

International  
Nuclear  
Fuel  
Cycle  
Evaluation

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**INFCE**

INFCE/DEP./WG.4/24

RECORD OF THE FIRST JOINT MEETING OF SUB-GROUPS A AND B.

Vienna, 30 November 1978

# International Nuclear Fuel Cycle Evaluation

# INFCE

INFCE/WG.4/52 (A,B)  
15 December 1978

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Working Group 4  
Sub-Groups A and B

## INFCE WORKING GROUP 4, SUB-GROUPS A AND B

### REPROCESSING, PLUTONIUM MANAGEMENT AND RECYCLE, RECORD OF FIRST

MEETING OF THE SUB-GROUPS VIENNA: 30 NOVEMBER 1978

1. Opening of session

Dr. Tamiva opened the meeting.

2. Opening remarks by Co-Chairmen

2.1 Dr. Tamiva explained that the joint meeting of Sub-Groups A and B had been called to examine three major topics: proliferation resistance assessment, safeguards and alternative institutional arrangements, relevant to the work of both Sub-Groups.

3. Adoption of the Agenda

3.1 The provisional agenda, incorporating corrections announced by the Co-Chairmen, was adopted. A revised version is attached as Annex C.

4. Assessment of Proliferation Resistance

Papers: Co-Chairmen/WG.4/42(A,B)	Contribution from the US
Co-Chairmen/WG.4/50(A,B)	French comments on the US contribution
Co-Chairmen/WG.4/56(A,B)	Background paper by the Co-Chairmen
Co-Chairmen/WG.4/59	Indian comments on the US contribution
INFCE/TCC/2/5	Indian statement at the <b>June TCC</b>
INFCE/TCC/3/2	French Working Paper for the October TCC
INFCE/TCC/3/3	UK statement at the October TCC
INFCE/TCC/3/4	US Working Paper for the October TCC

4.1 The Co-Chairmen reminded delegates that at the TCC meeting in October it had been agreed that working groups should examine proliferation resistance in relation to their groups' individual terms of reference. The paper Co-Chairmen/WG.4/42(A,B) prepared by the US delegation was the first contribution to this Task.

4.2 The US delegate said that a detailed examination of all the relevant assessment factors had not been possible. In particular, there was no consideration of the evolution of proliferation resistance policies with time. The importance of this aspect was stressed by several delegations.

4.3 The Indian delegate presented paper Co-Chairmen/WG.4/59, commenting on the US paper. There were two factors which concerned him: first, in view of the difficulty and breadth of the subject, should Working Group 4 be taking on this task; and second, at what level in the fuel cycle should one begin to consider proliferation. Strictly, the whole range of operations from mining to waste disposal was relevant but Working Group 4's remit covered only reprocessing and recycle. In discussion, the following points were made:

- although the subject was complex, the TCC had delegated responsibility to the Working Group and the Group should therefore try to make as good and as wide-ranging an assessment as possible.
- it was important to ensure that Working Group 4's work was not taken out of context. It should be stated in the Final Report that the question of non-proliferation was primarily a political one.

4.4 The French delegate then presented paper Co-Chairmen/WG.4/50(A). He did not accept either the substance of the US paper or the methodology adopted. There was a need to distinguish carefully between non-proliferation and the prevention of sub-national threats. The US paper concentrated too much on the latter aspect.

4.5 He did not consider that a quantitative evaluation could be made; judgements were essential. The proliferation resistance of different fuel cycles should not be compared. Working Group 4 should rather attempt to identify the most vulnerable parts of each cycle and then examine how improvements might be instituted.

4.6 The Co-Chairmen summing up this part of the discussion stressed the danger of making too abstract an assessment. The US approach, which examined three illustrative fuel cycles, was a sensible one. However, an entirely neutral approach, which avoided ranking fuel cycles in any way, was essential. There was a distinction between the threat of national proliferation and subnational diversion, but this distinction was blurred. The US had pointed out that national boundaries were not fixed; nor was the status of subnational groups for the indefinite future.

4.7 Further comments made on the US paper were covered in discussion of the Co-Chairmen's paper Co-Chairmen/WG.4/56(A,B). It was noted that the FRG would be submitting written comments on this subject.

4.8 The Co-Chairmen's paper was then discussed. The paper outlined a number of factors by which the proliferation resistance of fuel cycles could be assessed. In discussion of the paper the following points were made:

- some delegations said that the task of Working Group 4 was not to make any comparison of the proliferation resistance of various fuel cycles, that would be outside the terms of reference of the Group as decided at the Washington Organising Conference. Rather the Working Group should assess the proliferation resistance of reprocessing and thermal recycle.

- other delegations said that some comparison of fuel cycles from the point of view of proliferation resistance was inevitable and desirable. It was difficult to assess the proliferation resistance of plutonium recycle except in relation to other fuel cycles, in the same way that it was difficult to assess the economics of reprocessing without considering the economics of the once-through cycle and fast reactors. It was important that some overall comparison be made between fuel cycles since the Plenary had decided that the overview report to be prepared by the TCC should draw only on material contained in the Working Group reports. How far the comparison between fuel cycles should be pursued was a matter for the Working Groups' judgement, but the Groups' terms of reference should not be interpreted too rigidly.

4.9 After further discussion, the Co-Chairmen indicated:

- that the report of the Working Group should be limited to the proliferation risks of plutonium recycle in thermal reactors and the ways in which these risks could be reduced. During its assessment of plutonium recycle, the Working Group might need to consider the proliferation risks of recycle relative to other fuel cycles.
- that the Co-Chairmen's paper should be sent after consensus had been reached, to the Co-Chairmen of Working Groups 5 and 8 in line with the TCC's recommendation that the Co-Chairmen of WGs 4, 5 and 8 consult over matters of common interest.

4.10 The Co-Chairmen emphasised the point raised by the US delegation that the factors proposed were intended to be the basis for an analytical approach to proliferation risks.

4.11 The factors were then discussed one by one.

Factor 1 : Number of Sites with Significant Quantities of Special Nuclear Materials (S.N.M.)

4.12 The Co-Chairmen said that generally the higher the number of sites with significant quantities of SNM resulting from a fuel cycle, the greater the proliferation risk. One conclusion that might possibly be reached on plutonium recycle would therefore be that reprocessing in a large number of small plants would, in terms of this factor, be more risky than reprocessing in a small number of large plants. In discussion the following points were made:-

- (a) Where "nuclear sites" should be located was a separate question from their number; it was a political question that was not for the Working Group;
- (b) A distinction should therefore be drawn between the number of sites within a country and the number of sites in the world resulting from a fuel cycle;
- (c) The phrase "significant quantities" should not be defined in terms of specified amounts of nuclear material. If it were, the specified amounts would come to be regarded as limiting or unsafe quantities;
- (d) This factor was inter-related with all the other factors, particularly (2), (3) and (4).

- 4.13 The delegate from India argued that this factor was not significant, and that the proliferation risks of a fuel cycle could not be about conclusions drawn from the number of sites with significant quantities of nuclear material. The factor should be omitted. The Co-Chairmen said that it would be better to include the factor with the comment that it was of weak significance in assessing proliferation risks rather than omit it altogether. This was agreed.

Factor 2 : The Need for Transport of S.N.M.

- 4.14 The Co-Chairmen suggested that this factor concerned protection from subnational diversion rather than national proliferation; and should therefore be omitted. Canada however argued that a need for large scale transport of plutonium could offer risks of seizure by a national Government.

It was noted that an IAEA Convention on physical protection was under negotiation and that the discussions on safeguarding the transport of Pu in Sub-Group 4B were relevant. In conclusion, it was agreed that this factor should be included, but that it was largely concerned with the problems of physical protection.

Factor 3 : Accessibility of S.N.M.

- 4.15 The paper suggested four categories for defining the accessibility of nuclear materials: "inaccessible", "extractable", "extracted" and "separated". The factor was mainly concerned with the risk of diversion by sub-national groups and not of national proliferation.
- 4.16 In discussion the following points arose:-
- (a) it was agreed that the factor should be retitled the "specification of the special nuclear materials". A series of levels of accessibility not categories should be used, as in an earlier paper by the Technical Secretariat. There was no sharp distinction between inaccessible and extractable material. The distinction was between material in which the radiation field was so intense that it was the dominant factor in decisions to divert or seize it, and material where the radiation field was not the dominant factor;
  - (b) the natural radioactivity and toxicity of plutonium should be noted;
  - (c) dilution with uranium should also be noted as another way of reducing the accessibility of plutonium.
- 4.17 Some delegations questioned the importance of this factor in assessing the risk of national proliferation. A determined Government was unlikely to consider the specification of the S.N.M. when considering whether to seize it for unauthorised purposes.

Factor 4 : Quantity of S.N.M.

- 4.18 This factor was agreed subject to the following comments:-
- (a) there was an important inter-relation between the first four factors and there might be advantage in grouping them into one composite factor;
  - (b) there was a ceiling to the quantities of S.N.M. that were significant. The proliferation risks of sites with a thousand kilograms of plutonium, say, would not be significantly greater than those with a few hundred kgs.

Factor 5 : Resources required for different routes to Proliferation

- 4.19 This was a factor set out in the US paper which had been accepted by the TCC. In discussion two points were made:-
- (a) if it were to be used, this factor would have to be applied in a general and qualitative way. Otherwise there would be the risk of revealing the easiest routes to proliferation;
  - (b) Some delegations felt that this factor conflicted in a basic way with the internationally accepted aim to ensure the spread of the benefits of civil nuclear energy. It argued for restrictions both on the spread of knowledge about nuclear power and on the spread of nuclear technology itself; and was therefore unacceptable.
- 4.20 Summing up, the Co-Chairmen said that no conclusion on whether or not this factor should be used could be reached that day. The Co-Chairmen would consult before this factor was discussed further.

Factor 6 : Time required for Diversion

- 4.21 This factor was agreed. The Co-Chairmen explained that the reference in the paper to the subjects in relation to safeguards was a reference to the safeguards policy on timely detection of diversion being developed by the IAEA.

Factor 7 : Detectability of Diversion or Misuse

- 4.22 This factor was agreed, subject to the replacement of the word "misuse" by "unauthorised use". It was noted that this was one of the more important factors in determining the sensitive parts of fuel cycles.

Factor 8 : Quality of the Strategic Material

- 4.23 This factor was agreed. It was suggested that it should be combined with factor (3) to form a factor called the "physical state" of the material, and that this factor might cover the "protectability" of the material.

Factor 9 : Evolution of Programme with Time

- 4.24 It was agreed that this was not a factor to be used in isolation but a consideration that should be borne in mind when assessing fuel cycles on the basis of the other factors.
- 4.25 The delegate from Argentina then made a statement. The main points were:-
- (a) the task of INFCE, as agreed by the Washington Conference, was to make a cost-benefit analysis of the non-proliferation costs and energy benefits of nuclear fuel cycles. The first step was to analyse the existing situation before assuming that there was something wrong. International relations, including those on non-proliferation and nuclear trade, were governed by a legal framework of treaties and institutions. It was not clear yet whether there was anything that needed changing in this respect;

- (b) the Working Group seemed to be concerning itself in some areas with the sub-national risks of diversion which are not within its competence or terms of reference;
- (c) a country which wished to use nuclear material for unauthorised purposes could not be prevented from doing so. It would in any case choose an easier route to nuclear weapons than diversion from a civil nuclear programme;
- (d) all countries were at present using the once-through cycle. In three or four decades, all three fuel cycles would be in use. There, therefore seemed little point in comparing the proliferation risks of each cycle;
- (e) discrimination by nuclear suppliers was not constructive. It had brought nuclear trade to a virtual halt, and would inevitably encourage unregulated nuclear development. It would be better to build a legal framework in which trade could take place with the minimum of proliferation risk.

4.26 The Co-Chairmen, summing up the discussion, said that it would be important to continue discussion at the next meeting of the two sub-groups in January. Only in that way might a consensus develop. He had the impression that delegates were nervous of discussing the factors in his paper because they were not clear to what use the factors would be put. He therefore proposed:

- (a) to revise his paper setting out factors for the assessment of proliferation resistance in the length of the discussion of his existing paper;
- (b) to write a paper setting out a tentative assessment of recycle using these factors in a neutral way as a basis for discussion.

No objections were made to this procedure.

## 5. Safeguards

Papers: Co-Chairmen/WG.4/35 (A,B)	- Present Status of IAEA Safeguards (IAEA)
Co-Chairmen/WG.4/44 (A,B)	- Safeguarding a Domestic Mixed Oxide Industry (US)
Co-Chairmen/WG.4/57 (A,B)	- Safeguarding an industrial reprocessing Plant (UK)
Co-Chairmen/WG.4/65 (A,B)	- EURATOM Experience in Safeguarding Facilities within the European Community (CEC)

- 5.1 The Co-Chairman explained that this was only a preliminary discussion of safeguards; the main discussion would take place at the January meeting.
- 5.2 The US delegate explained that the paper he had promised on improved safeguards for an advanced reprocessing facility was not yet available but would be sent to delegates in good time for discussion in January. The paper addressed the possibilities for the effective implementation of safeguards for large reprocessing and fabrication facilities.

- 5.3 The UK delegate presented Co-Chairmen/WG.4/57 (A,B) on safeguarding an industrial reprocessing plant - a paper also scheduled for discussion in January. He explained that the paper covered safeguards only from receipt of fuel to storage as plutonium nitrate. It would be necessary to extend the coverage to conversion to oxide and this would be done before the January meeting. Meanwhile, he requested delegates to send any comments to him directly.
- 5.4. The CEC delegate then presented Co-Chairmen/WG.4/65 (A,B) for discussion in January. The paper was essentially a historical survey of Euratom safeguards experience. It also contained a short chapter detailing recent Euratom/IAEA co-operation in this field.
- 5.5. The French delegate said that he intended to submit three further papers to the January meeting on:
- alternative reprocessing schemes
  - the application of improved safeguards to a reprocessing plant
  - plutonium management
- 5.6. The Japanese delegate would also be submitting a paper for the January meeting. This would cover the application of improved safeguards, with an emphasis on material accountancy, containment and surveillance, to the back-end fuel cycle, in particular MOX fuel fabrication facilities.
- 5.7. The Co-Chairman asked all delegates to mail directly to the participants all papers being submitted to the January meeting. Since many countries would wish to be represented by specialists for the safeguards discussions, 24 January would be specifically reserved for this item.
- 5.8. The IAEA delegate presented a revised version of Co-Chairmen/WG.4/35 (A,B), "The Present Status of IAEA Safeguards". The IAEA hoped to distribute the paper in final form to all working groups. Their paper on the safeguarding of reprocessing plants would probably not be available in time for Working Group 4's final report, the IAEA delegate explained. However, the IAEA would make available papers from the Safeguards Symposium on 2-6 October for use as background material.
- 5.9. Delegates welcomed the IAEA paper. It was agreed that the section on "timeliness of detection" would merit detailed consideration in January.
- 5.10 The US delegate presented Co-Chairmen/WG.4/44 (A,B) (GESMO). He explained that the document was a draft review of national safeguards and did not represent the official USNRC position. The report examined the increased risk of introducing additional quantities of plutonium into the commercial fuel cycle, and the cost and adequacy of safeguarding the widespread use of MOX. The report concluded that there were no significant health, safety or environmental problems but that material accountancy would be more difficult in future reprocessing facilities.



## 6. ALTERNATIVE INSTITUTIONAL ARRANGEMENTS

- Papers: Co-Chairmen/WG.4/41 (A,B) - Contribution to assessment of  
Alternative Institutional Arrangements (US)  
Co-Chairmen/WG.4/43 (A,B) - Barnwell Nuclear Fuels Plant  
Applicability Study (US)  
Co-Chairmen/WG.4/58 (A,B) - Comments on paper Co-Chairmen/WG.4/41 (A,B)  
(India)

- 6.1 The U.S. delegate introduced Co-Chairmen/WG.4/41 (A,B). He explained that the US attached great importance to institutional arrangements in striking a balance between the peaceful development of nuclear power and the minimization of proliferation risks. The paper set out the range of alternative arrangements available. A more detailed description of the pros and cons of institutional arrangements was contained in volume 2, chapter 6 of the Barnwell Study (Co-Chairmen/WG.4/43 (A,B)).
- 6.2. Comments on the US paper had been prepared by India (Co-Chairmen/WG.4/58 (A,B)). The Indian delegate said that attempts to impose international and institutional controls should be avoided. Such arrangements should be voluntary, and the choice should be left to the government concerned.
- 6.3. In discussion the following points were made:
- in no sense was INFCE attempting to impose an institutional regime; it was simply seeking a consensus of views;
  - the development of the existing safeguards system should not be neglected. Institutional arrangements should supplement, not replace safeguards;
  - the relationship between the International Nuclear Fuel Authority described in the US paper and the international 'fuel bank' being discussed in Working Group 3 should be clarified.
- 6.4. Summing up the discussion, the Co-Chairmen said that the IAEA were hoping to produce a paper on institutional arrangements for the nuclear fuel cycle in time for the January meeting. This paper, Co-Chairmen/WG.4/67 (A,B), and those listed above, would be given detailed consideration at the San Francisco meeting.

## 7. ANY OTHER BUSINESS

### 7.1. Future Meetings

The US delegate outlined the administrative arrangements for the forthcoming meeting in San Francisco. He asked delegates to let him have provisional accommodation bookings. Definite arrangements would have to be made by 5 January at the latest.

- 7.2. It was agreed that further meetings of the joint Sub-Groups should be held in the weeks commencing 2 April and 14 May 1979. Full details are given at Annex C.

ANNEXES

- Annex A - Agenda as adopted and list of relevant documents
- Annex B - List of delegates
- Annex C - Dates of future meetings
- Annex D - Addresses of Technical Secretariat

# International Nuclear Fuel Cycle Evaluation

INFCE/WG4/49 (A,B) Rev. 2

30 November 1978

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AGENDA FOR THE FIRST MEETING OF INFCE WORKING GROUP 4, SUB-GROUPS A AND B (30 NOVEMBER 1978, HOFBURG CONFERENCE SUITE, VIENNA at 0930 HOURS)

- 1 Opening of session by Dr. TAMIYA.
- 2 Opening remarks by Co-Chairmen:
  - Dr Walter MARSHALL (UK Atomic Energy Authority)
  - Dr Shigefumi TAMIYA (The Federation of Electric Power Companies)
  - Mr Cyril BUCK (British Nuclear Fuels Limited)
- 3 Adoption of the Agenda.
- 4 Assessment of Proliferation Resistance
  - (i) The US paper Co-Chairmen/WG4/42(A,B) and comments from India (Co-Chairmen/WG4/59) and France (Co-Chairmen/WG4/50) to be discussed. (INFCE/TCC/2/5, INFCE/TCC/3/2, INFCE/TCC/3/3 and INFCE/TCC/3/4 also refer).
  - (ii) Background paper, Co-Chairmen/WG4/56(A,B) prepared by the Co-Chairmen, to be discussed.
- 5 Safeguards
  - (i) Co-Chairmen/WG4/35(A,B) describing the present status of IAEA Safeguards on Nuclear Fuel Cycle Facilities - statement by the IAEA delegate on progress made within the Agency on this paper.
  - (ii) Discussion of the US paper Co-Chairmen/WG4/44(A,B) on safeguarding a domestic mixed oxide industry. (GESMO)
  - (iii) Oral presentation by the US on improved safeguards for an advance reprocessing/fabrication facility.
  - (iv) UK paper (Co-Chairmen/WG4/57(A,B) on safeguarding an industrial reprocessing plant to be presented.
  - (v) CEC paper (Co-Chairmen/WG4/65(A,B) Euratom experience in safeguarding, reprocessing and thermal reactor mixed oxide fuel fabrication facilities within the European Community to be presented.

6 Alternative Institutional Arrangements

- (i) Discussion of the US paper Co-Chairmen/WG4/41(A,B) on institutional arrangements for reprocessing and plutonium management. (Co-Chairmen/WG/58(A,B) - comments from the Indian delegation refers).
- (ii) Discussion of the US paper Co-Chairmen/WG4/43(A,B) - The Barnwell Nuclear Fuels Plant Applicability Study. (IAEA report "Regional Nuclear Fuel Cycle Centres", Co-Chairmen/WG4/30, Co-Chairmen/WG4/12(A) and Co-Chairmen/WG4/47 (A,B) also refer).

7 Any other business.

LIST OF RELEVANT DOCUMENTS

INFCE/WG4/47 (A) Record of 4A Meeting 18-19 September

INFCE/WG4/46 (B) Record of 4B Meeting 20-21 September

Assessment of Proliferation Resistance

Co-Chairmen/WG4/42(A,B) Contribution to Assessment of Proliferation Resistance (US).

Co-Chairmen/WG4/50(A,B) Comments on Co-Chairmen/WG4/42(A,B) (France)

Co-Chairmen/WG4/56(A,B) Background paper on proliferation resistance assessment (Co-Chairmen).

Co-Chairmen/WG4/59 Comments on Co-Chairmen/WG4/42(A,B) (India)

INFCE/TCC/2/5 Statement on proliferation resistance assessment (India)

INFCE/TCC/3/2 Working Paper on the role of "safeguards" in the assessment of economic, environmental and non-proliferation aspects (France).

INFCE/TCC/3/3 Working Paper on Proliferation Assessment (US).

INFCE/TCC/3/4 Statement on the Assessment of Proliferation Resistance in INFCE (UK).

Safeguards

Co-Chairmen/WG4/35(A,B) The Present Status of IAEA Safeguards on Nuclear Fuel Cycle Facilities (IAEA).

Co-Chairmen/WG4/44(A,B) Safeguarding a Domestic mixed oxide industry against a hypothetical sub-national threat (US).

Co-Chairmen/WG4/57(A,B) Safeguarding an industrial reprocessing plant (UK).

Co-Chairmen/WG4/65(A,B) Euratom experience in safeguarding reprocessing and thermal reactor mixed oxide fuel fabrication facilities within the European Community (CEC).

Alternative Institutional Arrangements

Co-Chairmen(WG4/12(A) A Reference Regional Nuclear Fuel Cycle Centre (CEC).

Regional Nuclear Fuel Cycle Centres (IAEA).

Co-Chairmen/WG4/30 Feasibility of National and Regional Fuel Cycle Centres for Egypt's Nuclear Power Programme (Egypt).

Co-Chairmen/WG4/41(A,B) Contribution to assessment of Alternative Institutional Arrangements (US).

Co-Chairmen/WG4/43(A,B) Barnwell Nuclear Fuels Plant Applicability Study (US).

Co-Chairmen/WG4/47(A,B) International Management and Storage of Plutonium and Spent Fuel (IAEA).

Co-Chairmen/WG4/58(A,B) Comments on paper Co-Chairmen/WG4/41(A,B) (India).

Participants at the INFCE 4 Series of Meetings held  
from 29 November - 1 December, 1978 in Vienna

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Pakistan Mission

Future Meetings and Programme of Work

<u>Date</u>	<u>Group</u>	<u>Place</u>
Wednesday 24 January 1979	4A/4B	Palo Alto
Thursday 25 January	4A/4B	San Francisco
Friday 26 January	4A	
Monday 29 January	4B	
Tuesday 30 January	4B	
Wednesday 31 January	4A/4B	
Thursday 1 February	4	
2 April - 6 April 1979	Sub-Groups and main Group	Vienna
14 May - 18 May 1979	(to be arranged)	Vienna

Annex D

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