed with channel.

FIGURE 2. SCHEMATIC DIAGRAM OF REACTOR POWER CONTROL



Notes: 1. Reactor Power indicates neutronic power of the reactor.
2. Channel Actual power indicates the power as measured on the RRS Channel based on Delta T signal.
3. Channel Demand power indicates set power on individual RRS channels.

Fig-3 The Simulated event

LOGIC TREE OF OCCURRENCES

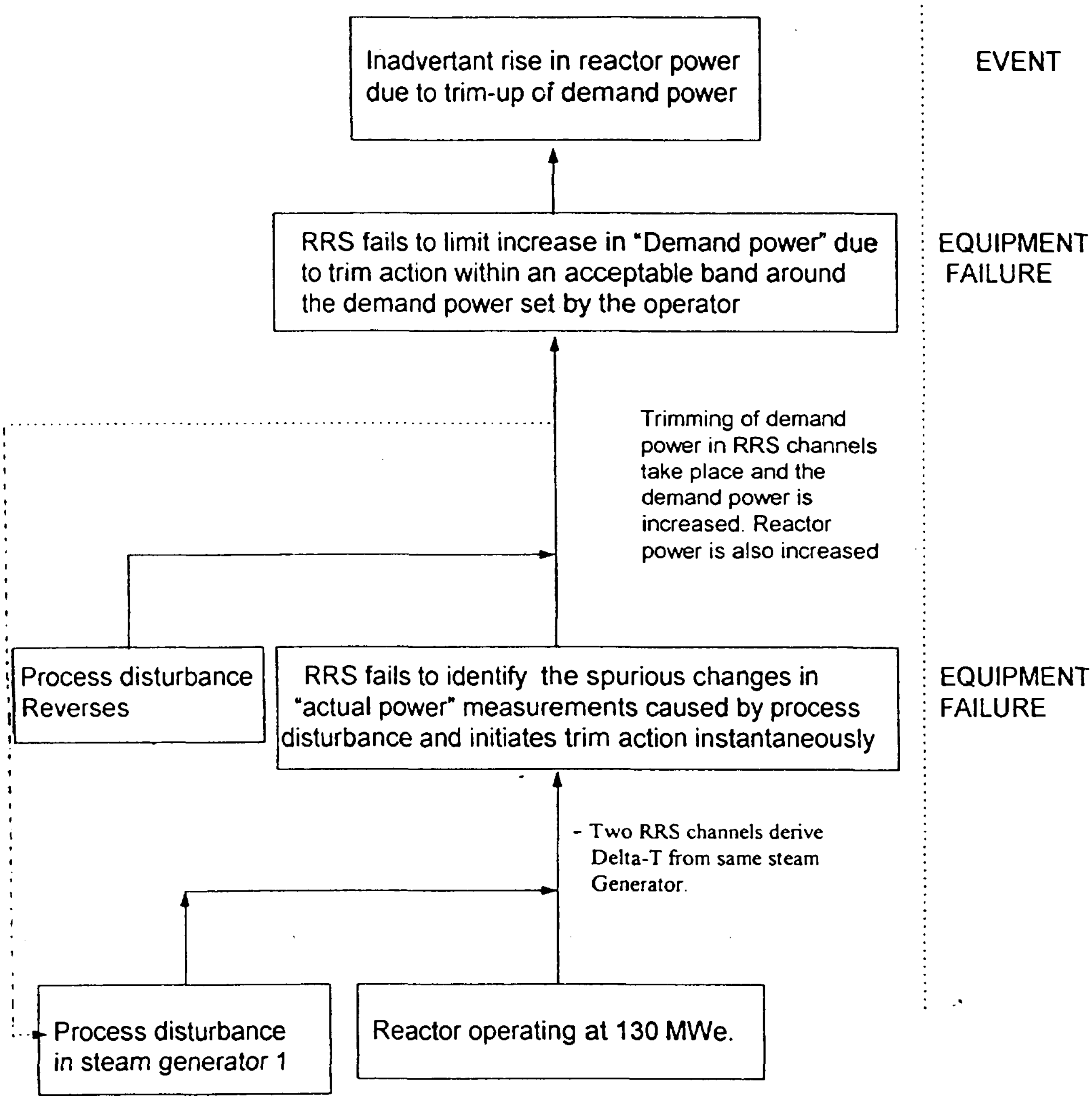


Fig-4

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JAPAN

Japanese Views on ASSET

Masashi HIRANO

Department of Reactor Safety Research
Japan Atomic Energy Research Institute

Presented at
Technical Committee Meeting
"Annual Workshop on ASSET Experience"
Vienna, 25-27 June, 1996

Japanese Participation in ASSET Activities

- Japanese experts have participated in totally 17 ASSET missions to VVERs and RBMKs but we have not participated in ASSET since last meeting in 1995.
- We have neither requested the ASSET mission nor seminar yet.
  - Not only the ASSET but also the other safety services are the services supplied by the agency to the member countries based on their request.

Views to ASSET Activities

- In general, the ASSET has had a positive effect on enhancement of operating experience feedback.
- The ASSET has played an important role to supply information to the IAEA Extra Budgetary Program. However, this role has come to an end, since the needs for safety upgrading have become identified and prioritized.
- ASSET missions in future:
  - Linkage among various safety missions should be sought in order to avoid duplication and to enhance effective usage of a limited budget and human resources.

On Dissemination of ASSET Results

- We have received almost no information on ASSET activities since the last meeting, therefore we have no comments on them.
- In the past meeting, we have requested the Agency to disseminate the major results from the ASSET activities. We think it beneficial for member countries to disseminate the highlights of the ASSET, for example, before the annual meeting.

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LITHUANIA

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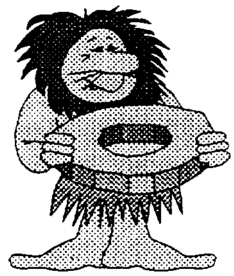
ANNUAL WORKSHOP ON ASSET EXPERIENCE
VIENNA, 25-27 JUNE 1996

PRESENTATION OF LITHUANIA

SAFETY SELF-ASSESSMENT



- BARSELINA - Joint Swedish - Russian - Lithuanian PSA Project:
  - Code RISK SPECTRUM;
  - Phase 3 - level 1; Phase 4 - going-on.
- BARSELINA Peer Review - Financed by USAID
- NS Reviews - Conducted as Part of Regular Plant Management Meetings. More Formal System Should be Introduced.
- More Challenging NS Expectations Should be Established.
- Self-Assessment and Independent Assessment Processes Implemented in All Departments
- Possible Participation in IAEA Regional Projects "Safety Assessment" and "Operational Safety Performance"

Survey of safety significant events management at Ignalina NPP

By Dr. Hab. Vytautas Bieliauskas
Head of the Nuclear Energy Division, Energy Agency, Lithuania

Assurance of safety of Ignalina NPP became one of the priorities of Lithuanian Government in 1991 during the difficult time of transient towards independence. Ministry of Energy was given the rights of founder and legal owner, regulatory body - State Nuclear Power Safety Inspectorate - was created, the status of Operator was formally provided to the plant itself.

Attention of Western world to our problems was expressed not only by expressions of concern by various governmental institutions and international organisations because of danger of operation Chernobyl-type reactors but also by technical aid, safety studies and personnel training. In 1993 ASSET Follow-up Mission visited Ignalina NPP and prepared its report. The same year INPP also hosted a Peer Review from Ontario Hydro. In September 1995 OSART team worked at Ignalina and we are expecting OSART follow-up in 1997. Preparation of Safety Analysis Report after implementation of safety upgrade measures financed by EBRD is going toward the end. The next year the process of unit's 1 licensing should be started (Slide 1).

It can be said that the management of nuclear power plant pays a lot of attention to safety matters and we are receiving a lot of foreign aid and recommendations. Nevertheless it seems that if we can say there is considerable progress in technical safety measures, much less progress is visible in the matters, concerning operations, especially the interface between different plant divisions involved in safety assurance.

I would not like to dramatise the situation but we can not be happy about the fact that ASSET was right in its conclusions about the situation in the plant in 1989, new events proved that it was right between 1989 and 1993, and in 1995 we have very similar events caused by very similar reasons (Slide 2). It shows that some part of big management body does not perform as expected.

If we look at the picture of number of safety significant events in the period of 1989 - 1995 (Slide 3) there is no wished for decrease of events number. On the contrary, in 1994 there was a peak approximately double of mean value for several previous years. It can be partially explained by the entrance into force of Safety significant event registration system with somewhat more strict criteria but increase of level 1 events can hardly be explained this way. Overall picture for 1995 looks better but there were two level 2 events including overexposure of staff member, so such situation can not be assumed to be acceptable.

Implementation of safety improvement measures themselves, in the absence of very good configuration management system, could be the factor, influencing development of some events. For this reason Nuclear Energy Division of Energy Agency helped to organize two workshops, concerning safety implications of changes in plant configuration, and various aspects of preventive and predictive maintenance. Workshops were led by specialists from USA nuclear power plants.

Considering the general developments at Ignalina NPP there is a number of positive trends and developments from the last ASSET visit. If we look at the list of generic lessons there is a considerable progress on all items (Slide 4). Though Lithuania is still world leader in the percentage of electricity, produced by nuclear power plant, the possibility of production interest taking over the safety matters is small. Main reason is the change of attitude by plant administration and operators. Policy statement on principles for improving of safety performance, stressing the overall priority of Safety, was made public by General Director in 1994. Also the negative factor - low electricity demand can play positive role in this case.

Proposal for implementation of internationally available NDT techniques for assessment of welds in highly developed tubing of RBMKs was implemented very successfully. Experience of Ignalina was then used in Chernobyl NPP.

Concerning the proposal to find an access to simulators using international co-operation and support it can be said that implementation of the own full scale simulator is expected in 1997. Funding from EBRD NSA will be complemented by Ignalina NPP financing. Delivery contracts are signed. Simulation of neutronic and termohydraulic behaviour of reactor is currently made using RBMK - 1500 Plant Analyser on the base of IBM RISC/6000 workstation, possessed by technical support organisation - Ignalina Safety Analysis Group.

What makes Lithuanian situation somewhat special - there is no utility level. It means that one usual stage of safety management is missing. Small staff of the Ministry of Energy and Energy Agency, related to nuclear matters, is not able to make independent assessment of plant safety level, or impact of prepared new measures. For this reason we are very interested in the possibilities of self - assessment (Slide 5). Probabilistic safety assessment is currently going on in the frame of Barselina project. Findings of phase 3 were used for updating of Ignalina Safety Enhancement Programme. At present nuclear safety reviews are conducted as part of regular plant management meetings. But plant is going towards introduction of more formal system. Self-assessment and independent assessment processes should be introduced in all departments.
Recent changes in the administration and supervision of NPP should be also favourable to the successful safety administration. Safety and Quality Control

Service was established. It is totally independent from technical management. It includes Division of Safety Survey, Division of Technical Control and Metal Control and Laboratory of Metrology. Investigation of events is done by this service, implementation of corrective measures is controlled by computerised monitoring system.

Bearing in mind still existing safety culture problems, joint workshop of IAEA and Argonne National Laboratory (USA) on safety culture with participation of several governmental bodies is foreseen for Fall 1996. We have also applied for participation in IAEA Regional Projects "Safety assessment" and "Operational safety performance". We strongly hope that open exchange of views and experiences in the regular meetings of IAEA, including current one, will be very beneficial to all participating countries and will help us to find our way to the further improvement of safety at Ignalina.

Thank you.

ANNUAL WORKSHOP ON ASSET EXPERIENCE
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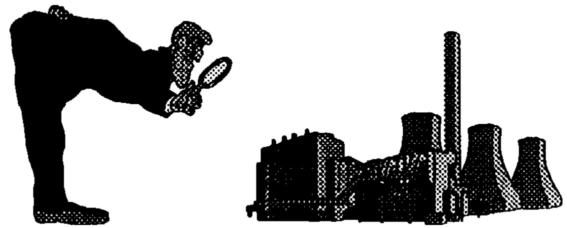
PRESENTATION OF LITHUANIA

SAFETY ASSESSMENT



ASSET mission	ASSET Follow Up Mission	OSSART Mission	Safety Analysis Report	OSSART Follow Up Mission
1989	**1993**	**1995**	**1996**	**1997**
	Ontario-Hydro Peer Review			Licence for unit 1 by VATESI

ANNUAL WORKSHOP ON ASSET EXPERIENCE
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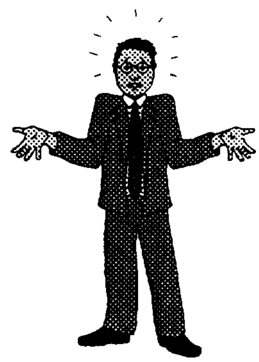
PRESENTATION OF LITHUANIA

IS THERE ANY PROGRESS?



From ASSET 1993 report: "Some events that have occured since 1989 **amplify the comments made by the ASSET in 1989** and confirm the need for the safety programme underway. One example of this is the event on **May 4, 1991, that led to the overexposure of three plant workers..."**

From OSART 1995 Report: INPP Management Team is Commited to Improving Operations at the Plant

From report of Ignalina NPP on the Nuclear Safety level in 1995: "Overexposure of one of the members of team working in the Reactor Building on 30th November 1995 was rated as having level 2 of INES scale because by supplementary medical tests it was found that the real dose exceeded calculated one. This event occured **mainly for the same reasons as overexposure of personnel on 4th May 1991..."**

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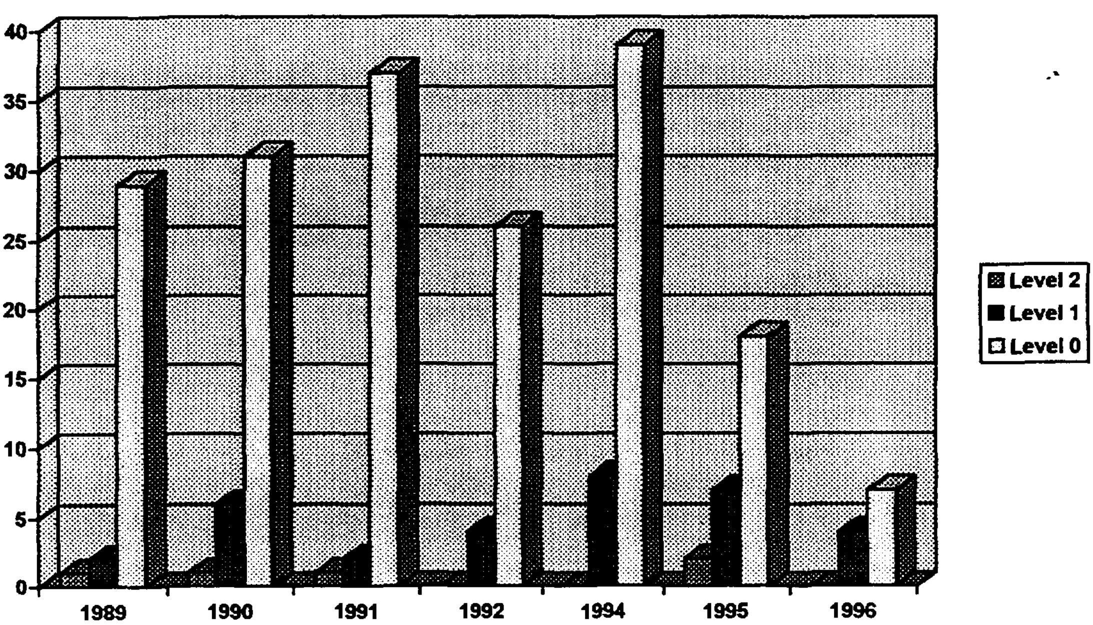
PRESENTATION OF LITHUANIA

SAFETY SIGNIFICANT EVENTS AT INPP

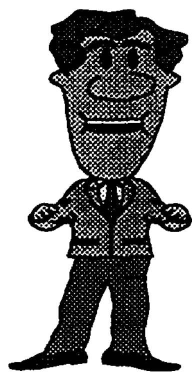
	1989	1990	1991	1992	1993	1994	1995	1996 01-04
Out of scale	14	8	7	4		25	53	
Level 0	29	31	37	26		39	18	7
Level 1	2	6	2	4		8	7	4
Level 2	1	1	1	0		0	2	0
Level 3	0	0	0	0		0	0	0
TOTAL	32	38	40	30		47	27	11



ANNUAL WORKSHOP ON ASSET EXPERIENCE
VIENNA, 25-27 JUNE 1996

PRESENTATION OF LITHUANIA

ASSET 1993 - GENERIC LESSONS



1. Production versus Safety - no serious problem exists anymore because of different attitude of administration and operators, and decrease of electricity demand.

2. Implementation of internationally available NDT techniques for assessment of welds in highly developed tubing of RBMKs - implemented very successfully, experience is transferred to Chernobyl NPP.

3. Access to simulators using international co-operation and support - implementation of own simulator not far away (sufficient financing, signed contracts).

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THE NETHERLANDS

FOLLOW-UP OF THE 1993 ASSET MISSION TO BORSSELE NPP

Presentation prepared for the June, 1996
Annual Workshop on ASSET experience.

Jan L. Wieman
NV. EPZ

1. SUMMARY

A description is given of the proposed in-house application of ASSET guidelines for periodic assessments of the Borssele NPP safety performance, and the definition of management initiatives to improve this performance.

The periodic assessments will provide a continuation of work performed by the IAEA ASSET mission of 1993.

The presentation is intended for experience exchange only, and does not report an authorised or formalised safety review.

2. BACKGROUND OF FOLLOW-UP IN-HOUSE ASSET EVALUATIONS

2.1 PURPOSE OF EVALUATION

The operating organisation of Borssele NPP, NV EPZ, has implemented an in-house process for feedback of operating experience, that has been developed and improved upon over the years. Presently, it is based on the guidelines of WANO for Human Performance Enhancement (usually known as HPES). This process includes methods for the detection and analysis of operational events, especially in the area of human factors, and the definition of required improvements to prevent recurrences.
For reportable events, according to criteria written in the Technical Specifications, the results of this in-house evaluation are formally presented to the regulatory authorities by Licencee Event Reports (7 reports in 1995).

In 1993, an ASSET review was conducted by the IAEA, and Borssele staff received additional training in the use of the ASSET guidelines. However, this did not have an immediate impact on the existing in-house operating experience feedback process.
The 1993 ASSET review revealed some long-term safety items, which required extra management attention and for which corrective measures were taken. The post-ASSET action plan was reviewed by the regulatory authorities.

It was subsequently decided by the plant's management to use the ASSET guidelines for follow-up in-house evaluation of safety items, in order that the effort made for the preparation of the ASSET review (in training as well as in data collection and analysis) would not be lost, but that some continued benefit would exist. A procedure for this follow-up evaluation is now being developed.

This workshop presentation is intended to verify that the EPZ approach is consistent with the best practices of other ASSET users. Its content is exemplary, for purposes of experience exchange, and not a complete or authorised review of Borssele NPP operational performance.

2.1 PROCEDURE OF IN-HOUSE EVALUATIONS

The in-house evaluations will be conducted as follows:

- starting from the list of safety items identified by the 1993 ASSET mission, the data base of operational events is screened for additional significant or repeated safety problems.
- the safety priority of the problems is assessed using Performance Indicators.
- the root causes of the safety problems are analysed.
- corrective management initiatives are taken in adequate measure to the priority of the problem.
- if the corrective actions have been implemented, the safety problem is taken off the list.

3. RESULTS

3.1 DETERMINING THE LIST OF OPEN SAFETY ITEMS

3.1.1 items identified by ASSET

In 1993, the IAEA ASSET team reviewed 648 event reports, all concerning in-house events of Borssele NPP during 1983-1992. The report listed 7 (at the time) unsolved safety related problems. These were identified mainly on basis of their repetitive appearance. 5 of these items have since been completely solved, 2 have been addressed but not yet completely corrected.

3.1.2 items found from event analysis

Since 1992, 3 safety significant (INES 1) events have occurred in Borssele NPP. These have been analysed and resulted in the identification of 8 safety-relevant problems; of these, 4 have been solved and 4 are added to the list.

3.1.3 items found from event trending

Annually, a report is produced on the results of the in-house feedback of experience process; this report contains a review of repeated operational events. Repeated events, which in themselves may not be safety significant, can identify unsolved safety problems. However, the latest review of repeated events did not indicate safety problems which were not already on the list.

3.1.4 items found by PSA evaluations

One additional source of information could be the living PSA. Borssele NPP completed a full-scope PSA, which now is available on a small computer, and is being used to evaluate the impact of operational events (including planned and unplanned unavailability of components). On a monthly basis, an assessment is being made of the increase of theoretical core melt frequency as a result of non-available components. This assessment can potentially disclose safety problems resulting from "normal" maintenance and operational activities. Attachments 1 and 2 demonstrate, that the combination of planned, and in themselves quite acceptable component maintenance jobs in the ultimate heat sink (systems VF/TF) had more impact on the core damage frequency than reportable operational events.

3.1.5 list of open safety items

Table 1 gives the present version of the list of safety-related items.

NUMBER	SAFETY PROBLEM	SOURCE
1	digital protection breakers had software problems, spurious activation	significant event /repeats
2	incomplete system status verification by operators prior to plant startup	significant event
3	vendor maintenance documents inadequate for specific application	significant event
4	incomplete requalification of component after maintenance	significant event
5	quality of preparation of maintenance work and of minor modifications	ASSET '93 /repeats
6	leaks of check valves in connection of safety injection system to reactor	ASSET '93
7	Combined effect of component unavailabilities in ultimate heat sink	PSA

TABLE 1: UNSOLVED SAFETY ITEMS

3.2 PRIORITY OF THE IDENTIFIED SAFETY PROBLEMS

The list of open safety-related items does not in itself imply a significant safety problem. The ASSET mission of 1993 introduced some performance indicators, to evaluate the overall safety performance of Borssele NPP. These have been updated annually, in order to detect any adverse trend.

The first indicator concerns the number of reported events (attachment 3). In 1988, the system of in-house reporting of events was introduced, and since then the number of safety significant and not safety significant events has been decreasing over the years.

The second indicator gives the ratio of INES=0 events to INES≥1 events (attachment 4). This ratio has been consistently over 90% since 1987.

The third indicator gives the percentage of safety-relevant events identified by surveillance activities. This indicator suffers of statistical scattering due to the low numbers, but indicates an average of 40-50%.

Collectively, these performance indicators do not show adverse trends, but indicate a high level of operational safety.
There is no indication of high priority safety concerns. Still, all known safety items are being addressed.

3.3 ROOT CAUSES

According to the ASSET guidelines, the causes of the observed safety problems have been classified and related to the areas "equipment", "personnel" or "procedure". Within each area, the root cause is in "quality", "maintenance of quality" or "surveillance of quality".
Using this doctrine, the assignment of root causes to the identified safety items is as follows

NUMBER	SAFETY PROBLEM	EQUIPMENT	PERSONNEL	PROCEDURES
1	digital protection breakers had software problems, spurious activation	quality (qualification of equipment)		
2	incomplete system status verification by operators prior to plant startup			surveillance (shortcoming of manuals not detected)
3	vendor maintenance documents inadequate for specific application			quality (maintenance documents not adequate for specific application)
4	incomplete requalification of component after maintenance			maintenance (inadequate upkeep of tagout procedures)
5	quality of preparation of maintenance work and of minor modifications		maintenance (proficiency of personnel not adequate)	
6	leaks of check valves in connection of safety injection system to reactor	maintenance (tolerances have been decreased, maintenance no longer adequate)		
7	Combined effect of component unavailabilities in ultimate heat sink			maintenance (tagout planning systems not updated to include insights)

TABLE 2: CLASSIFICATION OF PROBLEM AREAS AND ROOT CAUSES

3.4 IMPROVEMENTS

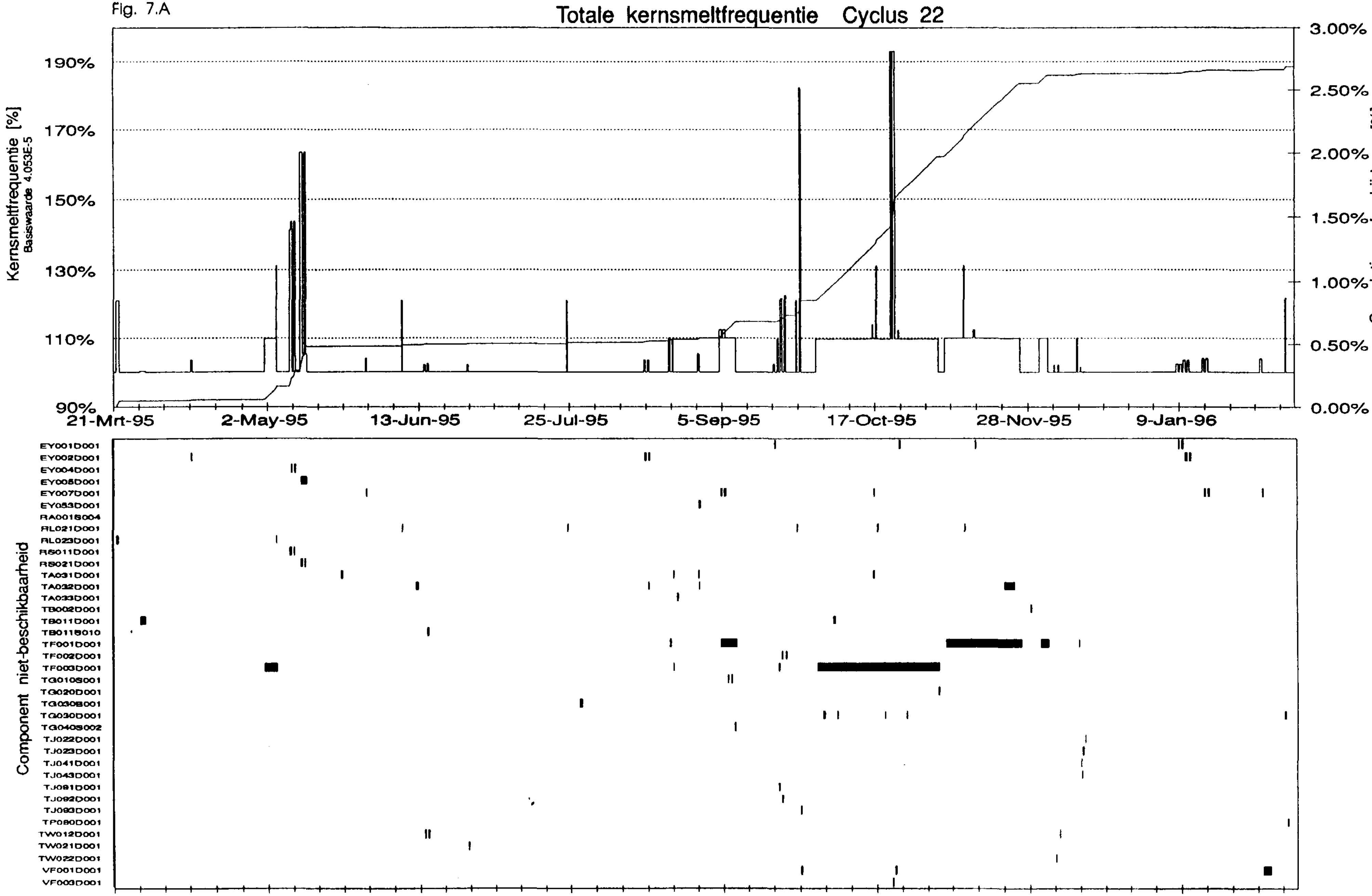
The following remedies are taken or will be taken in order to correct the root causes:

NUMBER	SAFETY PROBLEM	ROOT CAUSE	CORRECTIVE MEASURE
1	digital protection breakers had software problems, spurious activation	qualification of equipment	diversity of qualified breaker models in separate trains of safety system
2	incomplete system status verification by operators prior to plant startup	shortcoming of manuals not detected	review of all operating manuals in order to implement upgraded Technical Specifications
3	vendor maintenance documents inadequate for specific application	maintenance documents not adequate for specific application	additional reviews of maintenance procedures with respect to engineering standards and maintenance of safety equipment
4	incomplete requalification of component after maintenance	inadequate upkeep of tagout procedures	computerised tagout procedures to be extended with references to requalification requirements
5	quality of preparation of maintenance work and of minor modifications	proficiency of personnel not adequate	additional training of maintenance and technical support personnel in requirements of quality system for works
6	leaks of check valves in connection of safety injection system to reactor	tolerances have been decreased, maintenance no longer adequate	modification of components in order to relax maintenance tolerances to more realistic values
7	Combined effect of component unavailabilities in ultimate heat sink	tagout planning systems not updated for new insights	upgrade planning procedures with provisions for acceptable combined system unavailabilities

Table 3: corrective actions in preparation

The list of open safety items, and the corrective measures, will be subject to periodic in-house review by the safety committee. The regulatory authorities are informed of the in-house process, but are not involved in the specifics.

Fig. 7.A

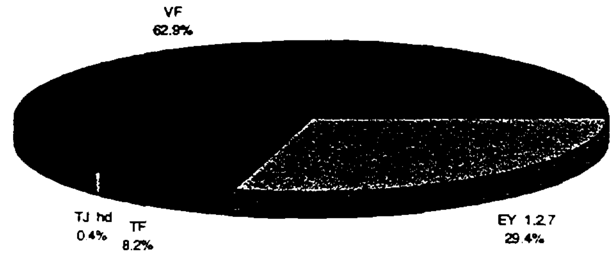


ATTACHMENT 1: INCREASE OF THEORETICAL CORE DAMAGE FREQUENCY AS RESULT OF COMPONENT UNAVAILABILITIES

Bestand : flg7a.cdr
Datum : 21-3-96

Systeembijdrage niet-beschikbaarheid van veiligheidsfunkties, door component niet-beschikbaarheid

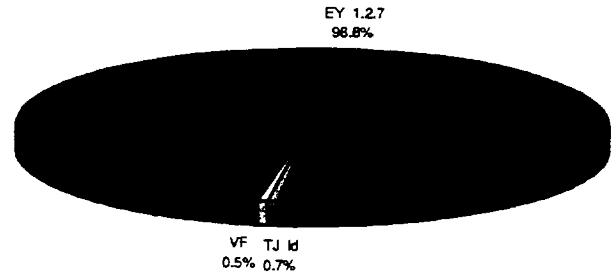
Functie Hogedruk TJ injectie



Cum. jaarbijdrage 4.6 %
Basiswaarde 4.14E-4

Fig. 1.B

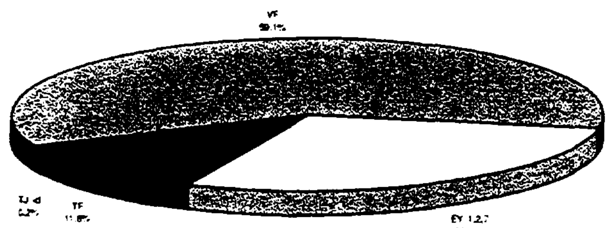
Functie Lagedruk TJ injectie



Cum. jaarbijdrage 2.8 %
Basiswaarde 1.26E-4

Fig. 2.B

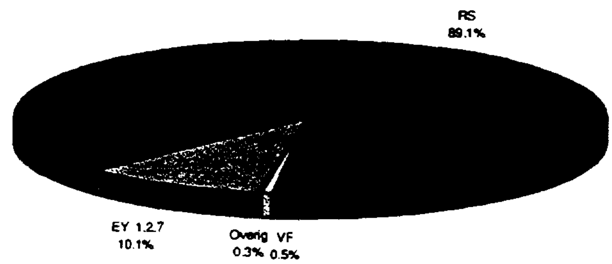
Functie Putbedrijf



Cum. jaarbijdrage 1.2 %
Basiswaarde 1.6E-3

Fig. 3.B

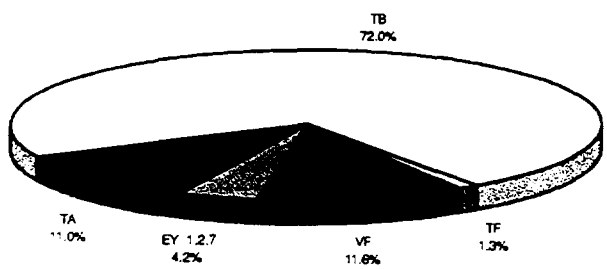
Voedingswater functie



Cum. jaarbijdrage 92 %
Basiswaarde 3.55E-7

Fig. 4.B

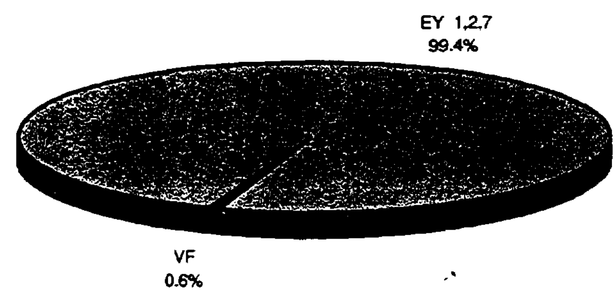
Functie snel afkoelen



Cum. jaarbijdrage 0.2 %
Basiswaarde 3.62E-2

Fig. 5.B

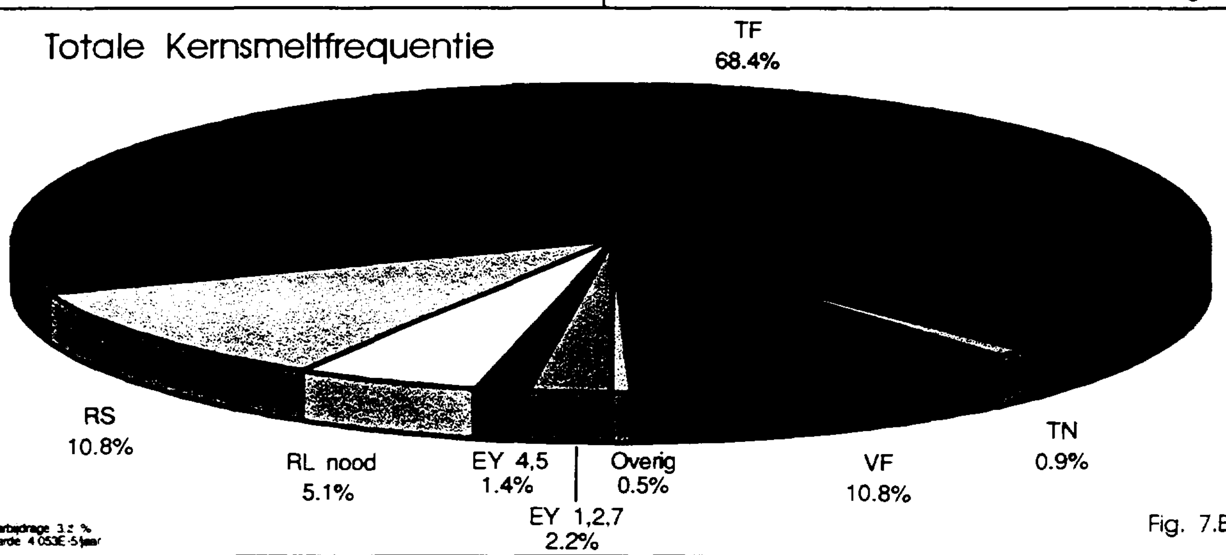
Functie noodstroomnet 1



Cum. jaarbijdrage 15.6 %
Basiswaarde 1.29E-3

Fig. 6.B

Totale Kernsmeltfrequentie

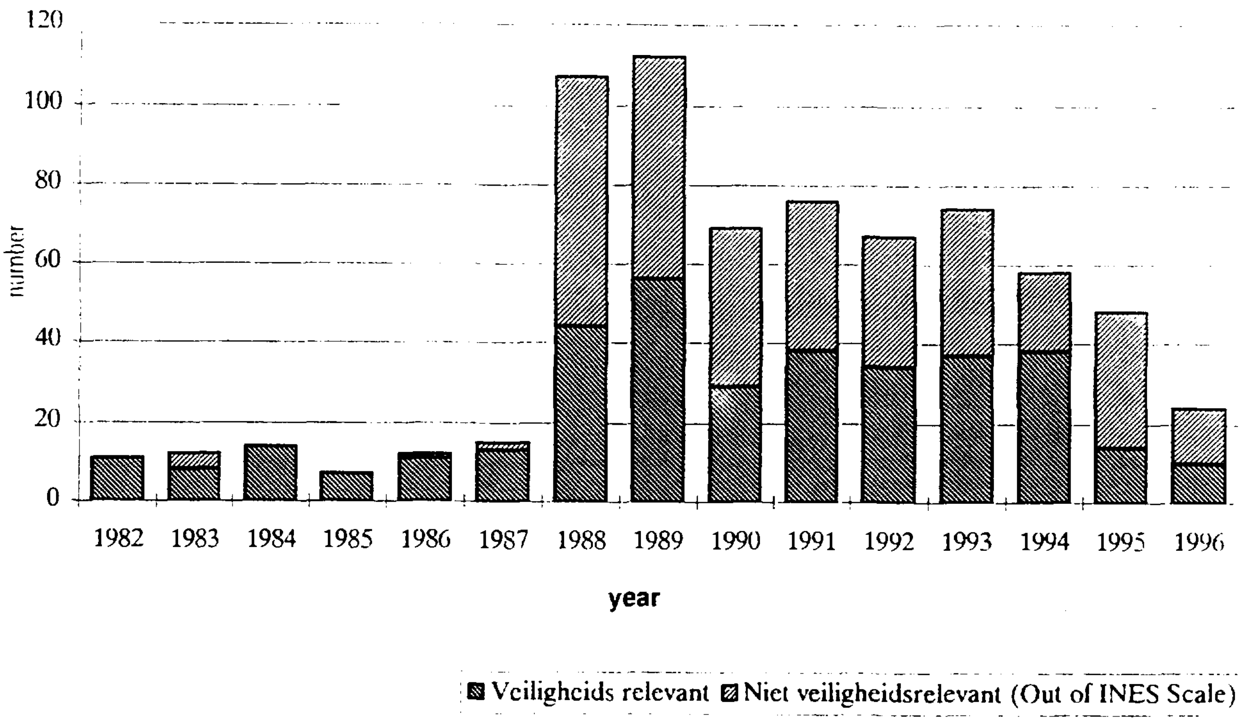


Cum. jaarbijdrage 3.2 %
Basiswaarde 4.053E-5/jaar

Fig. 7.B

ATTACHMENT 2: RELATIVE CONTRIBUTION OF UNAVAILABILITIES TO TCDF

ATTACHMENT 3: NUMBER OF REPORTED EVENTS (SAFETY RELATED AND NOT SAFETY RELATED)

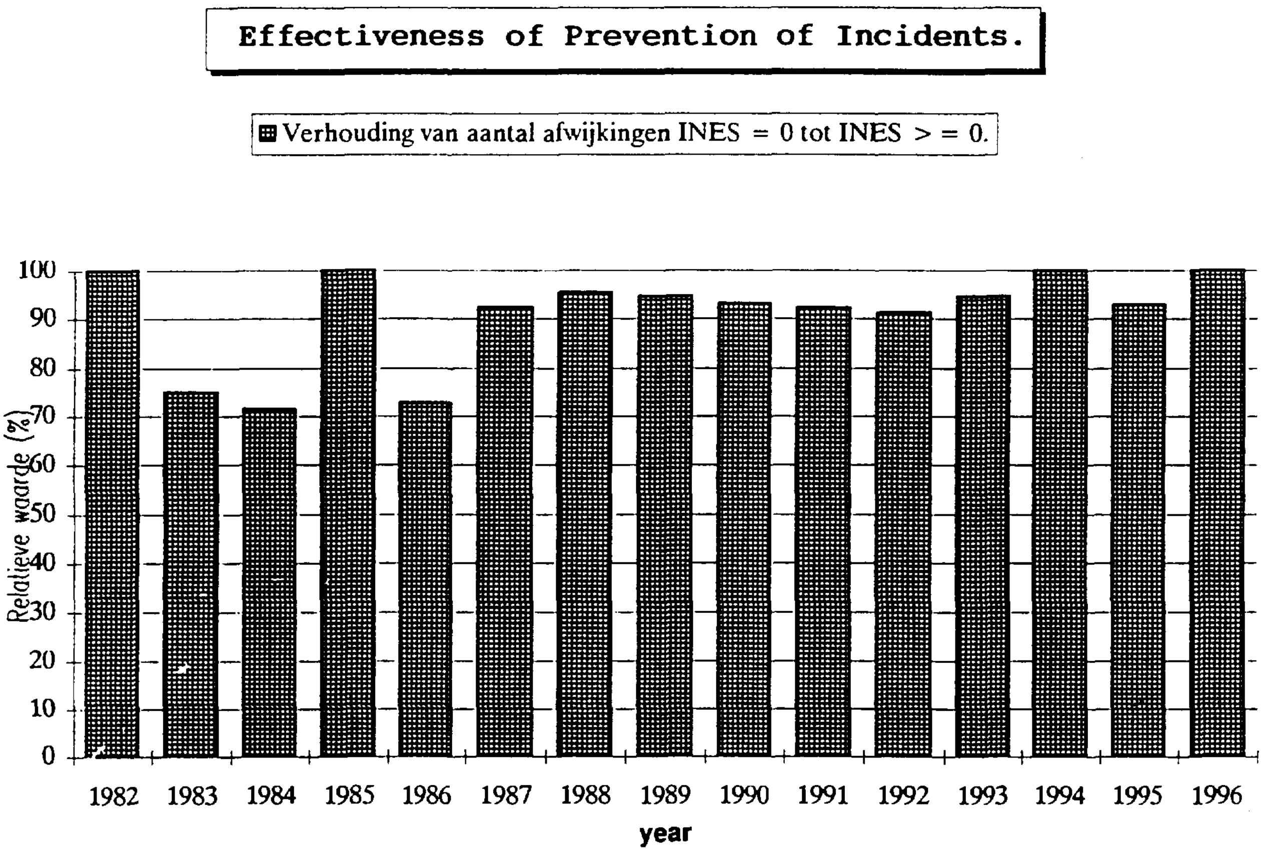


NOTE: before 1988, only events reportable to the safety authorities were included in the feedback of experience process

SAFETY ATTRIBUTES

SAFETY ATTRIBUTE		Number of Events 82-92	93	94	95	96/6	Sub-total	TOTAL
OFF-SITE IMPACT	RADIOACTIVE DOSE TO PUBLIC	0	0	0	0	0	0	364
	RADIOACTIVITY RELEASE	0	0	0	0	0		
ON-SITE IMPACT	RADIOACTIVE DOSE TO PERSONNEL	0	0	0	0	0	0	
	CONTAMINATION	0	0	0	0	0		
	DAMAGE TO REACTOR CORE	0	0	0	0	0		
DEGRADATION OF DEFENCE IN DEPTH	INOPERABILITY OF SAFETY SYSTEMS	13	1	4	2	0	364	
	OPERATIONAL LIMITS AND CONDITIONS	74	0	2	1	0		
	DEGRADATION OF SAFETY PROVISIONS	178	36	32	11	10		

ATTACHMENT 4: RELATIVE NUMBER OF SAFETY SIGNIFICANT EVENTS



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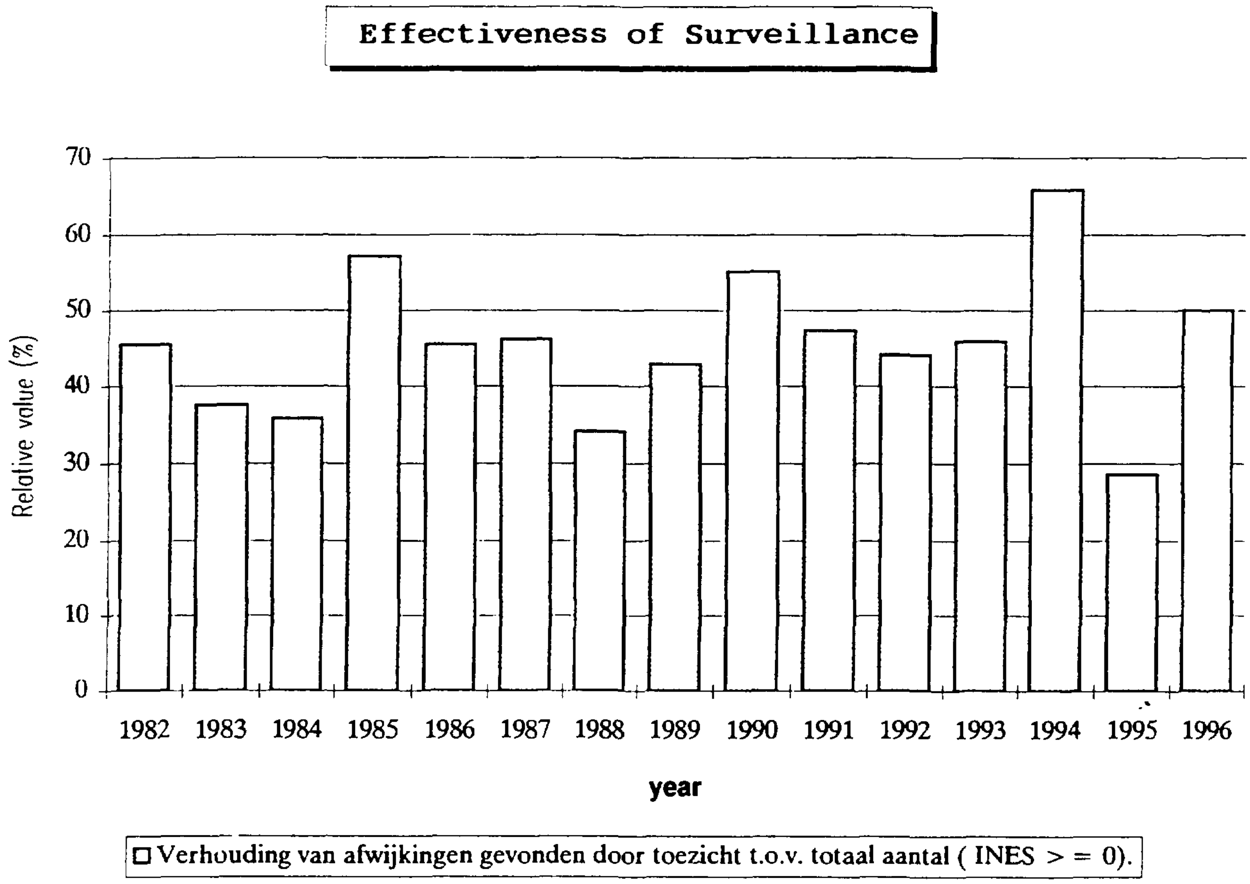
ATTACHMENT 5: RELATIVE NUMBER OF EVENTS IDENTIFIED BY SURVEILLANCE



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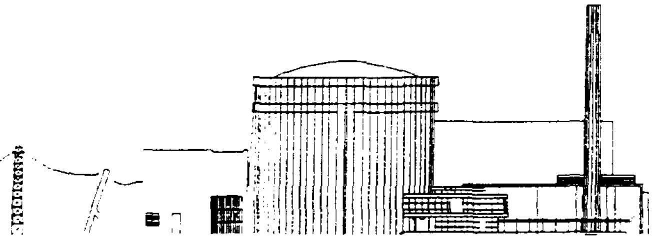
PAKISTAN



KARACHI NUCLEAR POWER PLANT
KARACHI - PAKISTAN

IAEA ASSET SERVICE --- A KANUPP PERSPECTIVE

BY

MIAN ABDUL GHAFOOR

To be presented at IAEA Technical Committee Meeting on Workshop on ASSET Experience from 25 to 27 June 1996 at IAEA Headquarters in Vienna, Austria

INTRODUCTION

As you all know IAEA has been providing ASSET Service since 1986. It is a mechanism for drawing and disseminating specific and generic lesson from a significant event.

Like many other operating organizations, KANUPP has also benefitted from its in-depth technical exchange experience which has resulted in significant improvement in the level of operational safety. The Asset mission, which visited KANUPP in connection with fuelling machine locking problem in 1989, triggered many actions which were responsible for improvement of overall safety of the plant.

KANUPP REACTOR FUEL CHANNELS PROBLEM – A BRIEF HISTORY/BACKGROUND

In 1983 the problem at reactor channel G-12 started. The fuelling machine would not lock onto the south end-fitting of this channel because the end of the channel was retracted relative to the neighbouring channels. Changes were made to the fuelling machine programme to enable it to fuel the channel G-12 on auto. The comparative expansion measurements of channel G-12 with other channels, taken in 1987, revealed that at cold shutdown state (120°F) the channel retracted 0.4" from other channels and on heating (at 538°F) it moved only 0.176" compared to 0.55" for other channels. The thermal expansion should move the free end of the channels at least 0.475" when heated from 120°F to 400°F. From 1987 onward the fuelling in this channel was performed in plant shutdowns only. In year 1989, reactor channel F-15 was also found to be retracted by 0.375". The expansion bellows of 14 channels were found to be leaking. (The testing in 1993 revealed that bellows of six channels were leaking). The sag of channels G-12 and F-15 (cold, defuelled and dry) was measured to be 2.0" and 0.47" respectively.

ASSET MISSION TO KANUPP – SEPTEMBER 1989

In May 1989 PAEC officially requested IAEA for ASSET Service to look into KANUPP fuel channel locking problem. The Agency formed a team of 4 experts consisting of two experts from Canada, one from Germany and one, the team leader, from IAEA. Names of the mission members were as follows:

1- Mr. E. ADAMS, Canadian General Electric, Canada
2- Mr. A. OWEN, Ontario Hydro, Canada
3- Mr. STEINKAMP, Siemens, Germany
4- Mr. B. THOMAS, IAEA (Team leader)

The mission visited KANUPP from 18th to 29th September 1989.

REPORT OF ASSET MISSION – RECOMMENDATIONS

The team inferred that the retracted cold shutdown position of channel G-12 was due to the south end-fitting being jammed and not able to move on its bearing. They also concluded that annulus gas system had not been operated correctly and was prone to contain both moist air and heavy water over the years. They suggested that carbon steel lattice tube had corroded and the gap between the end-fitting and the lattice tube was filled with corrosion products. When the channel was heated, the diametral expansion locked the south end-fitting in the lattice tube and prevented axial movement. The team also suggested that the behavior of channel F-15 was probably due to the same phenomenon.

As a result of ASSET review, it could not be determined that locking problem of the fuelling machine on the G-12 reactor fuel channel was due to a generic problem of corrosion in the annulii.

Alongwith recommending some short term measures like defuelling of channel G-12 and F-15 and improvement in CO_2 annulus system, the ASSET mission recommended removal of pressure tube and calandria tube of channel G-12 to confirm the cause of the channel retraction and determination of the extent of damage to the tube.

Besides the above mentioned specific recommendations, the ASSET team gave some general recommendations for enhancement of overall safety of the plant. These general recommendation provided a sound basis for KANUPP to start on safety improvement programme and to achieve enhanced plant safety. The IAEA ASSET mission, in fact, proved a turning point towards strengthening and enforcement of an effective operational safety programme for KANUPP.

IAEA TC PROJECT PAK-9/010

Since implementation of ASSET recommendations at KANUPP was not possible without access to proprietary CANDU technology, the IAEA was approached for assistance which approved a four-year Technical Cooperation Project (PAK-9/010), and as a result the Canadian government allowed experts to assess and plan the required safety improvements under the auspices of CANDU Owners Group (COG). Later, the ASSET recommendations and other issues concerning safety improvements were consolidated in an Integrated Safety Review Master Plan (ISARMAP). The plan was submitted to IAEA in 1991 and was approved by IAEA Steering Committee. The ISARMAP activities are divided in five broad areas as:

a) Project Management
b) Aging
c) Obsolescence
d) Operational Safety
e) Design Safety Improvements.

IAEA STEERING COMMITTEE

Since the activities related to ISARMAP are multidimensional and involves safety implications, it was essential that the required resources be coordinated internationally and managed judiciously for prompt and optimum execution of the tasks. For this purpose, IAEA setup a Steering Committee consisting of experts from IAEA, Canada, KANUPP and one other CANDU operating country (Argentina) to guide, prioritize, adjust and approve the implementation of this plan from time to time. The Steering Committee meets at least once a year to review the progress of implementation of ISARMAP tasks, amend or add tasks as necessary.

CANADIAN ASSISTANCE

It was strongly realized that Canadian technical support is essential for accomplishment of many of the tasks listed in ISARMAP. Consequently on April 25, 1991, PAEC signed a bilateral agreement termed as SOK-II with COG for providing technical support in the implementation of ISARMAP tasks approved by IAEA Steering Committee and as permissible under the Canadian government export policy.

STATUS OF ISARMAP TASKS

Some of the tasks in ISARMAP have been completed. One of the tasks of the ISARMAP was Fuel Channel Integrity Assessment (FCIA) which, as mentioned earlier, was included in the plan as per recommendation of ASSET mission, 1989. For FCIA, a comprehensive programme in collaboration with AECL of Canada was chalked out. The task was undertaken in October - December 1993. The inspection, cutting and removal of channel G-12 was carried out successfully. The channel openings were plugged with dummy end-fittings by the state-of-the-art bellow welding machine. Seven other channels including F-15 were also inspected. The results of ISI of eight selected channels were very favourable. Channel F-15, which had previously been taken out of service (along with G-12) was normalized since inspection results were quite good and it was also confirmed from the previous record that its length was shorter since installation. It may be of interest to note that the inspection by AECL-Research concluded that the seizure of G-12 inboard bearing was a non-generic problem. The CO_2 system was not the root cause for sagging of channel G-12 as suspected by IAEA ASSET mission.

The Fuel Channel Integrity Assessment and other completed tasks has helped to restore confidence in the safe operation of KANUPP. Based on inspections and implementations of several safety related tasks, we can now rightly expect that KANUPP should be able to operate safely upto and even beyond its design life i.e after years 2002 provided the other on-going tasks to resolve aging and obsolescence problems are also executed. Some of the tasks which have already been started, or to be started shortly, are as follows:

- **FCIA Follow-up:**

  7 to 13 new and seven already inspected fuel channel will be inspected in 1998. Another fuel channel will be removed for metallurgical examination to confirm fuel channels suitability for further service.

- **Radiation Instrumentation:**

  Commissioning of four new stack radiation monitoring and three high range gamma monitoring channels have been completed. Tritium in air and tritium in light water systems are being commissioned.

- **Upgrading of Computers, Control & Instrumentation:**

  The task is being pursued actively. All the equipment has arrived and are being tested at KANUPP. The commissioning and operational checks are expected to be completed by July, 1997.

- **FSAR Update:**

  Phase-I of KANUPP FSAR has been updated. The results of Phase-I indicated that plant Safety Systems are adequate to safely shutdown the Plant in case of large break LOCA and other transients. Preparation for phase-II of the task is underway. FSAR Update Phase-II shall be completed during 1996-97

- **PSA Level 1**

Updating of Event Trees was completed in February, 1996 based on recommendation of the IAEA Expert Review Mission in April 1995, KANUPP Operating Experience and result of Phase-I of FSAR Update. Fault Trees have been developed and reviewed by IAEA expert during a recent visit to KANUPP from 12 to 23 May, 1996. Qualitative results are expected by December 1996.

- **Booster Rod Cooling**

KANUPP has abandoned use of boosters as a policy to circumvent the safety concern. Removal of the booster rods is also being planned in due course.

- **Secondary Heat Sink**

A conceptual study at KANUPP has been reviewed by an Ontario Hydro Expert in June, 1994. All the equipment required for the new system of Emergency Feed Water (EFW) to boilers have been ordered and the delivery expected by June, 1996. Connection of new piping to the Feed Water System will be undertaken in the next long shutdown. The system is expected to become operational by November, 1996.

- **Emergency Power Supply**

The detailed engineering of auxiliaries is in hand. Civil work for installation of the Diesel Generator has been started. Tender for the bus bar duct have been invited and evaluated. Approval of the same is in process. The Diesel Generator has already been received from Mirrless Blackstone.

- **Improvement in Containment Testing Pressure**

Test has been successfully performed at 5 psig instead of usual 2 psig. Feasibility to conduct test at half or full design pressure is being explored with the help of Canadian experts. Scoping visit of two Canadian experts from N.B. Power and Hydro Quebic Canada to KANUPP is scheduled in first week of June, 1996, to discuss the programme of testing the containment at high pressure.

- **Hazards Review**

Seismic

Scheme for anchoring of Control Room panels was reviewed by CHASNUPP and requires re-analysis which is being undertaken. The IAEA Steering Committee concluded in December, 1994 that the long-term recommendations are not essential and be given low priority. As such the outstanding part of the geological work shall be taken up in due course.

Equipment Qualification

A dedicated Equipment Qualification (EQ) group, led by an engineer trained in E.Q, has been formed. The group has started working towards establishing a systematic E.Q. program following recommendation of the expert mission. The upgrading of junction boxes and cable conduits against moisture ingress is in hand.

CONCLUSION

I can say without reservation that IAEA ASSET mission to KANUPP in 1989 proved to be a turning point in the formation and implementation of an effective policy to achieve overall improvement in plant safety.

The mission had identified some good practices and generic lessons learnt from operating events and accidents elsewhere. The implementation of these good practices and lessons learnt would prove useful and effective in prevention of incidents at the plant.
The ASSET mission gave KANUPP personnel also an opportunity to exchange and update knowledge and experience with the experts. It was a good training opportunity for our engineers to learn the methodology of ASSET review process.

In short, apart from its delegated mission, the ASSET mission played a very vital and important role in assisting KANUPP in the development of an effective safety enhancement programme which in turn helped achieve a safe and reliable plant operation.

ROMANIA

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ROMANIA MINISTRY OF WATER, FORESTS AND ENVIRONMENTAL PROTECTION

NATIONAL COMMISSION FOR NUCLEAR ACTIVITIES CONTROL

12, Bd.Libertatii, Bucharest 5, Fax (401) 410 3476 Phone: (401) 410 2441 Tlx. (06500) 11457

The Use and Implementation of the ASSET Methodology in Romania

- STATUS AND FUTURE TRENDS -

Dan Serbanescu, Ph.D.
PSA & Severe Accidents expert
Safety licencinng of Cernavoda NPP
INES & IRS National officer

1. STATUS

@ The status of use and implementation depends on:

- NPP status - last phases of commissioning

- Regulatory environment -see fig.1

  -generic and specific aspects are important

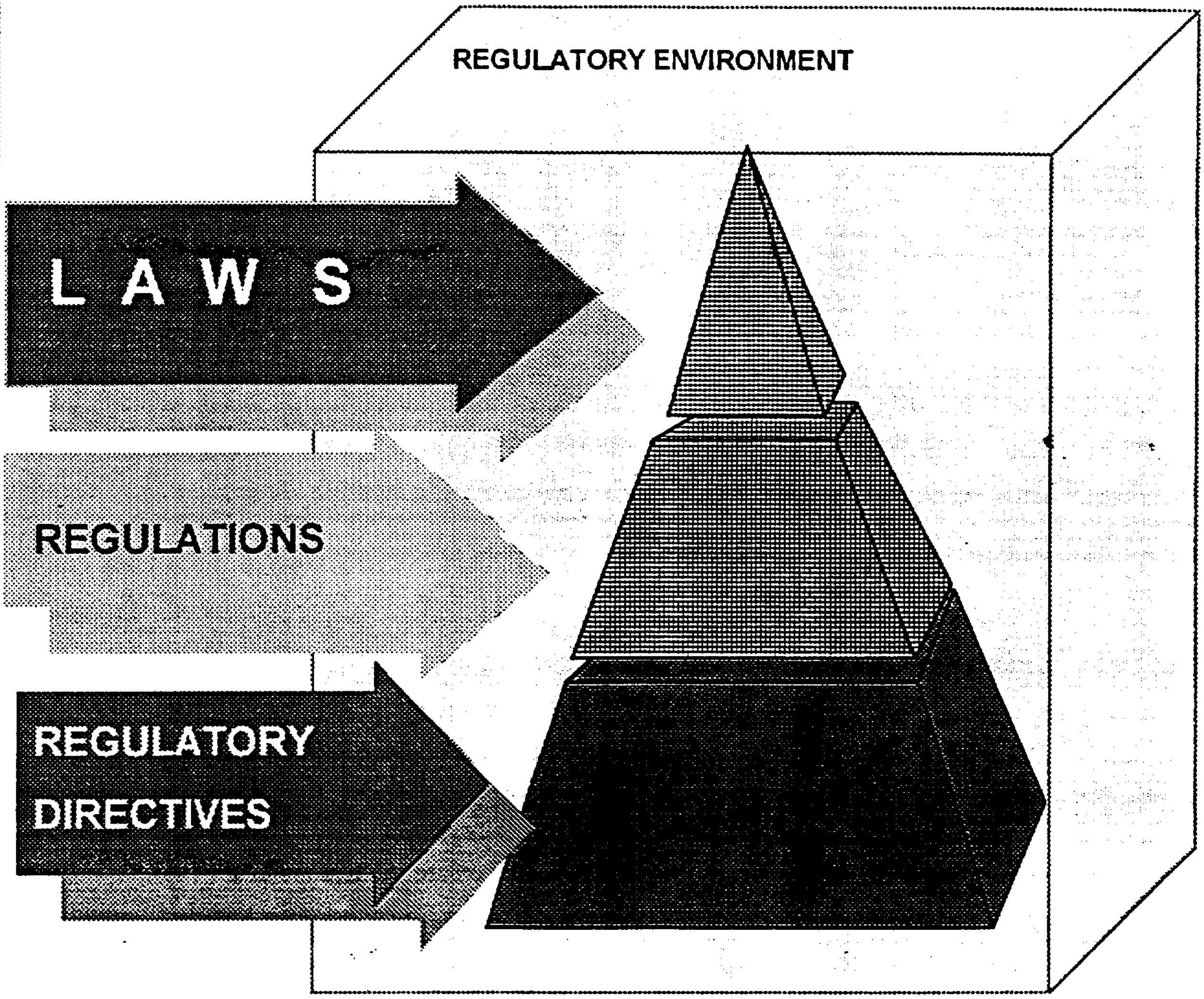
@ Implementation of a ROOT CAUSE analysis method which is REQUIRED by regulatory environment:

ASSET

-- reccommended to the LICENSEE
-- used by regulatory body for independent evaluations

One ASSET mission held in Cernavoda 1 NPP for an event during commissioning phase in July 1994

A new ASSET TOPICAL mission after starting commercial operation and a training seminar



NUCLEAR SAFETY REGULATORY ENVIRONMENT

Fig.1

@The actual status of the use of ROOT CAUSE methodologies

--> ASSET recommended in the licence by the Regulatory Body

--> Licensee uses a methodolgy of the Canadian external consultant during commissioning

For operation the methodology is still to be evaluated and final decision to be taken in order to comply with the licence requirements

TARGET DATE is the moment prior to the issue of the OPERATION LICENCE

@ SOME RESULTS OF ASSET MISSION IN 1994

* The technical results confirmed the decisions, which were taken to improve safety in a PREVENTIVE way starting from the commissioning phase.

* The PREVENTIVE VALUE of the use of ASSET methodology during the last commissioning phases was confirmed and will be used in the future, too.

* ASSET methodology is used for independent evaluation during the regulatory decision process for the Commissioning Unplanned Event Reports and Unplanned Event Reports

@ Unplanned Event Reports use also the INES rating (fig.2) and a ROOT CAUSE method is being used to derive follow-up actions and to keep them under control (fig.3)

The ROOT CAUSE method is still to be evaluated prior to the issue of the OPERATING LICENCE

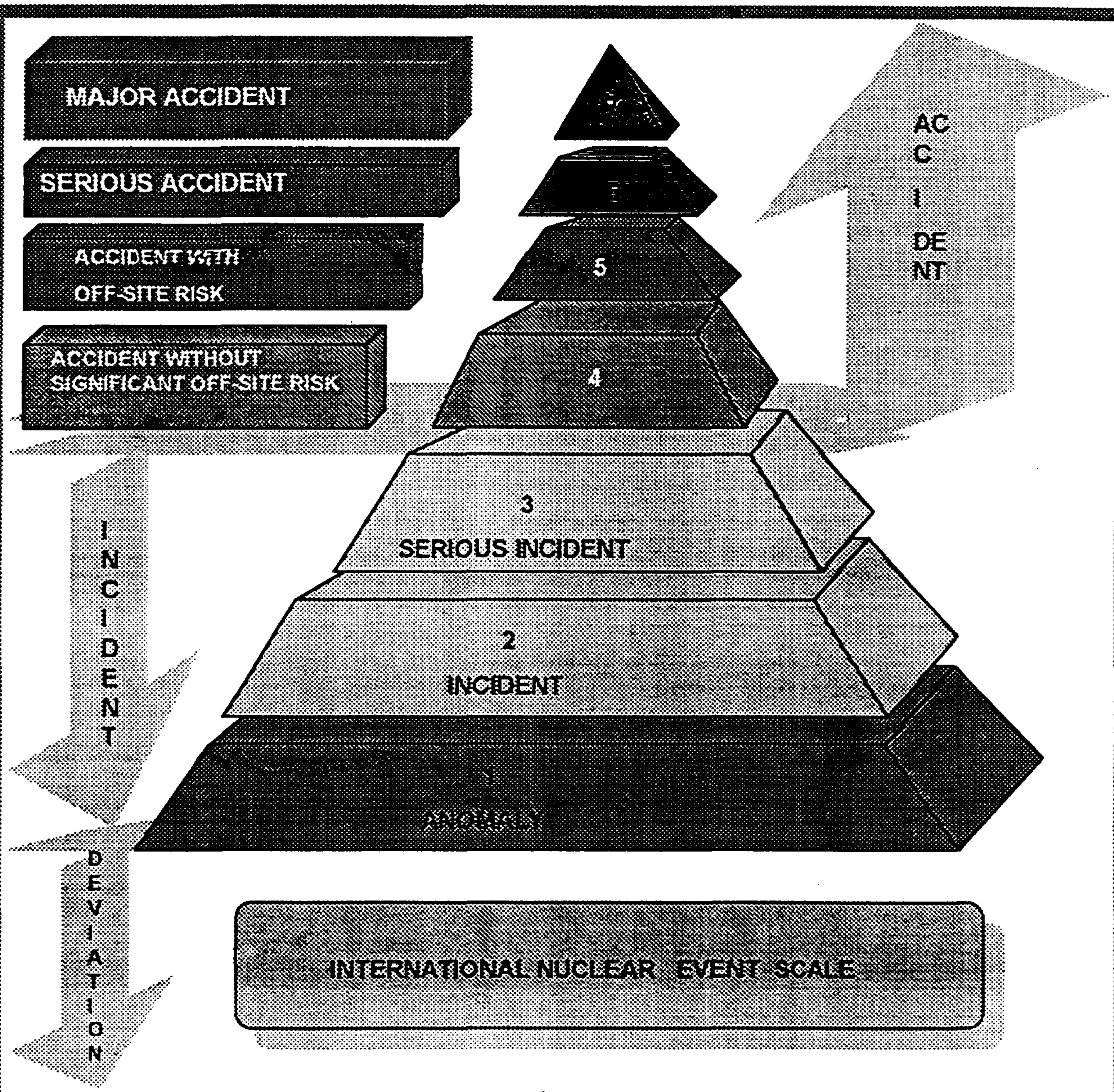


Fig.2

2. The OBJECTIVES of the use of ASSET methodology

------> LICENCEE to decide on the use of the ASSET methodology as recommended by the regulatory body to be done during the commissioning licencing phase, but not later than the milestone of issuing the OPERATION LICENCE

------->DEVELOP training programmes for the use of ASSET methodology both for the LICENSEE and the Regulatory Body

------->USE the IAEA ASSET services and implement ASSET as a self assessment tool defined clearly by the requirements

------->CORRELATE the use of ASSET with the decisions on:

- reporting
- systematical safety review
- extent and limitations on the use of INES, IRS
- requirements for the feedback from operation (including the tools to be used)

GOALS & TOOLS	COMMISSIONING PHASES			LAST COMM'NG & OPERATION	
	PRE COM.	"A"	"B"	"C" "A" "D"	OPERATION
GOALS					
● PERFORM PROACTIVE ANALYSIS OF THE EARLY SAFETY PROBLEMS REVEALED BY THE EVENT	X X	X X	X X	X X	X X
● ACTIVATE FEEDBACK MECHANISM BASED ON THE EVENT ANALYSIS - FOLLOW UP ACTIONS & IMPLEMENTATION	X X	X X	X X	X X	X X
● INFORM & REPORT	X	X	X	X	X
TOOLS					
● ANY ROOT CAUSE ANALYSIS COMPATIBLE WITH THE INTERNATIONAL PRACTICE & GOOD VENDOR PRACTICE	X	X	X	X	X
● ASSET GUIDELINES FOR EVALUATION & INDEPENDENT REVIEW		X	X	X	X
● INTEGRATE ASSET IN THE GENERIC/SPECIFIC REVIEW /FEEDBACK MECHANISM USING RESULTS FROM OTHER METHODS / SOURCES: - PSA - REVIEW & INSPECTION ; EXPERTIZE	X	X	X	X	X

EE SET-TCM 1995 rec. SET-TCM 1991

— LICENSEE
— REGULATOR

Fig. 3b)

ASSET-TCM 1996 CNCAN Dr.ing. D. Şerbănescu

„The use and implementation of ASSET in Romania"

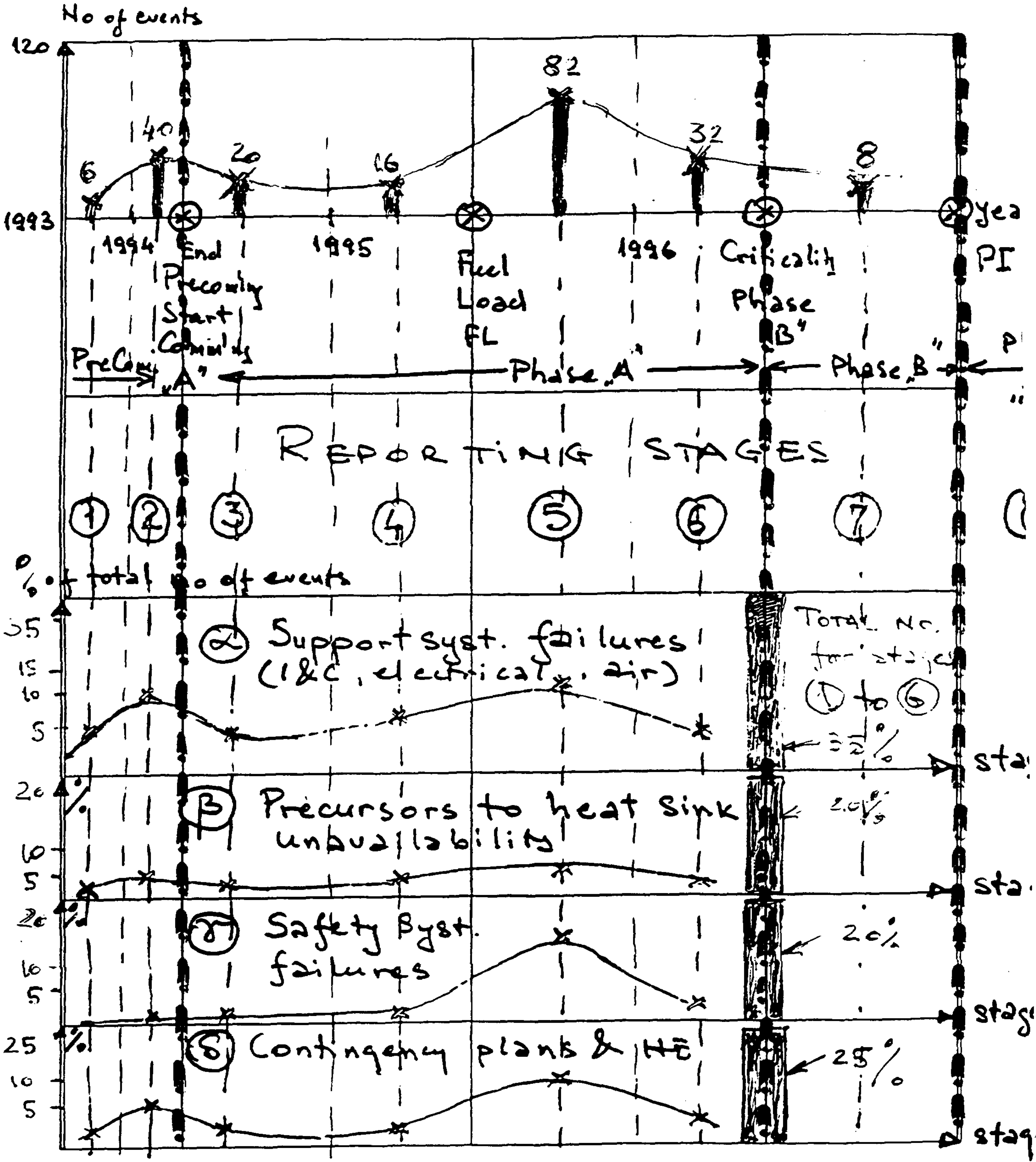


Fig. 3a)

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RUSSIAN FEDERATION

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Presentation by Ms. N. Garnyk, Russian Federation

On behalf of Minatom and of the operating Organization of the Russian Federation I would like to use this opportunity to express my gratitude to the IAEA for the assistance in ASSET missions and seminars which were held at the Russian NPPs and which facilitate the enhancement of nuclear safety culture.

The Leningrad operating Organization has requested the IAEA ASSET service to review the Self Assessment of the 3 years of operating experience following the first ASSET review that took place in 1993.

The decision was motivated by the plant management's desire to benefit from international perspective on the current Leningrad NPP self assessment of safety culture with a view to further improving incident prevention.

This position reflects the plant management's opinion to improve safe operation and to develop the plant capability of identifying safety problems and to learn the lesson with calculations of international expert experience.

The Leningrad NPP management highly appreciates the ASSET mission's usefulness in the area of safety culture enhancement and operational incidents prevention and accepts all recommendations made by the IAEA. In order to implement these recommendations, a detailed plan of action is developed at Leningrad NPP, specifying the scope and the terms and allocating responsibilities for implementation and supervision.

Leningrad NPP staff is confident that the implementation of these recommendations will facilitate safety culture enhancement and express its gratitude t all the ASSET team members for their contribution into the Leningrad NPP safe operation.

There are two operating Organizations in Minatom": Concerning "Rosenergoatom" and "Leningrad NPP".

Rosenergoatom actively participates in all ASSET events and possesses all necessary information.

In this respect, the Ministry renders assistance to Leningrad NPP only. Due to the fact, that ASSET missions are carried out at Leningrad NPP rather seldom, the experience so accumulated has been considerably less than in Rosenergoatom.

To summarize:

The Ministry is interested to keep up with all new developments of ASSET-INES service and favors participation in seminars and missions to foreign NPPs for the exchange of the experience.

Minatom considers also the possibility to use the ASSET methodology to enhance safety of nuclear facilities of other types, for example research reactors.

The IAEA activity in the field of ASSET is considered as one of the most effective methods of assistance to NPPs for the exchange of international experience.

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SLOVAK REPUBLIC

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EXPERIENCE WITH THE ASSET SERVICE IN SLOVAKIA

Jozef Mišák
Nuclear Regulatory Authority of the
Slovak Republic

Annual Meeting of the ASSET service
users - Workshop on ASSET Experience
IAEA Vienna, June 25 - 27, 1996

Limited experience with ASSET in Slovakia

- ASSET follow-up mission to Bohunice Unit 1-2 NPP, July 5-9, 1993 (previous mission in 1990, 1991)

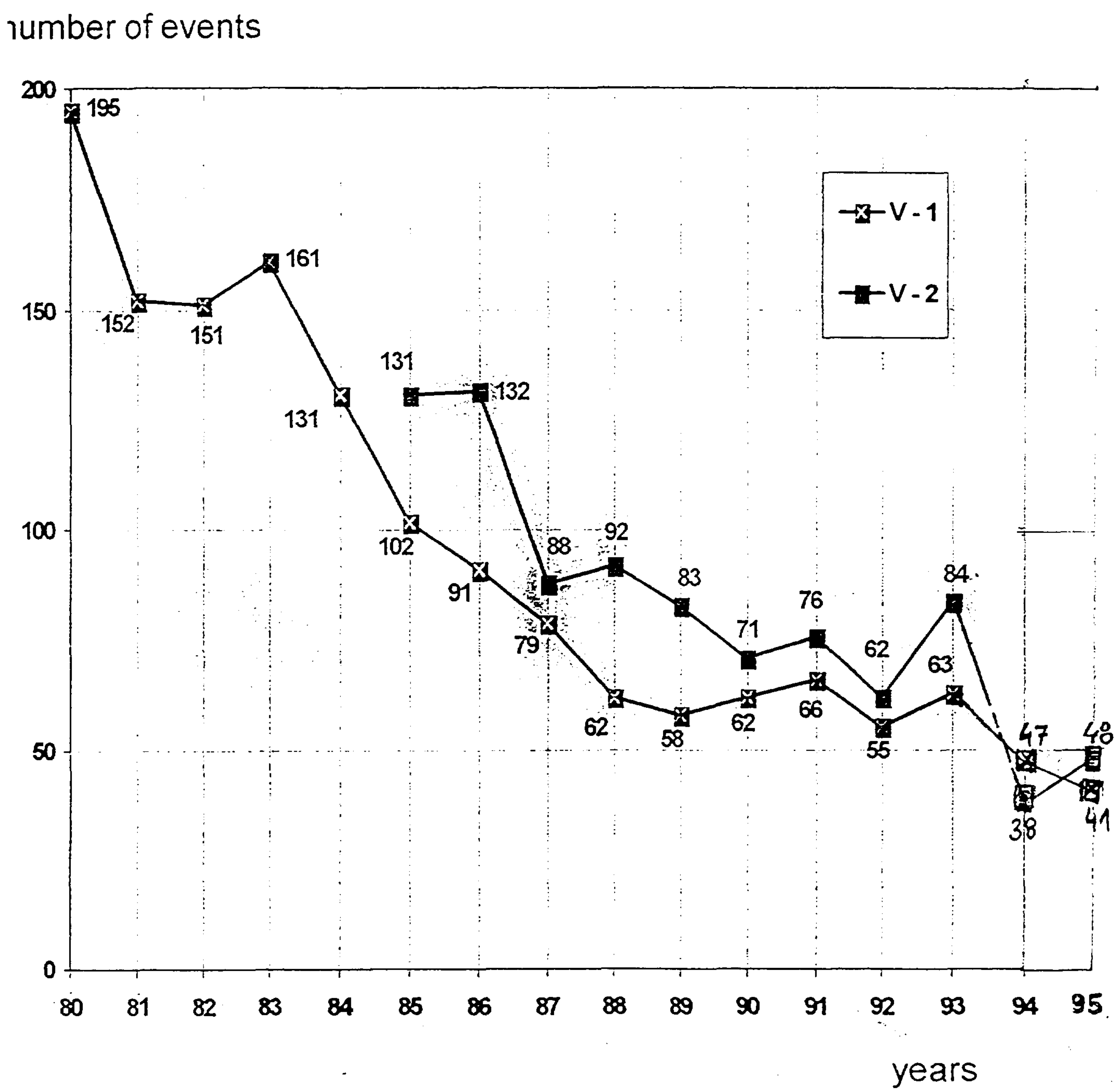
- IAEA peer review of the national Incident Reporting System in the Slovak Republic, July 3-7, 1995

- ASSET Seminar on Prevention of Incidents, Bratislava, January 8-12, 1996

ASSESSMENT OF SAFETY SIGNIFICANT EVENTS

- essential component for enhancing safety through improved conduct of operation (contribution to the management of prevention of incidents)

TOTAL NUMBER OF EVENTS V-1 and V - 2



IAEA ASSET METHODOLOGY

BENEFITS

- Introduces a system for assessment of events (looking for direct and root causes of failures of a) human b) equipment c) procedure)
- Allows statistical evaluation of events, their categories, root causes => investigation of trends in general and for individual areas
- Formalized detail analysis of each event, finding of weak points for individual components

WEAK POINTS

- Conclusions from assessment of event are too general
- Formulation of Root causes is too broad
- Methodology is strongly interrelated with whole QA system; difficult implementation of countermeasures in plants without adequate QA system

  => usual measures is to elaborate adequate QA system, which is very true from very long term point of view, but not applicable when some measure must be taken immediately

SELF-ASSESSMENT OF OPERATIONAL EVENTS

PROS:

- Important component of safety culture
- Help for establishment of "self-questioning attitude" for individual as well as for groups
- Discovering of weaknesses prior to external interference (or punishment)
- Recognition of responsibility for safety of each individual through self assessment of own work
- Possibility for deeper investigation due to better knowledge of equipment and all problems

CONS:

- Self-assessment requires additional human resources with adequate training
- Self-assessment is oriented to prevention; it is sometimes complicated to specify countermeasures and to evaluate their effectiveness
- Large amount of administrative work is needed (planning, assessment, working and reporting, evaluation, countermeasures)
- Conflict of interest for individuals and groups; more safety vs:
  - potential for negative evaluation of work results by bosses
  - implementation of countermeasures means more work (more effort in assessment means more work)
  - strong support and understanding by manager is expected

OPERATIONAL EXPERIENCE FEEDBACK - present practice in Slovakia

- Plant analyses events and prepares Licensee Event Report
- Regulatory body evaluates events through activities of inspectors and participants in monthly plant event Committee meetings
- ASSET mission in 1993 evaluated positively independent acting of inspectors and level of details of reporting to regulatory body
- VÚJE (Nuclear Power Plant Research Institute) carries out independent event analyses since commissioning in line with the IAEA Guide No.93
- Regulatory guide for Incident Reporting System elaborated in 1995, based on the IAEA Peer Review in July 1995, at present in preparation for issuing

CONTENTS OF REGULATORY GUIDE FOR INCIDENT REPORTING SYSTEM

- ❖ Introduction
- ❖ Scope and objective
- ❖ Definitions
- ❖ Reported incidents
  - 1st category with immediate reporting (within 4 hours)
  - 2nd category with reporting within 3 days
  - formal arrangement of reporting
  - content of the preliminary report
  - content of the final report (includes direct and root causes, type of failure, code of the cause, short term and long term countermeasures, INES sealing)
- ❖ Conclusions

LEGAL BASIS FOR ASSESSMENT OF EVENTS

Regulation No. 6/1980 on ensuring Nuclear Safety in NPPs during Commissioning and Operation

§ 13 In the case of a deviation from the limits and conditions the responsible personnel shall take immediate action for the speediest possible restoration of compliance. In case such restoration of compliance is not possible and the possible consequences of the deviation are significant from the nuclear safety point of view, a reactor shut down and core cooling shall be secured. In all cases an analysis of the violation of limits and conditions shall always be carried out, measures shall be proposed for excluding any repetition of such violation and a report shall be submitted, under principles set in advance by the UJD SR to the UJD SR.

§ 31 10) The operating organization shall ensure the immediate transmission of information to the UJD SR

- on the occurrence of operational modes dangerous from view-point of nuclear safety
- on reactor shutdown initiated by protection systems

11) The operating organization shall regularly carry out analyses of operation and failures and submit them to the UJD SR together with measures taken; the intervals between reports shall not exceed one month.

§ 38 The staff of the UJD SR is entitled to participate in the analyses of extraordinary situations such as are related to nuclear safety, e. g. the violation of limits and conditions, emergency shutdown, etc.

Detailed assessment of selected events

The plant has always the primary responsibility to investigate events that occurred at the plant.

Nuclear Regulatory Authority Tasks

Events investigation

In some cases, according safety significance UJD SR makes investigation of safety significant events, as part of inspection program.

Events assessment

All information of events, registration and their preliminary and final assessment is provided in inspection and assessment section at nuclear safety assessment department Every event is evaluated independently, according safety importance

- determination of direct and root causes
- evaluation of the operator conclusion
- discussion of technical problems
- assessment of direct and potential safety menace
- assessment of safety culture
- repeating of failures according their characteristic features

Methods used for detailed assessment of selected events

UJD SR has not own methodology (procedures) for detailed assessment.

UJD SR analyses of events are based on:

- Task analysis (review of work documents, logs, manuals, procedures, direct observation or interview)
- Change analysis (compare the previous trouble free activity with the event to identify differences)
- ASSET analysis (assess the management latent weaknesses and associated root causes)

Engineering judgement and knowledge, experience of members "Event analysis group" is used for assessment.

Support organizations are involved for selected events assessment. (Slovak Technical University, Relko - fire safety, probabilistic assessment, VUZ - welding and material problems, VUEZ - containment problems).

Results of "Event analysis group" assessment

Report with:

- identification date
- assessment of events and overall conclusion
- if need more corrective actions
- plan for perform special inspection

Screening

1. ***Nuclear power plant level***

   It ranges the event as minimum to the three categories according reporting criteria.

2. ***VUJE level***
3. ***UJD SR level***

3.1. Safety significant

Final screening is done by UJD SR (Event analysis group)

This group screens events in four levels

I. Safety very - significant event
II. Safety medium - significant event
III. Safety low - significant event
IV. Safety non - significant event

3.2. INES scale

Event analysis group finally screens events also according INES scale for INES coordinator.

3.3. Criteria used for screening

The selection of safety related events is done according IAEA Safety Guide No. 93. Engineering judgement of members "Events analysis group" is used for screening.

3.4. Frequency of screening

- quarterly
- in case of important operating events -outright

Reporting criteria as part of Technical specifications

1. Immediate reporting (max within 8 hours)

- reactor scram or fast shutdown using the safety system
- pressurized leakage of the primary coolant system
- violation of any plant Limits and Conditions
- loss of natural circulation which cannot be restored within one hour
- all events rated INES level 2 or higher

2. Report within 72 hours

- unscheduled unit power output drop without scram or fast shutdown, actuation of HO-3, HO-4 with drop of control rod assembly
- damage to or leaks from the main components of the primary circuit
- foreign objects in the primary circuit
- radiological conditions in which the basic levels set by the Health Authority are exceeded
- dangerous situation prejudicing the safety of a shutdown reactor
- total loss of lighting in the reactor building
- automatic actuation of load sequencer
- unscheduled opening of pressurizer and steam generator safety valves

3. Report within 30 days

- final report of violation any plant limits and conditions
- the results of a review of recent operations and analysis of any failures and justify corrective measures

Recommended actions resulting from the assessment

1. ***NPP Level***
2. ***VUJE Level***
3. ***UJD SR Level***

UJD SR recommended actions are results of:
- event investigation and assessment
- IRS reports
- inspections
- VUJE assessment

UJD SR recommended actions are issued as "Protocols" or "Decisions" and they are mandatory. They usually have the form of general recommendations, and plant has to elaborate them into specific solutions that will be implemented.

The event analysis group of the UJD SR

I. The purpouse of the group

The main goal is deep investigation of events related with nuclear facilities, revealing of direct causes and rootcauses, and to find those information which are the major contributors in the prevention process.

The investigation is provided in three independent levels:

- in operator organization
- in VUJE research institute
- in UJD SR, by the event analysis group (group)

Effective feedback for the operator is the main tool for improving of failure prevention and upgrading of nuclear facilities safety.

II. Organizational structure of the group

The group consists from staff of section 300. Head of nuclear safety assessment department is the leader of the group, the other members are selected according the character of event.

In the basic composition, group provides event analyses in areas:

- Leader of group..... Head of nuclear safety assessment department
- Basic analysis of event, screening and storage
- Probabilistic safety assessment
- Operation of facilities
- Quality assurance and periodic tests of devices

including the investigation from operator.

Every event is evaluated independently, according safety importance, taking in account safety implication of occurrence and development of event , as e.g. :

- determination of direct and root causes,
- evaluation of the operator conclusion
- discussion of technical problems
- assessment of direct and potential safety menace
-assessment of safety culture
- repeating of failures according their characteristic features, etc.

Detailed investigation is devoted to each contributor of incipient failure and a course of failure, mainly to those issues:

-contribution of equipment failure
-contribution of rules failure
-contribution of personnel failure (human factor)

Every event is assessed by all profiles according section II. Results of investigation are safety importance of events and their screening following INES scale.

Final decision have to be made in consonance with each member opinion.

In the case of need the group takes appropriate corrective measures , as e.g.:

- to perform individual inspection of event or problem
- to complete information or operator documentation of unusual event

- Assessment of devices before start-up after overhaul
- Technical specification
- Thermo-hydraulic analysis
- Reactor physic and safety analysis
- I&C
- Operational tests and integrity of components
- Changes and modifications of devices
- Power-supply of systems
- Operational diagnostic methods

In compliance with needs more experts could be invited.

III. Organization of Group activities

The meeting of the group is usually . In well-founded case (e.g. occurence of safety important events) calling a meeting of the group is outright.

The place and time of the meeting is designated by leader of the group. Every member of the group is inv ted in advance The secretary of the expert group for event investigation is responsible for complete documentation (LERs, and other relevant information) and for elaboration of the basic assessment of event and the draft of safety evaluation.

IV. Working method of Group

On the working meeting of group every member is familiar with each event and with basic assessment of event

- to notify all interested experts (internal and external) about problem
- to introduce corrective actions for improving of operator failure committee activities, and etc.

V. Documentation of group activities

Every group meeting provids a " report" , which consists mainly:

- identification data (number, date,)
- time-sheet
- specification of investigated events
- assessment of events and overall conclusion
- if case needs , more corrective actions

VI. Feedback

Information from group meeting is disseminated to:

- operator
- VUJE

by a special letter.

In the case of INES 1 or higher the letter contains a detailed argumentation.

In the case of INES 2 or higher the information is submitted to national INES coordinator immediately, also information on events which are under significant public interest.

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NPP BOHUNICE experience with ASSET Services

Presented by : Jozef KLIMO
Bohunice 6 June 1996

The general description of Bohunice NPP ASSET experience history was given at last annual workshop in 1995. In my short presentation I would like to pay attention of progress in this area which was achieved at our NPP during the last year.

As you know from our previous presentation , Bohunice NPP has so far hosted two regular ASSET missions reviewing the operational events of the V-230 units. The first ASSET mission was held in 1990 at the invitation of the government of former Czech and Slovak Republic. The follow up ASSET mission which was held in 1993 was invited jointly by the Slovak Electric Power Company and Slovak Regulatory Authority .

In both of this missions I was involved as a plant counterpart . It was the first opportunity for our experts to participate in a systematic approach in an in-depth analysis of the selected events based on well defined methodology.

The authority of the international experts group succeeded to direct the plant management's attention at the operational events analysis process , which was not systematic at the time of missions .

A need for routine application of some root cause analysis techniques has been acknowledged not only by the most plant experts but also by the plant management.

The result of this two missions were several recommendations for improvement our feed back process as well as for several modifications in plant procedures , practices and organisation.

All recommendations were issued as an plant manager order to be implemented at the plant .The tasks from this order are regularly evaluated at the plant management level.

One of the main recommendation of both ASSET mission was to established an independed group of experts for systematic event analysis .This recommendation was fulfil and feed back group was completed last year . The group consists on four engineers and one technicians with appropriated operational experiences. The group is organised at technical support section , which is independed on operational section.
All members of feed back group have been trained in two techniques for root cause analysis :

* **ASSET methodology -training was provided by IAEA staff on several courses in the past.**
* **HPES techniques - training was delivered this year by Nuclear Electric company in the frame of UK government aids for Bohunice NPP .**

Both techniques are now used simultaneously for event investigation process. The criteria for using this techniques are established in the plant procedure for event investigation process.
In the year 1995 ASSET methodology has been applied by Bohunice staff to 5 most complicated events. The application ASSET methodology depends on and is limited by QA programme because most corrective measures are aimed to this area. However development and implementation of QA programme is at Bohunice NPP still in progress and in the future we suppose using ASSET analysis methodology for groups of similar problems or pending events in wider scope .

On April 1996 we began use also HPES methodology . From that time we analysed 6 events using this techniques. HPES methodology we plane to use for individual events analysis.
All members of the feed back group were trained also in INES scale application , which is now used mandatory as a only one tool for safety significance determination of the operational events reported to the regulatory body.

Four units VVER 440 are in operation at Bohunice NPP. Total number of reported operational events in 1995 was 89 . From this number 4 events was ranked as level 1 , 49 events as level 0 and 36 events as „below scale“ .

As was mentioned above , this year Bohunice NPP developed and issued new plant procedure for event investigation system in the frame of QA documentation. This procedure clearly defines all responsibilities , duties and interaction for all people and organisational units in NPP , which are involved in event analysis process .

Another procedures for international experience feed back process is prepared . This instruction will describe the system for using all operational experience from foreign plant , gained from several information sources - WANO , IRS etc.

Our general opinion is that is useful to exchange information about ASSET services among their users because Bohunice NPP will continue using the various ASSET activity in the future.

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SWEDEN

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Self Assessment and Peer Review at Forsmark

Karl-Fredrik Ingemarsson
Forsmark Kraftgrupp AB

presented at ASSET meeting, June 25-27, Vienna, Austria

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Why ASSET at Forsmark?

Background - Development of Safety Management

- Introduced "MTO" technique in 1988
  ("MTO" = Human factors - Technique - Organization)
- Further discussion of "Safety culture" (INSAG-4)
- Interpretation of INSAG-4 for Swedish conditions

- But ... Why was the incident not prevented?

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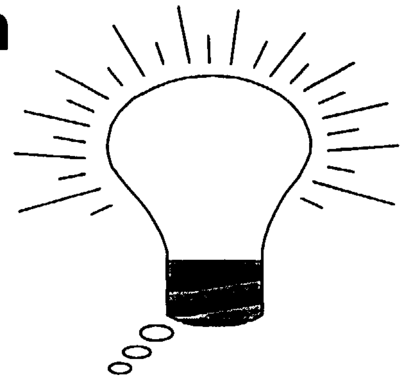
ASSET at Forsmark (cont)

- Inspiration from Koeberg ASSET review and corresponding Koeberg work
- Importance of activating the organization

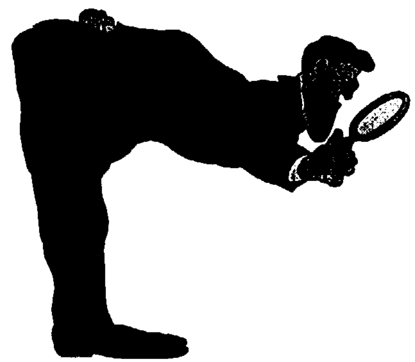


➔ Self-Assessment and Peer Review Decision taken in end 1994.

✓ Education at two occasions in ASSET methodology

Objectives

- To increase understanding of personnel of underlying causes to incidents



- To evaluate potential advantages of ”root-cause” analysis
- To obtain international perspective of the self assessment work

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Forsmark self assessment

Major committment by the organization!

- Forsmark personnel: 8-10 manmonths
- IAEA ASSET review team: 2-3 manmonths

Lessons learned

◆ Important with involvement from the units but the work group must have a broad competence!

ASSET review team?

or

Self Assessment results

- Reliability of components in safety functions, such as control rod manoeuvre, switches and safety valves

- Deficiency in quality of maintenance related work

- Defiencies in supervision and attentiveness

ASSET team review

- Self assessment thorough
- Defence-in-depth provisions comprehensive
- Prevention of failures can be further improved
- Forsmark safety culture commendable
- Number of suggestions concerning Feedback, Safety awareness, Fire protection, control of modifications and Event analysis
- Strongly recommends annual self assessment to be peer reviewed by safety department

Lessons learned

- ✓ INES classification difficult.
  Help needed!!

- ✓ Reporting tresholds? Significant events?

- ✓ Takes time to implement understanding of root-cause analysis.

FORSMARKS KRAFTGRUPP

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UKRAINE

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IAEA TECHNICAL COMMITTEE MEETING

on

EXPERIENCE AND FEEDBACK FROM ASSET MISSION

Vienna, 25-27 June 1996

COMPARATIVE ANALYSIS OF EVENTS AT NPP OF UKRAINE DURING 1993 - 1995

VLADIMIR KOLTAKOV
National Co-ordinator, Ukraine

MINISTRY FOR ENVIRONMENT PROTECTION AND NUCLEAR
AND RADIATION SAFETY OF UKRAINE
NUCLEAR REGULATORY ADMINISTRATION
SCIENTIFIC AND TECHNICAL CENTRE

Kyiv 1996

Distribution of malfunctions over the level of event severity according to the INES for the Units

Table 6

Year	Level acc. to INES	NPP															
		Zap					Khm	S-U			Che			Riv			Total
		1	2	3	4	5	1	1	2	3	1	2	3	1	2	3	
1993	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	1	3	2	1	2	2	5	0	4	3	2	0	3	2	2	1	32
	0	26	13	13	6	12	7	10	13	5	3	0	8	4	8	4	132
	out of scale	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
1994	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	4	3	1	1	0	4	3	1	0	1	0	2	0	0	2	22
	0	11	7	11	11	7	11	5	3	12	5	1	5	2	6	6	103
	out of scale	1	0	2	2	0	1	0	0	1	1	0	0	0	2	0	10
1995	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	1	2	0	2	0	0	1	1	0	3	0	0	1	1	0	0	11
	0	6	5	5	9	6	3	11	4	4	2	0	0	4	0	5	64
	out of scale	0	0	0	0	1	3	0	0	1	0	0	0	2	2	2	11

level 2 - incident (significant violation of safety supporting measures)
level 1 - anomaly (deviation from the permitted mode of operation)
level 0 - deviation (not important for the safety)
out of scale - not relevant to the safety

The suggested comparative analyses of malfunctions in operation of Ukrainian NPP during the last 3 year shows a tendency for decreasing the total number of malfunctions, out of plan power changes and malfunctions connected with safety system nonavailability.

Conclusions

The SSTC NRS database on events at NPP was mordernised in ACCESS according to the new "Regulations on the order of investigation and accounting of events in nuclear power plant operation" that has widened equipment specifications.

Acted at present "Rules ..." PNAE G-12-005-91 accepted in 1991 is not in accordiance with the mordern requiments for ensuring the safety operation of Ukrainian NPP and with the normes acted in the Ukrainian atomic energetics. Therefore in 1995 SSTC NRS had developed a new above mentioned "Regulations..." where the approaches to the analysis of malfunctions were changed with the use of the "ASSET Methodology of root cause analysis of events". With the use of the "Regulations..." the code vocabulary of the database was reviewed with the aime of better event separation for the deep analysis and developing the necessary corrective measures in order to prevent their recurrence.

Now we are preparing for the Peer Review Mission (PRM) of the Regulatory Body of Ukraine.

In September 1996 IAEA will conduct in Kyiv the ASSET training seminar on investigation of events that reflect the safety culture.

Safety system availability

Data in the table 5 characterise safety system channel nonavailability on demand and the effectively of actions of operating utility aimed to sustain workability of the safety systems.

Distribution of malfunctions connected with the safety system channel nonavailability

Table 5.

	1993	1994	1995
Unit 1 Zaporozhye NPP	9	2	1
Unit 2 Zaporozhye NPP	6	7	2
Unit 3 Zaporozhye NPP	7	4	7
Unit 4 Zaporozhye NPP	2	7	5
Unit 5 Zaporozhye NPP	4	5	5
Total Zaporozhye NPP	***28***	***25***	***20***
Unit 1 Khmelnitsky NPP	4	4	0
Total at Khmelnitsky NPP	***4***	***4***	***0***
Unit 1 South-Ukraine NPP	3	4	12
Unit 2 South-Ukraine NPP	6	2	5
Unit 3 South-Ukraine NPP	2	4	4
Total at South-Ukraine NPP	***11***	***10***	***21***
Unit 1 Chernobyle NPP	0	0	1
Unit 2 Chernobyle NPP	0	1	0
Unit 3 Chernobyle NPP	2	2	1
Total at Chernobyle NPP	***2***	***3***	***2***
Unit 1 Rivne NPP	1	0	4
Unit 2 Rivne NPP	1	3	0
Unit 3 Rivne NPP	1	4	3
Total at Rivne NPP	***3***	***7***	***7***
Total at Ukrainiane NPP	***48***	***49***	***50***

According to the international obligations of Ukraine in the area of the nuclear energy use each malfunction is estimated on International Nuclear Event Scale (INES).

stant flow of malfunction is observed at that about a half of these malfunctions had occurred previously at the same NPP and even at the same Units.

Examples for that may be statistics of malfunctions connected with the human errors during 1995. In the table 1 the enumeration of events at NPP of Ukraine the causes of which were the errors of operating and repairing personnel is presented.

The main factors that had influenced at initiation or increased severity of these malfunctions were the following:

* deficiencies (lack) of procedures on conducting the technological operations;
* deficiencies (lack) of procedures on control for fulfilment of technological operations;
* bad ergonomics not permitting to determine and eliminate timely arising defect of equipment or human error;
* absence of a qualitative tagging of safety system equipment and equipment important for safety, and operative communications among the personnel when conducting the work;
* presence some specific conditions when an accident situation was arisen:
  - lack of experience necessary for the task fulfilment;
  - routing character of the task that frequently was successfully fulfilled previously resulted in decreasing the feeling of self-control and in origin of malfunction;
  - start-up or shutdown of the Unit, the final or beginning of the shift and so on.

It is necessary to mark that the used practices of malfunction investigation and reporting criteria are such that conduction of statistical selection from the database on malfunction according to the "Rules..." don't reveal all the malfunctions connected with the human errors. So for obtaining the more reliable statistics it is necessary to analyse all the reports on malfunctions for this period. This work was conducted for the reports of 1995 resulted in revealing four not accounted malfunctions that consists 20% of the total human error malfunctions in 1995.

The distribution of the malfunctions connected with the wrong or incorrect actions of personnel over the Units of Ukrainian NPP is presented in the table 4. This table characterises the dynamics of changing of the technical training level of operating and repairing personnel of NPP during Unit operation.

Table 4

	1993	1994	1995
Unit 1 Zaporozhye NPP	12	8	0
Unit 2 Zaporozhye NPP	3	5	3
Unit 3 Zaporozhye NPP	2	2	0
Unit 4 Zaporozhye NPP	2	2	4
Unit 5 Zaporozhye NPP	1	2	4
Total Zaporozhye NPP	***20***	***19***	***11***
Unit 1 Khmelnitsky NPP	3	4	1
Total at Khmelnitsky NPP	***3***	***4***	***1***
Unit 1 South-Ukraine NPP	0	2	7
Unit 2 South-Ukraine NPP	7	1	0
Unit 3 South-Ukraine NPP	3	0	1
Total at South-Ukraine NPP	***10***	***3***	***8***
Unit 1 Chernobyle NPP	3	2	4
Unit 2 Chernobyle NPP	0	0	0
Unit 3 Chernobyle NPP	5	3	2
Total at Chernobyle NPP	***8***	***5***	***6***
Unit 1 Rivne NPP	0	0	3
Unit 2 Rivne NPP	1	2	0
Unit 3 Rivne NPP	0	0	0
Total at Rivne NPP	***1***	***2***	***3***
Total at Ukrainiane NPP	***42***	***33***	***29***

The general statistical estimation of malfunctions occurred because of the human errors.

Personnel reliability along with the reliability of equipment and quality of procedures makes a weighty contribution in effective and safety operation of the NPP. Statistical analysis conducted by the use of information contained in the SSTC NRS database has evidenced that the cause of each forth reportable malfunction in NPP operation was human errors. And this correlation is steady during four years Besides the influence of human errors on the stable operation of Units is such that at the each Unit not less than once a year shutdown is occurred because of the human error and for the separate Units this indicator is far greater

The fact that from year to year about 20-25 % of the total number of anomaly events at NPP consists of malfunctions occurred because of human errors evidences that the corrective measures developed by the operating utilities after each malfunction are ineffective and not eliminate the root causes of events as a result of that the con-

Down to the text results of the comparative analysis of the data of NPP operation in 1993, 1994 and 1995 years are presented.

In the table 2 the distribution of malfunctions on NPP Units is presented

Table 2.

	1993	1994	1995
Unit 1 Zaporozhye NPP	29	16 (3)	8
Unit 2 Zaporozhye NPP	15	10 (3)	5
Unit 3 Zaporozhye NPP	14	14	7
Unit 4 Zaporozhye NPP	8 (2)	14 (1)	9
Unit 5 Zaporozhye NPP	14	7	7
Total at Zaporozhye NPP	***80 (2)***	***61 (7)***	***36(2)***
Unit 1 Khmelnitsky NPP	12 (1)	16 (1)	7
Total at Khmelnitsky NPP	***12 (1)***	***16 (1)***	***7***
Unit 1 South-Ukraine NPP	11	8	12
Unit 2 South-Ukraine NPP	18 (2)	4 (1)	4
Unit 3 South-Ukraine NPP	8	13	8(2)
Total at South-Ukraine NPP	***37 (2)***	***25 (1)***	***24(2)***
Unit 1 Chernobyle NPP	5	7	3
Unit 2 Chernobyle NPP	0	1	0
Unit 3 Chernobyle NPP	11	7	1
Total at Chernobyle NPP	***16***	***15***	***4***
Unit 1 Rivne NPP	6	2	7 (1)
Unit 2 Rivne NPP	11 (1)	8	2
Unit 3 Rivne NPP	5	8	7 (1)
Total at Rivne NPP	***22 (1)***	***18***	***16 (2)***
Total at Ukrainiane NPP	***167 (6)***	***135 (9)***	***87 (6)***

* In brackets a number of malfunctions with violations of safety operational limits and/or conditions of the total number of malfunctions is presented.

During the last 3 years the tendency to decreasing the total number of malfunctions is evidenced.

In the table 3 are presented numbers of malfunctions connected with nonplanned changes of power that characterise the intense of transients decreasing the remaining resource of the main equipment of NPP, its reliability and safety during the work.

Table 3.

Influence at the mode of the Unit	1993	1994	1995
SCRAMS	34	17	20
Shutdown	23	13	7
Power lowering	36	29	22

1. The general characteristics of the Ukrainian NPPs operation.

During 1995 15 Units of Ukrainian NPPs had produced 70523 million Kwt-h of electricity, that is 36,7% of the common production of electricity in Ukraine during the year. Down in the table 1 some results of the Ukrainian NPPs operation are presented.

Table 1.

№ п/п	NPP Name	Elictricity production. (million Kwt-h)	Fulfillment of the plan %.	Capacity factor %	Under production of electricity	Under production because of malfunctions
1	Zaporozhye	24784	90.4	54.4	20792	536
2	South-Ukraine	16778	105.8	63.8	9502	148
3	Rivne	11241	102.0	70.6	4685	337
4	Chernobyle	11676	102.4	66.6	5844	190
5	Khmelnitsky	6044	102.2	69.0	2716	111
	Total	**70523**	**98.5**	**61.8**	**43539**	**1324**

Underproduction because of malfunctions consists 1,87% of the total production of electricity by the NPPs.

2. Results of the malfunctions analysis.

In 1995 at 15 operated NPP's Units 87 malfunction had been occurred that is less comparatively to the previous years.

Malfunctions according to a type of reactor are distributed in such a way:

-VVER-1000 (11 Units) - 74
-VVER-440 (2 Units) - 9
-RBMK-1000 (2 блока) - 4

Distribution of malfunctions over the NPPs is the following:

- Zaporozhye NPP (6 Units) - 36
- South-Ukraine NPP (3 Units) - 24
- Rivne NPP (3 Units) - 16
- Khmelnitsky NPP (1 Units) - 7
- Chernobyle NPP (2 Units) - 4

During the last year malfunctions that are characterised as an accident according to the effected rule had not been occurred. At the Unit 1 of ZapNPP one malfunction had occurred that may be characterised as an accident situation with the leak through the impulse safety valve of the pressuriser of the primary circuit.

The total number of malfunctions with the violation of the safety limits were registered 6 at the Units 1 and 3 RivNPP, at the Units 1 and 3 ZapNPP, Unit 3 SUNPP (2 malfunctions).

Introduction

In Ukraine 15 NPP Units with thermal- neutron nuclear reactors are in operation. The most prevalent type of nuclear installations is PWR (VVER) and channeled carbon-uranium boiling type reactor (RBMK).

At present time the power of a single Unit is 440 and 1000 Mwt.

The production of electrical power at the NPP is inevitably connected with the Unit's start-up and shutdown, different transients of reactor and turbine installations, increasing and decreasing thermal and electrical loading. All of the mentioned factors influence on the reliable operation of the NPP equipment. It is natural that during the NPP system equipment operation there are malfunctions and failures in workability of the separate elements, system in common, omissions of the operative personnel.

In the SSTC NRS the database on failures in operation of Ukrainian NPP Units is keeping since 1992. During of the last 4 years in the database the information of about more than six hundred events was collected. According to the effected in the Ukrainian atomic energetic "Rule on the order of accounting and investigation of malfunctions in the NPP operation" PNAE G 12 - 005-91 all malfunctions are investigated by the commissions organised at NPPs. On the base of reports on malfunctions the specialists of SSTC NRS conduct their summarising analysis according to the special methods developed in UkrSSTC NRS according to the IAEA Guide (TECDOC - 632, ASSET) that includes the developing of the logical tree of events in order to reveal anomalies in operation of equipment, automatics, actions of personnel, correctness of application of operational procedures, and to obtain the estimation and to give recommendations on corrective measures.

In my report the selections of the main results from the annual report on statistical and technological analysis of failures in the operation of the NPP of Ukraine for the period of 1993 - 1995 are made.

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Synopsis

In the report the short data on the Ukrainian NPP Unit operation in 1995 are presented so as the comparative analysis of operational events during 1993 - 1995. Graphical and table data on events were chosen from the annual reports on statistical and technological analysis of events in the Ukrainian NPP operation fulfilled in the SSTC NRS of MEPNSU.

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INTERNATIONAL ATOMIC ENERGY AGENCY
Technical Committee Meeting on Annual Workshop on ASSET Experience,
IAEA Vienna Headquarters
Conference room V, C07

Constantin G. RUDYA
Ministry for Environmental Protection and Nuclear Safety of Ukraine

GENERAL OVERVIEW OF THE ASSET ACTIVITIES IN UKRAINE

25-27 June 1996, Vienna, Austria

/91

GENERAL OVERVIEW OF THE ASSET ACTIVITIES IN UKRAINE

Constantin G. RUDYA
Ministry for Environmental Protection and Nuclear Safety of Ukraine

ABSRACT

Brief retrospective summary of the ASSET experience in Ukraine since first mission held in June 1992. Analysis of the positive influence of the ASSET approaches to the general safety culture status. Specific problems of the current situation. Difference in attitude to ASSET missions of plant managers and plant safety experts reveals global safety culture drawbacks on the organizational level. Analysis of the direct and root causes of the situation. Lessons learned. Ideas for corrective measures to be implemented.

1. SOME HISTORY

ASSET history in Ukraine was commenced with ASSET mission of the type "A," that took place 21-26 June 1996 at Chornobyl NPP. Mission conducted in-depth investigation of the turbine hall fire at the unit 2 of the CHNPP, using ASSET methodology. Due to outstanding cooperation of the plant management and openness of the assigned plant counterparts, mission succeeded to reveal the most principal deficiencies of the specific and generic nature. Success of the mission contributed to the positive attitude of the Ukrainian regulatory authority to the ASSET methodology and soon after comprehensive ASSET programme was requested by Ukraine from Agency. Report of the mission was translated and distributed between other Ukrainian NPP. It clearly shown to the plant management the difference between ASSET and OSART approach, and removed fears caused by the first OSART mission conducted at Rivne NPP in 1988. Further experience of the ASSET programme in Ukraine demonstrated an example of good cooperation between Agency, Regulatory Body and Ukrainian NPPs.

The first mission was folowed by the series of the coupled ASSET missions of the type S and R during the years of 1993-1995. Beside ASSET methodology seminars were used for highlighting of relevant IAEA safety practices and approaches, as IRS, INES, etc. In six missions there took part about 120 safety experts from NPP safety departments, regulatory body and utility Headquarters.

For the moment, seminars on the ASSET methodology were held at all Ukrainian NPPs. Table I gives chronology of the ASSET seminars since 1992.

Table I. ASSET missions type S conducted at Ukrainian NPP, 1992-1995:

NPP Name	Number, type of units	Date of the mission
Chmelnitsky NPP	1 VVER-1000	7-11 September 1992
Rivne NPP	1VVER-1000, 2 VVER-440	28 May - 2 June 1993
Zaporizha NPP	6 (5) VVER-1000	7-11 February 1994
South Ukraine NPP	3 VVER-1000	21-25 March 1994
Chornobyl NPP	3 (2) RBMK-1000	3-5 October 1995
Khmelnytsky NPP	1 VVER-1000	11-15 December 1995

Type S missions are designed as a preparatory tool before performing the analytical ASSET mission (type R, A).

Up to now missions of the R type, representing the comprehensive analysis of the operational experience of the NPP during whole operational history, have been completed at all Ukranian NPP.

Table II. ASSET missions type R conducted at Ukrainian NPP, 1993-1995:

Chmelnitsky NPP	1 VVER-1000	8-19 March 1993
Rivne NPP	1 VVER-1000, 2 VVER-440	22 Nov.- 3 Dec. 1993
Chornobyl NPP	3 (2) RBMK-1000	11-22 April 1994
Zaporizha NPP	6 (5) VVER-1000	13-24 June 1994
South Ukraine NPP	3 VVER-1000	16-27 January 1995

2. SOME GENERAL RESULTS

2.1. Chmelnytsky NPP.

Chmelnytsky NPP has one operating unit of the VVER-1000 type. There were analysed 212 operational events occured during 5 years of the NPP operation. Of this nomber 111 operational events were rated as a important to safety by INES scale:

Table III. Operational events important to safety at Chmelnytsky NPP analysed by ASSET mission.

INES Rating	Equipment	Personnel	Procedure
Level 0	67	12	5
Level 1	14	7	4
Level 2	-	1	1
Level 3	-	-	-
Total	81	20	10

2.2. Rivne NPP.

At Rivne NPP there are 3 units under operation - 2 of VVER-440 (V-213 model), and 1 of VVER-1000 (V-320 model). Asset mission type R took place in November 1993. General information on the operational events analysed is given in Table IV.

Table IV. Operational events important to safety at Rivne NPP analysed by ASSET mission

INES rating	Nomber of events						
	1988	1989	1990	1991	1992	1993	Total
Level 0	11	18	19	29	22	10	109
Level 1	1	1	-	1	1	2	6
Level 2	-	-	1	-	1	-	2
Level 3	-	-	-	-	-	-	-
Total	12	19	20	30	24	12	117

2.3. Chornobyl NPP.

Chornobyl NPP, is the oldest Ukrainian NPP (unit 1 was put into operation in 1977), and represents a special case with respect to the type of the reactor (RBMK-1000) and operational history which includes the first and hopefully last major nuclear accident in the history of the nuclear power. The specific conditions of the operation of NPP is clearly reflected by the operational history analysed by the ASSET mission in April 1994 (Table V). Mission considered 243 events with in-depth analysis of 110 events important to safety.

Table V. Operational events important to safety at Chornobyl NPP analysed by ASSET mission

INES rating	Nomber of Events					
	1989	1990	1991	1992	1993	Total
Out of scale	57	33	14	8	21	133
Level 0	17	2	11	24	21	96
Level 1		-	3	1	2	12
Level 2		-	2	-	-	2
Level 3	-	-	-	-	-	-
Total	19	27	16	25	23	110

2.4. Zaporizha NPP.

At the moment of conducting ASSET mission in June 1994 there were 5 operated units (now Zaporizha NPP has 6 units of VVER-1000 under operation). ASSET mission provided assessment of 709 events, 277 of them were confirmed to be important to safety. Table VI illustrates the general information about events important to safety.

Table VI. Operational events important to safety at Zaporizha NPP analysed by ASSET mission.

Year	Equipment	Personnel	Procedure	Total
1990	49	8	-	57
1991	60	11	1	72
1992	46	13	-	59
1993	65	8	2	75
1994	12	2	-	14
Total	232	42	3	277

2.5. South Ukraine NPP.

South Ukraine NPP has 3 operational units of the VVER-1000 type. ASSET mission worked there in January 1995. Of the total 178 events considered there were rated 98 as a safety important.

Table VII. Operational events important to safety at South Ukraine NPP analysed by ASSET mission

INES rating	Nomber of events						
	1989	1990	1991	1992	1993	1994	Total
Out of scale	8	22	6	12	11	21	80
Level 0	13	16	8	17	19	19	92
Level 1	-	-	1	1	2	2	6
Level 2	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-
Total	21	38	15	30	32	42	178

2. PROBLEMS, COMMENTS AND RECOMMENDATIONS

So, up to now ASSET analytical methodology was introduced to each of Ukranian NPP and each NPP had an experience in performing preparatory activities for the ASSET experts work, which means rather comprehensive practical involvement of the local safety experts into ASSET mission activity. It is important, that ASSET seminars conducted at each particular NPP always included representatives from other Ukrainian NPP, thus creating general similar approaches and integrated interpretation of the ASSET methodology and common safety language.

ASSET missions created special circle of safety experts both at operational part - NPPs (major portion), and regulatory body and it's supporting structures.

Specific feature in Ukraine was that from the very beginning Ukrainian regulatory body leaded the way in co-ordination of the ASSET activities, rather than utility side (State Committee for Nuclear Power Utilisation - "Derzhcomatom"). This fact was the result of the situation that existed for the moment of the ASSET introduction, the main characteristic feature of which was relative maturity of the regulatory body and organizational uncertainty of the utility side.

Nowdays the basic policy of the Ukrainian regulatory body (Ministry for Environmental Protection and Nuclear Safety) includes a gradual involvement of the Derzhcomatom into more active participation in planning and co-ordination of ASSET activities. Still, it is supposed that regulatory body will retain general control and oversight function determined by the nature of the regulatory body functions.

In general, Ukrainian practice has clearly demonstrated following advantages of the ASSET approach:

- ASSET has shown to be flexible and constantly developing safety assessment methodology to comply with current status of the knowledge, needs and capabilities of the accepting countries;

- it provides practical and relatively a simple tool for systematic assessment of the operational safety performance and implementation of immediate corrective actions within available resources;

- ASSET services are equipped with well-developed mechanism for transference of the ASSET approach and procedures to local plant safety experts;

- opportunity for direct contact of plant safety experts with their experienced counterparts from all over the world, thus giving a systematic way for exchange of specific safety experience and safety relevant information;

- for Ukraine (as well as for other FSU countries) - communicating a habit for establishing definite safety goals and detailed safety criteria, as well as for prioritizing of safety problems by their importance.

With respect to specific Ukrainian experience following issues could be shared with other countries - receptors of ASSET services:

- balanced and well-coordinated cooperation of the regulatory body with an operators and governmental agency responsible for nuclear power planning is of prime importance for the success of the ASSET program in the country.

Following recommendations could be proposed to Agency with respect to improvement of the ASSET practices:

- emphasize managerial implications of the ASSET assessment results (requirements to plant management should be more strict and comprehensive and avoid too much diplomacy); as standard ASSET seminars usually involve medium safety expert level, some appropriate events for familiarization with the essence of the ASSET approach for plant managers level (1-2 days, appropriate place and program). This is especially relevant to Ukraine with respect to the implementation of the pant self assessment stage of ASSET;

- Modernization of the INES scale is desirable to provide a tool for prioritization of Level 0 events, which represent the vast majority of the reported events;

- The Agency should never suspendAfor considerable period the ongoing process of ASSET activities (as it in fact is taking place in Ukraine now, where since January of the 1995 we have not got any assessment ASSET missions), because it causes interruption of the continuous learning process, breaks expert contacts and communication, affects consistency of the safety performance assessment practice.

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UNITED KINGDOM

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Presentati0on by Mr C R Phipps.
Review of UK Participation in
ASSET Activities 1995/96 for the
Annual Workshop on ASSET Experience.
25 - 27 June 1996. IAEA Vienna.

With the restructuring of the Nuclear Generation Industry in the UK over the last 12 months it has been difficult to provide support to international activities including ASSET. This is likely to continue for a further 12 months whilst consolidation of the privatised part of the industry takes place and Magnox Electric plc is merged with British Nuclear Fuels Ltd.

Having made that statement I would confirm that the UK is fully supportive of the ASSET methodology and will continue to be a participant in as many ASSET activities as possible. It was noted that during 1995 ASSET completed its 100th mission and the UK would like to congratulate the staff in the IAEA on this achievement.

Discussions are at present ongoing within Magnox Electric plc. regarding the possibility of hosting an ASSET Peer Review mission, at one of the UK's Magnox plants, in 1997/98.

During the 1995/96 period the UK participated in a number of ASSET activities as detailed below.

1995 ASSET Workshop.

This workshop confirmed continued support for the new Peer Review and Topical Analysis types of missions. The workshop could not, at present, see a place for a probabilistic approach being used during the presently scheduled site missions and suggested that further development of this technique may enable it to be used in the future. It was also recommended that a system of ranking events be developed within the ASSET framework.

1995 Review of the Results of ASSET Missions 1995.

A review was completed on the ASSET missions to the South Ukraine, PAKS and Kursk Nuclear Power Plant in 1995. The Peer Review mission scheduled to be completed at Forsmark, Sweden was rescheduled from Nov. 1995 to Feb. 1996 and could not therefore included in this review.

The objective of this review was to determine if there is an improving trend in the events being analysed both for specific, plant related, and generic events. In addition feedback was sought from the recently introduced Topical Analysis and Peer Review type missions.

The conclusion by the consultants was that the 1995 missions were successful in identifying the important safety issues and that the use of self assessment stimulates the plant staff to further improvement in terms of safety.

It was noted, with concern, that the South Ukraine NPP was experiencing difficulty in maintaining adequate trained staff levels as well as lack of finance to fund plant improvements.

Forsmark Peer Review ASSET Mission.

This mission was completed in February 1996 and demonstrated the viability of the Peer Review approach. A number of recommendations were provided to the operator and regulator of the plant prior to the ASSET leaving the site and these recommendations were accepted. However it would be useful if it could be confirmed that all or some of these recommendations have been implemented and if so has there been any improvement at the plant.

With regard to the actual mission programme it must be concluded that further refinement is needed. The content of the programme resulted in the team working very long hours over the whole of the scheduled week for the mission. It is recommended that ASSET assess the content and length of future missions of this type.

Regional Training Course, Madrid 11-29 March 1996.

A presentation was made to delegates on the methodology and control of reporting events at Nuclear Electric plants, together with a description of one or two recent significant events that have occurred on UK plants.

From the questioning following the presentation it was evident that allot of interest was generated in the difference of approach between the US and the UK. The fact that the representatives from these countries were from the regulator [US] and the operator [UK] added to the value of these discussions and demonstrates the value of ASSET in involving both "sides" of the industry.

Leningrad Peer Review ASSET Mission.

An ASSET mission was hosted by the Leningrad Plant in 1993 and the Peer Review Mission was therefore a logical progression. This mission concurred that improvements have been made since 1993 but also noted that further progress can be made in the identification of safety issues and feedback from such issues.

In a similar manner to the Forsmark mission it is recommended to ASSET that the length of the programme is reviewed as timescales were very tight when on site.

Conclusions.

The Type Z ASSET mission, self Assessment of operational events reflecting safety performance and the Type T ASSET mission, self Assessment of operational events reflecting safety culture are now proven and can provide an effective methodology for the review of operational events at Nuclear Power Plants with staff experienced in event analysis.

The UK will continue to support ASSET and hopefully, in the near future, will host a Peer Review mission.

C R Phipps. 25 June 1996.

ATTACHMENT 5

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ATTACHMENT 5

Department of Nuclear Safety *Issue No.4*
Division of Nuclear Installation Safety *1996-06-26*

NOTIFICATION OF AN AGENCY-SPONSORED MEETING

Title of meeting:	*Annual Workshop on ASSET Experience*	
Dates of meeting:	*25-27 June 1996*	*Scientific Secretary:* *Mr. P. Bliselius (B0869, ext. 26082)*
Place of meeting:	*IAEA Conf.Room V, CO7* *ext.21351* ***For Working Groups:*** ***Meeting Room A7*** ***ext.21371*** ***Meeting Room C0241*** ***ext.26391***	*Secretary:* *Ms. M.E. Guerra-Garduño ext. 26066 (B0847)*

PARTICIPANTS	*ADDRESS ABROAD*	*PERIOD*
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