SOME COMMENTS ON TERMINATION OF SAFEGUARDS UNDER ARTICLE 10a OF THE QUADRIPARTITE AGREEMENT (ARTICLE 11 OF INFCIRC/153)

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Abstract

In December 1995, ABACC received the first petition of safeguards' termination based on the concept that: "the material has been diluted in such a way that it is no longer usable for any nuclear activity relevant from the point of view of safeguards". This paper describes the waste involved and its origin, the studies made, the conclusions reached and the status of the discussions with the IAEA. An aspect that seems not to be considered previously plays a key role in ABACC's decision making process: kind of product obtained if the nuclear material present in the waste is recovered.

1. Introduction

ABACC is a relatively new safeguards organization created by the Bilateral Agreement signed between Argentina and Brazil on December 1991/1/. Because of such Agreement ABACC headquarters are located in Rio de Janeiro where the Secretariat started to operate on July 1992. Several papers described the full scope safeguards system that embraces both countries and the organization, evolution and present status of ABACC /2/3/4/.

In March 1994, the Quadripartite Agreement among the IAEA, ABACC, Argentina and Brazil entered into force/5/. Since then the IAEA and ABACC have been making progresses to improve the coordination of activities in order to avoid unnecessary duplication of safeguards efforts, maintaining the principle that both organizations shall be able to reach independent conclusions. Coordination and cooperation between the IAEA and ABACC are foreseen in several articles of the Agreement, in the General Part of the Subsidiary Arrangements and in a specific document agreed in January this year.

For the case of termination the Quadripartite Agreement states that safeguards of nuclear material shall terminate only upon determination by both organizations.

As in Article 11 of INFCIRC/153, Article 10a of the Quadripartite Agreement (INFCIRC/435) states that: "*Safeguards under this Agreement shall terminate upon determination by ABACC and the Agency that the material has been consumed, or has been diluted in such a way that it is no longer usable for any nuclear activity relevant from the point of view of safeguards, or has become practically irrecoverable.*"

In December 1995 ABACC received a request for termination from a State Party based in the concept that the material has been diluted in such a way that it is no longer usable for any nuclear activity relevant from the point of view of safeguards. This was the first time such kind of request was made to ABACC and the consequence was a planned effort for getting the information and perform the studies necessaries to give a sound technical answer to the request.

2. The Material

The request for termination involved natural Uranium contained in wastes. These wastes were originated at a conversion plant as result of special campaigns for recovering natural Uranium scraps from a fuel fabrication plant. Normally the conversion plant processes yellow cake for producing nuclear grade powder of natural Uranium dioxide (UO2), and safeguards started to be applied on this material. Although the same wastes are generated during the standard operation of the conversion plant, they remain before the starting point and can be disposed of or recovered without requesting termination.

The total quantity of natural Uranium was about 2,100 kg, with a variable concentration that reached up to 16% in weight. Of this material, 54 metallic drums contain 8,700 kg of waste with about 1,400 kg of natural Uranium mixed with diatomaceous earth, water and HNO3 as well as some organic components, (concentration 16%: in the following **Type I** waste). Due to the fact that HNO3 attacks steel, some drums were leaking and the reaction between the acid and

organic components liberates toxic gases. Other 96 metallic drums have 17,500 kg of waste with around 700 kg of natural Uranium mixed with TBP, water and several impurities (concentration 4.2%: in the following **Type II** waste).

The material was intended to be transferred to a mining/milling complex where Type I would be reintroduced into the fuel cycle at a previous stage (the material would be incorporated to the ore concentrates), and Type II would be disposed of together with the tails accumulated in the site.

3. Methodology

After a preliminary analysis several actions were decided: to request more information on the material involved; to convoke consultants with great experience in the nuclear fuel cycle to have independent explanations, and to make and internal study aimed at reaching a clear understanding of the meaning of "*diluted in such a way that is no longer usable for any nuclear activity relevant from the point of view of safeguards*".

3.1 The Consultants' Activities

The first study and analysis of the information provided by the State, including the additional information provided on request, as well as the information available on some documents dealing with termination /6/7/ indicate that the concentration of U was atypical, the characteristics of the waste should be clearly understood and its strategic value evaluated. Therefore, in order to clarify these matters, two consultants where convoked by ABACC, both with more than 30 years of experience in the nuclear fuel cycle. In summary, the mission of the consultants was:

- To explain the origin of the wastes (in particular the reasons for having an atypical Uranium concentration);
- To evaluate the recoverability of the natural Uranium contained in the wastes and;
- To evaluate the strategic value of the wastes.

In May 1996, after having participated in internal discussions and analyzed the information available, the consultants went to the conversion plant to examine the wastes and to observe *in situ* the plant and the process. The conclusions of their activities can be summarized as follows:

- The process for recovering scraps was the same used for processing yellow cake, and the wastes generated were also the same.

- The atypical Uranium concentration in Type I waste arose from the fact that one purification stage of the plant was dismantled years ago due to chemical problems when processing yellow cake with high Zirconium concentration impurities. On the other hand, the concentration of Uranium in Type II waste arose from the need to speed up the process in the plant.

- Although in both cases the Uranium can be recovered, Type I waste was more attractive from an economic point of view than Type II. This conclusion was mainly related to its chemical characteristics, playing a secondary roll the concentration of Uranium (Type II waste concentrates all undesirable impurities).

- The final result of recovering the Uranium contained in the wastes would be yellow cake.

- The strategic value of the wastes was lower than yellow cake, being the Type II similar to some ores.

- The storage of the drums containing the Type I waste was experiencing great problems because of the acid attack.

Note: We fully acknowledge the work done by the Consultants, Mr. Alcídio Abrão and Mr. Osvaldo Cristallini who, based on their great experience, were able to fully explain all the aspects of the processes and the wastes generated.

3.2 The Study

From the beginning it was clear that dilution itself can not be an argument for defining a waste as no longer relevant from the point of view of safeguards. It is possible to have a highly diluted solution of a nuclear material more easy to recover than another solution with higher concentration. Therefore, neither the dilution nor the recoverability

should play a role in this case. The problem was to technically understand what means “no longer usable for any nuclear activity relevant from a safeguards point of view”.

It was noted that Article 10a of the Quadripartite Agreement considers three cases for termination:

a) The material has been consumed;

b) The materials has been diluted in such a way that it is not longer usable for any nuclear activity relevant from the point of view of safeguards; or

c) The material has become practically irrecoverable.

It was also noted that, coherently, Code 10 of the Subsidiary Arrangements considers three inventory change codes for reporting termination of safeguards:

LN, Nuclear loss (*consumption of nuclear material due to its transformation into another element(s) or isotope(s) as result of nuclear reactions).*

SS, Return to pre-safeguarded stage (*transfer of safeguarded material back to pre-safeguarded stage),* and

LD, Measured discard (*Operational loss, loss of a measured or estimated (on the basis of measurements) quantity of nuclear material from processing which has been disposed of in such a way that is not suitable for further nuclear use*).

It was evident that case a) can be easily correlated with **LN** and case c), in spite of the different wording, can be correlated with **LD** (if the material has been disposed of in a way that it is not suitable for further nuclear use it becomes practically irrecoverable). The correlation between case b) and **SS** seems not to be evident. Nevertheless, it was assumed that the experts that worked out INFCIRC/153 and Code 10 deserved respect and that a correlation should exist, particularly taking into account that no other inventory change code was foreseen for reporting termination.

This internal work was done in parallel with the Consultants activities described above. In addition, several available documents where analyzed and a paper describing the IAEA policy on termination /8/ merited special consideration. The main principles stated in the Agency’s policy, as described in the paper quoted above, where considered consistent and logic:

- Overstatement of the nuclear material in waste should not conceal a diversion;
- Resubmission of previously terminated material should not conceal diversion; and
- Assurance shall be provided.

The only difficulty identified when analyzing the Agency’s policy was that the case we were dealing with seems not to be covered. In fact, it is clearly stated in the paper that the policy was developed for measured discard and mainly for Plutonium waste. Although the same conclusions could be easily extrapolated to wastes containing other nuclear materials, like enriched Uranium, it was evident that the case of a material “no longer relevant from a safeguards point of view” was not specifically addressed.

The concept of retained waste was also briefly addressed during the studies, but as the State has not the intention of conditioning the waste but to dispose of part of them together with ore tails and to reintroduce the main part in a previous stage of the nuclear fuel cycle this subject was no further considered.

4. Conclusions

When the information provided by the Consultants was incorporated to the internal analysis the elements of the puzzle came to their positions. In addition to provide a clear understanding of the origin of the wastes, their Uranium concentration and their recoverability, the Consultants’ report presents two key points

- the results of recovering would be yellow cake and,
- the strategic value of the wastes was lower than yellow cake.

While the concept of strategic value is subjective, the product obtained of recovering nuclear material from a waste is objective and, therefore, can be taken as the main element to technically define when a nuclear material "has been diluted in such a way that it is no longer usable for any nuclear activity relevant from a safeguards point of view". This concept shall be linked to the starting point of safeguards, which at present is, in the natural Uranium fuel cycle, nuclear grade UO2.

The other elements to be considered are equal or similar to the ones described in the Agency's policy paper, namely:

1. Overstatement of the nuclear material in waste should not conceal a diversion;
2. Resubmission of previously terminated material should not conceal diversion; and
3. Assurance shall be provided that the material is reincorporated to previous stages of the nuclear fuel cycle.

In the case described here, ABACC considers that the termination should be granted based on the fact that the material "is no longer usable for any nuclear activity relevant from the point of view of safeguards" and that conditions 1 to 2 are fulfilled, because measurements were taken, in order to have an independent evaluation of the quantity of material involved and that the resubmission of the material can not conceal a diversion, even if recovered, because it would consists in yellow cake. The last condition was not fulfilled in this case, because the pragmatic solution indicated below was temporarily adopted.

5. Status of the discussions with the Agency

At the time this paper is presented it is most likely that the Agency will not have a definitive position on this subject. The case described here was finally resolved using an exemption by quantity, a pragmatic solution reluctantly accepted by all parties as the fastest mean to avoid additional problems to the Operator, considering the precarious condition of the storage of the wastes and the associated risks.

The IAEA is a complex organization that applies safeguards in several countries and ABACC is aware that any change or addition to the Agency's policy on termination would require time to be settle. A similar case is expected to become an issue in the near future and ABACC is confident that a more appropriate procedure to deal with the problem will be agreed.

6. References

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/6/ Advisory Group on Safeguards Related to Final Disposal of Nuclear Material in Waste and Spent Fuel. IAEA, STR-243(Revised), Vienna, Austria, December 1988.
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