VARIOUS APPLICABLE RULES BASED ON SINGLE INTERNATIONAL REGULATIONS

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ABSTRACT

Radioactive materials are transported according to national, regional and international regulations widely based on rules set by the International Atomic Energy Agency (IAEA): “Regulations for the Safe Transport of Radioactive Materiel”. Many advantages stem from the existence of a uniform basis for regulations. Implementation of and compliance with the regulations are facilitated and safety is consequently improved. International and multi-modal transports can hence be performed efficiently and safely.

However the reality of implementation of these regulatory principles is often a different matter. Continuous difficulties are faced for instance in design of packages requiring competent authority approval in several countries.

The IAEA regulations, as well as regional and international regulations, define “unilateral approval”, that is approval which is required only from the competent authority of the country of origin. Nevertheless, the number of countries where this concept of “unilateral approval” is recognized practically is steadily decreasing.

Furthermore, the regulations may be written differently from one country to another. Even with the same wording, they can be understood and implemented in different ways.

The paper develops examples regarding the above issues, and, moreover, presents how these difficulties can be overcome by various solutions ranging from clarification of regulations, closer contact between the applicant and authorities, and passing by development of standards.

INTRODUCTION

Radioactive materials are transported according to national, regional and international regulations widely based on rules set by the International Atomic Energy Agency (IAEA): “Regulations for the Safe Transport of Radioactive Materiel”. Many advantages stem from the existence of a uniform basis for regulations. Implementation of and compliance with the regulations are facilitated and safety is consequently improved. International and multi-modal transports can hence be performed efficiently and safely.

However the reality of implementation of these regulatory principles is often a different matter. Continuous difficulties are faced for instance in design of packages requiring competent authority approval in several countries.

Industrials involved in transport, such as Transnucléaire, cannot remain inactive in view of this situation.

The purpose of this paper is to illustrate this issue by various examples of recurring difficulties and the actions we implement in order to alleviate them.

UNILATERAL AND MULTILATERAL APPROVALS

The IAEA Regulations, as well as regional and international regulations, define "unilateral approval" as an approval that is required only from the competent authority of the country of origin.

On the other hand, "multilateral approvals" require that the competent authority of each country through or into which the consignment is to be transported has the opportunity to make its own assessment of the package design, in addition to the assessment performed in the country of origin of the design.

Are unilateral approvals unilateral?

- **Regional and national regulations**

  In spite of the title, generally the IAEA "Regulations for the Safe Transport of Radioactive Material" are not on their own applicable as regulations: they are implemented through regional and / or national regulations, and / or mode specific regulations (it is recognized that IAEA Regulations is applicable to IAEA operations and IAEA assisted operations: as such, their name are definitely not usurped). The direct consequence of this situation is that the applicable regulations require that package design approvals certify compliance with the applicable regulations, and compliance with IAEA Regulations is not sufficient, even when the applicable regulations are a verbatim copy of IAEA Regulations.

  For instance, regional regulations, such as the "European Agreement concerning the International Carriage of Dangerous Goods by Road" (ADR) or the "Regulation concerning the International Carriage of Dangerous Goods by Rail" (RID) require that packages to be used within a country Contracting Party of this Agreement or of this Convention must be approved under the provisions of these regulations. More precisely, in the ADR it is stated that:

  "Any design that requires unilateral approval originating in a country Contracting Party to ADR shall be approved by the competent authority of this country; if the country where the package has been designed is not a Contracting Party to ADR, carriage is possible on condition that:

  a. a certificate has been supplied by this country, proving that the package satisfies the technical requirements of ADR, and that this certificate is countersigned by the competent authority of the first country Contracting Party to ADR reached by the consignment;

  if no certificate and no existing package design approval by a country Contracting Party to ADR has been supplied, the package design is approved by the competent authority of the first country Contracting Party to ADR reached by the consignment."

  It is quite common that radioactive materials are transported from a country outside Europe to a country within Europe, in a package which requires unilateral approval, and which was originally approved against IAEA Regulations in a country out of Europe. As such, the package needs to be approved under the provisions of ADR.

- **Validation process**

  Reading paragraph a. of above-mentioned requirement, it can be understood that a unilateral approval against ADR, issued by any competent authority, from a country Contracting Party to ADR or not, is acceptable in the ADR area. There is no need for a counter-assessment.

On the other side, competent authorities of a country that is not Contracting Party to ADR are reluctant to issue approvals that prove that the packages comply with ADR requirements. They are not familiar with these regulations, and naturally inclined to issue approvals against IAEA Regulations. Consequently, according to above paragraph b., in such a case, the competent authority of the first country Contracting Party to ADR must issue an approval.

On one hand, as regards radioactive materials, the ADR is almost a verbatim copy of IAEA Regulations. On the other hand, competent authorities of ADR countries consider as reliable an approval of compliance with ADR issued by non-ADR countries. Furthermore, compliance with the requirements that are common to ADR and IAEA Regulations has already been assessed by the competent authority of the country of origin of the design. Therefore, it could be imagined that a validation in Europe (against ADR) of an approval issued under the provisions of IAEA would be a fast, and almost purely "administrative" action: the concerned European competent authority could "only" assess that the package meets the ADR requirements which are different from IAEA's ones.

The reality appears quite different. Some European competent authorities do not attach any value to approvals issued against IAEA regulations by competent authorities from countries that are not Contracting Parties to ADR. When applying for validation of such an approval, the Safety Analysis Report, which proves compliance with the regulations, is fully assessed by those authorities. This involves obviously time and money, and may jeopardize the viability of the transport, or the route chosen for the transport. In the mean time, other European competent authorities will almost automatically endorse the original approval, with a behavior close to those described previously, that is to say assessing only the items relevant to differences between ADR and IAEA Regulations.

Therefore, depending on the route that is forecast for the shipments, the validation process may turn in two opposite ways, inducing non-comparable times and costs for validation.

The situation that has been here above described is not specific to ADR and RID. National regulations exist from Far East to Far West (wherever is the center of the world…); each of them is very close to IAEA Regulations. Nevertheless, to be granted a validation of a unilateral approval issued in one part of the world in another part of the world is a long and difficult hurdle-race.

Packages containing fissile material: how multilateral are multilateral approvals?

Each package containing fissile material requires multilateral approvals: once the country of origin has granted an approval, other concerned countries must validate this approval.

- **Criticality assessment**

  In the past, many countries limited their validation assessment to criticality studies, including various degrees in this assessment. Some competent authorities accepted the hypotheses and the model chosen by the applicant and endorsed by the competent authority of the country of origin of the design. They run these accepted worst cases with their own calculation codes. In other words, the process was almost limited to the validation of the calculation codes, running the same cases with two different codes on two different computers. Others discussed the hypotheses and the model of the fissile content, before checking the results of the calculation.

Competent authorities who limit their assessment in such a way are less numerous, and even in these cases, it was difficult to obtain a consensus on this single issue: methods of assessment varied between authorities.

- **Hypotheses upstream the criticality assessment**
  Nowadays, in addition, there exists a significant trend to enlarge the assessment to all hypotheses of the criticality study.

  The first step is to accept the results of the regulatory drop and fire tests, and to discuss the way the damaged package is modeled.

  The second step leads to question, for example, the precise manner in which regulatory tests were performed, as the regulations provide requirements only in general terms. For instance, drop tests must be performed with the package in the most damaging orientation, and sequencing of drops must consider the most damaging order of impacts. Even if the designer provides analyses to justify the most damaging orientations and sequences, and in addition succeeds in convincing his own competent authority of the correctness of these justifications, other authorities can be of conflicting opinions.

- **Beside criticality**
  Packages containing fissile material must comply with specific requirements, and require a multilateral approval. Beside this aspect, they have also to comply with the other requirements of the regulations. If the activity transported in the package exceeds a given amount, then the package must satisfy the requirements applicable, for instance, to Type B(U) packages. In this case, the package is twice approved: first as a package containing fissile material (multilateral approval), and second as a Type B(U) package (unilateral approval). Globally, it is considered that the approval is of a multilateral nature, but it is world wide accepted that the validation process in a foreign country should only deal with the fissile aspect.

  Recently, additional requirements from some competent authorities appeared, in reaction to some very sensitive events.
  An example can be provided with the contamination issue. In 1998, it was made known to the public that a significant number of transports of spent fuel in Western Europe had taken place over several years with surface contamination values locally higher than the international threshold. This had as consequence to modify the validation process. More precisely, competent authorities of countries where validation was requested made their own assessment of compliance to the regulatory requirement which deals with necessity for packagings to be, as far as practicable, “so designed and finished that the external surfaces […] can be easily decontaminated”. In addition, those authorities also scrutinized the decontamination procedures, as well as the procedures to measure the residual contamination, in association with the quality assurance program that enables to bring confidence in the appropriate implementation of these procedures. It was recognized by these authorities that this was neither in the spirit, nor to the letter of the IAEA Regulations to proceed like this, but these authorities were submitted to such pressures that could not lead a different result.

- **Beyond the regulations**
  When the history of transport of radioactive materiel will be written, the chapter that deals with the transport of enriched uranium hexafluoride (UF6) will not be the thinnest. UF6 is universally transported in cylinders named 30B, protected by overpacks in order to withstand the regulatory

drop and fire tests. Criticality assessment of these packages is a difficult and controversial issue, particularly regarding the assessment of a single package when considering water in-leakage. In view of this almost unique situation of a package used worldwide, and which modifications would involve dramatic changes in many facilities, the regulators tailored specific requirements in the last edition (1996) of the IAEA Regulations for these packages. These requirements take into account the features of the material and of the packaging in order to provide the appropriate level of safety, whilst avoiding undue changes to the enrichment and fuel fabrication industry.

For several decades, the difficulty to match packages transporting UF6 in the regulatory framework lead US competent authorities to impose a Criticality Safety Index (CSI) (Transport Index – TI – in the former editions of the IAEA Regulations) equal to 5 for these packages. With the newest wording of the IAEA Regulations, these difficulties vanish and it could be expected that, if appropriate demonstration is provided, a lower CSI should be assigned to the packages. This is particularly important for the industry, when dedicated ships must be chartered: to load the highest number of packages on a single ship is an economic challenge. The first signals we have received from US do not lead us to expect a significant relief on this matter. It is our understanding that, for safety reasons far beyond regulatory requirements, a reduction of the CSI will require additional safety measures, over the demonstration of the compliance with the regulations.

COMMON APPROACH TO THE REGULATIONS

Single regulations?

As already mentioned, the IAEA "Regulations for the Safe Transport of Radioactive Material" are generally implemented through regional and / or national regulations, and / or modal regulations. The IAEA Regulations are the common basis for all these regulations. Nevertheless, some differences can be identified. While most of them are definitely minor, some may have a significant impact.

Sequencing for drop tests can provide a significant example.

For Type B(U) and Type B(M) packages, as well as for packages containing fissile material, tests for demonstrating ability to withstand accident conditions of transport include typically two drop tests: a punch test (1-meter drop of the package onto a bar of circular section – 15 cm in diameter), and a 9-meter drop test (9-meter drop of the package onto a flat and unyielding surface). The IAEA Regulations prescribe that these tests must be performed in the order which leads to the maximum damage, while the US regulations specify that the 9-meter drop test must be performed first and the 1-meter punch test second.

Should the applicant and an authority with regulations based directly on the IAEA Regulations (verbatim copy) agree that performing the punch test before the 9-meter drop is the most damaging sequence, what happen if the applicant further needs a validation in US? It can be expected that he will able to demonstrate that his proposal is conservative versus the US regulations, but in some cases non-compliance to the letter of the regulation can be a problem.

On the other side, to obtain validation of a US package design approval may raise difficulties. Compliance with the US regulations does not provide full guarantee of compliance with the IAEA Regulations: the US regulations may, in some cases, appear less demanding than the international regulations, regarding this aspect.

Single understanding?
Even when the wording of the regulations is the same, discrepancies may occur regarding its understanding.

For instance, let us consider the punch test. For Type B(U) and Type B(M) packages, as well as for packages containing fissile material, the tests for demonstrating ability to withstand accident conditions of transport include a punch test: 1-meter drop of the package onto a bar of circular section. The target on which the bar is mounted must be unyielding.

During a long time, it was understood that the "unyielding" feature applies to the area where the bar is mounted, and not to the area surrounding the bar. Nevertheless, a competent authority questioned this understanding, and requested that the entire target surrounding the punch was unyielding. Consequences were dramatic for large dimensions and large aspect ratio packages that are punched on one end: the secondary impact, on the flat surface around the bar was quite significant. In other terms, this interpretation of the regulations led to add to the usual 9-m drop test and punch test, an additional test with a height (for the center of gravity) of several meters. In the mean time, experience showed that this interpretation was not considered in other countries.

Single implementation?
An example of difficulties in the implementation of the regulations has already been given previously, and is recalled here.

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HOW TO MITIGATE THE DIFFICULTIES?

To inform authorities
Variable behaviors of European authorities in response to application for validation against the regional regulations has been described.

What can be done when facing such issues? An answer could be to bypass countries with the "tougher" behavior and to give preference to a route with a country of entry into Europe with a "more friendly" competent authority. This should not be a responsible solution. On our side, we advocate for a homogeneous approach of all the competent authorities, and take all the opportunities to claim that, either in bilateral meetings with competent authorities, or in various fora, particularly in conferences, where industrials has a good opportunity to send messages towards competent authorities. We should remember that in the 60's, French regulations allowed to carry a package approved, in any country, under the provisions of the IAEA Regulations, without any specific application in France. It should be our goal to develop the conditions so that this becomes in the future the common rule.

To keep close contact with authorities

When developing a new package design for which we intend to apply for an approval in France and whose demonstration of compliance requires drop tests on a prototype or a scale model, we usually prepare a detailed drop test program (with the orientations of the packaging, points of impact…), including all justifications to demonstrate that the selected attitudes of the model, as well as the sequences of tests, are the most damaging. This documentation is then provided to the French competent authority, who then is able to assess these preliminary justifications. It should then be possible to get confidence that implementing this program should allow adequate level of quality for demonstrating the satisfactory behavior of the package during accident conditions of transport. If necessary, the program is revised to take into account the comments from the competent authority (it is recognized that assumptions about the expected behavior of the package are made at this time, and that the results may lead to reconsider the adequacy of the program). On the basis of the results of the tests, we prepare the Safety Analysis Report of the package, in order to demonstrate full compliance with the applicable regulations. After review of the Report by the competent authority, as well as its revision to deal with the questions raised by the competent authority, approval is granted by the French competent authority.

At this end of the process, the next step is the application for validation. At this stage, should a foreign competent authority disagree with choices made for the tests, then that would correspond to a big step backwards.

When validation in foreign countries is planned before starting design and justification of compliance with the regulations, considering some negative experiences, it is now our policy to involve almost in parallel the competent authorities of the country of origin of the design (France in general) and of the country where it is intended to apply for validation. This allows considering an envelope of the requirements of all the competent authorities for which it is necessary to comply with. Variable expectations can be due either to variations in the wording of the regulations, or to variations in the assessment which is made of the application. This behavior is the best to allow a smooth licensing process. Nevertheless, additional time and cost linked to this necessity, as well as risk to make the project non-viable, due to addition of layers of regulations, cannot be ignored. It must also be kept in mind the potential decrease in the payload of the packages, which may lead to increase the number of transports, difficulties with public acceptance, and, overall, decrease of safety.

To be involved in preparation of regulations

It has been our policy for a long time to follow carefully the evolution of the regulations. In order to mitigate risks of different understanding of the international or national regulation, we propose realistic amendments facilitating the day to day life while maintaining the appropriate level of safety.

Several examples of our work in this field are provided hereafter.

- We recognize that French competent authority involves French industrials in the revision of the IAEA Regulations, as well as of the French regulations. Consequently, we have opportunities (and we take them!) to propose modifications of the regulations, as well as to comment proposals made by others, either at French level or at international level. Particularly, we take care that the regulations are clear, simple, and with a wording that can be understood by all authorities, as well as by all applicants in the same manner.

  For instance, in front of various understandings of the punch test mentioned in section 3.2, during the current revision cycle of the IAEA Regulations, we proposed through our competent authority,

to clarify the purpose of the punch test and the way it has to be implemented. An "Identified Problem" was submitted to the 2000 Revision Panel, and two possible wordings for the next revision of the "Advisory material for the Regulations for the Safe transport of Radioactive Material" (ST-2) were proposed for discussion and review by the Member States. After discussion, a consensus was reached and a new text should be included in the next revision of ST-2, if the proposal passes the next steps of the revision cycle: *"The bar is required to be mounted on a [unyielding] surface […]. The damage due to a drop onto a flat surface is expected to be assessed with [the 9 m drop test]. Therefore, it is not necessary that the secondary drop due to [the punch test] induces additional damage. The surface that surrounds the bar does not need to meet the requirements set forth [for an unyielding surface]. However, the surface that surrounds the bar should not reduce the energy absorbed during the impact of the package onto the bar."*

- We participate to meetings where the regulations are discussed. This can be done either directly, or as a member of French delegation, or through recognized International Organizations. As such, the benefits to participate actively in the preparation of international standards are two folds (balancing the workload induced!). The first and obvious benefit is to be involved in the preparation of standards. On the other hand, the organizations in charge of developing the standards are generally also involved in the development and/or revision of the regulations. Therefore, the second benefit can be to belong to the delegations of these organizations in meetings where the regulations are discussed; consequently, it is another opportunity to be a direct stakeholder in the establishment of the regulations.

- The World Nuclear Transport Institute – WNTI – was built to represent the collective interest of the industry at the international level. It is a place where regulatory issues can be discussed, and common positions established. This organization has the possibility to echo these positions towards the regulators, in order to get revised regulations more clear; WNTI can be an efficient way to represent the industry in the bodies in charge of establishing the regulations, at the international levels (at the IAEA or in the modal organizations). This is why we play an active role in this organization. At the national level, organizations, such as the Nuclear Energy Institute (NEI) in the USA, can also defend the collective interest of the industry and promote consistency between national and international regulations.

CONCLUSION

Fair competition, as well as free trade, is not possible without predictable costs and time schedule. Common regulations, understood in a common manner and implemented in a common way, is a prerequisite to predictable costs and time schedule, and consequently fair competition and free trade. For that purpose, it is important that the IAEA "Regulations for the Safe Transport of Radioactive Transport" remain the common basis for regional and national regulations, and also for modal regulations.

A process has been launched to revise the Regulations with a two-year cycle. It has been widely proven during more than 40 years that the IAEA Regulations ensures safe transport. Whilst it is quite worthwhile to permanently improve the IAEA Regulations, it is also important that their spirit and their letter are enforced in the same manner in all countries.

Examples that show that this target will not be reached in the near future are numerous. Nevertheless, it is needed to take the necessary actions to get uniform rules based on single international regulations. It belongs to the industry, and to companies like Transnucléaire, to play an important role, regarding this goal. Being involved, individually and collectively in the process of establishing

and revising regulations, allows to improve regulations, and to promote consistency between all the texts and to ask for regulations which will be understood by all in the same manner. In order to have the best understanding of each individual competent authority requirements, it is also important to keep a close contact with all authorities who will be involved in the approval and validation process of a new package design (not only the country of origin of the design), as long as common regulations, understood and implemented in the same manner everywhere, do not exist. In addition, it is also crucial to take all opportunities, including bilateral meetings with authorities and conferences where numerous authorities are present, to emphasize these issues and to increase their awareness.

Other subjects linked to the importance of uniformity of the regulations need also consideration, and were not developed due to lack of space. Among them is the importance that new requirements developed in the framework of the IAEA, after a long and difficult process are effectively implemented in applicable regulations: the way the newest requirements of the 1996 edition of the IAEA regulations dealing with the transport of UF6 (enriched or not), or dealing with the transport by air of large quantities of radioactive materials (Type C packages) will be effectively implemented can be a subject of concern. Another item is the importance that internationally recognized standard may play for a better implementation of the regulations: it is certainly one of the most challenging issue of the future.