

# THE DENIAL OF SHIPMENTS OF RADIOACTIVE MATERIAL: A WORLDWIDE SOCIAL PROBLEM

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**Abstract.** Radioactive material is used in medical diagnosis, therapy, industrial applications, production of nuclear power and research purposes. Every day a few million diagnostic procedures are carried out all round the world using radioactive material. Despite the strong safety record and general good performance, concerns remain regarding the transport of radioactive material. While a governmental and non-governmental bodies have safety and security concerns, other feel that the current regulation is adequate. The increase in denial and delay of shipments of radioactive material is not only generating economic problems but also it is mainly turning into a social concern since it is affecting globally the possibility of making an adequate peaceful use of nuclear energy. Perhaps this problem can be considered a worldwide social problem.

## 1. Introduction

Radioactive material is used throughout the world for many applications that benefit humankind, encompassing agriculture, industry, medicine, electric power generation and research purposes. In almost all cases, the materials are generated in locations other than those where used, and the resulting radioactive wastes are usually moved to other locations. The transportation of the radioactive material places it outside of controlled facilities, in the public domain, and often entails movement between countries. As the peaceful uses of radioactive material grew, the international community recognized early on that rigid and uniform standards were needed to ensure the safety of handlers, the public and the environment. Because of their short half-lives, denial and delay of transport of radionuclides like fluorine-18 or Iodine-131 has a strong and negative impact on health care.

The issue of denial of shipments is not just for specialists but affects the lives of millions of people around the world. The majority of the radioactive material shipped every day is used in hospitals for diagnostics and treatment of several illnesses. Any delay or denial of shipment may render the isotopes useless for their intended application. Delay and denial of shipments of radioactive material occur in all modes of transport. Then the transport of radioactive materials is vital to the use of such materials in medicine, general industry and in the nuclear fuel cycle.

We can say that the growing problem of refusal by carriers, ports and handling facilities to transport radioactive material are generating both social and economic problems and not only needs to be addressed with a lot of attention but also requires a quick solution.

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## **2. History and Background**

The transport of radioactive material has been subject to regulation for many decades, and the International Atomic Energy Agency (IAEA) , working with its Member States and all relevant international governmental organizations, has played a key role in fostering the establishment of those regulations and providing for their application. Soon after the creation of the United Nations more than 50 years ago, the international community initiated efforts to harmonize practices for the safe transport of hazardous goods, including radioactive material.

First published in 1961, the IAEA's Regulations for the Safe Transport of Radioactive Material are periodically revised to incorporate technical advances, operational experience and the latest radiation protection principles. This current worldwide system of regulatory control, while not without shortcomings, has achieved an excellent safety record. Over several decades of transporting radioactive material, there has not been an in-transit accident with serious human health, economic or environmental consequences attributable to the radioactive nature of the transported goods.

This excellent record demonstrates the positive influence of the IAEA's Regulations for the Safe Transport of Radioactive Material. However, even the best standards cannot ensure safety if they are not widely and uniformly interpreted and applied. The experience shows that this is not always the case today.

## **3. The Issue**

A major issue for users of radioactive materials is the denial of shipment by some carriers, sea ports and airports. There are problems with all modes of transport sometimes due to the perception of possible hazards rather than the reality. For example some maritime carriers and harbours have refused to transport and handle radioactive material, although the risk created by the material is very low: even excepted packages have been refused. The classification as 'radioactive' gives rise to a negative prejudgement that often makes it impossible or difficult to transport this kind of dangerous goods. Similar perception is not apparently frequent in the case of the other classes of dangerous goods. These situations, which are linked to perception and not to safety issues, may negatively affect future transports by sea, air and road. In order to allow a suitable and safe transport of radioactive material, it is necessary to investigate what actions should be adopted to avoid these problems.

This kind of problems cause a lot of negative consequences in the peaceful use of nuclear energy. Also generates economic problems and a very important negative social impact which is the case of medical applications. On the other hand it should be added that the IAEA is suely, in some cases, experiencing difficulties in fulfilling its technical cooperation commitments to developing Member States as a result of these denials of shipments of radioactive material.

## **4. Negative consequences of denial and delay of shipments of radioactive material**

### **4.1 The IAEA and the peaceful use of nuclear energy**

On 4 December 1954, the United Nations General Assembly unanimously passed an "Atoms for Peace" resolution expressing the hope that an international atomic energy agency would be established without delay to facilitate the use by the entire world of atomic energy for

peaceful purposes, and to encourage international co-operation in the further development and practical use of atomic energy for the benefit of humanity.

Later, the Resolutions adopted by the General Assembly 32/50 about Peaceful use of nuclear energy for economic and social development considered the following declaration : “ The use of nuclear energy for peaceful purposes is of great importance for the economic and social development of many countries”.

Nowadays, people in many countries around the world are seeing benefits of nuclear technologies in their lives, through IAEA-supported projects in fields of health care, water management, agriculture, and industry, for example.

The IAEA works to mobilize peaceful applications of nuclear science and technology for critical needs in developing countries. The IAEA is the world's focal point for scientific and technical cooperation in nuclear fields. The work contributes to fighting poverty, sickness, and pollution of the earth's environment, and to other global “Millennium Goals” for a safer and better future.

On the other hand, the International Atomic Energy Agency was assigned the task, within its statutory mandate, of developing, maintaining and providing the application of safety standards for the transport of radioactive material. These standards were first issued almost 50 years ago, and have since been updated periodically to account for the changing environment in which the material is transported, changes in the types of material transported, and in the modes by which they are transported, road, rail, sea and air.

A number of techniques developed and applied with the IAEA's assistance are significantly contributing to the solution of serious problems hampering social and economic development. The growing problem of denials of shipment of radioactive material should be considered also an obstacle for the IAEA to comply with their main objectives and goals.

#### **4.2 Negative social impact**

According to industry statistics 85,000 nuclear medicine procedures are carried out around the world every day. Additionally, radioactive material shipped every day all over the world is also used in a multitude of industrial applications, research and development, and in the generation of electricity and power. With an estimated 75 million medical treatments involving radioactive material taking place annually, rejection or interruption of shipment can have a deleterious effect on patients receiving cancer treatments or those awaiting diagnoses.

Denials or delays in international shipments of radioactive material, including short-lived isotopes used for medical diagnosis and treatment, are being reported more frequently. Many countries import isotopes used to treat cancer, diagnose heart attacks or sterilize medical equipment. Hospitals and clinics depend on these international shipments to arrive on time, particularly if the isotope has a short half-life and must be sent by air. Since then, If an airline or other transport provider refuses to take a shipment, or is unable to take a shipment, then this increases the prospect of someone missing a cancer treatment. Isotopes with short half lives, such as iodine used to treat and detect thyroid tumors, become useless if they miss a flight. Or if they miss a flight and make a later one, their use is limited.

There is a risk that if more airlines do deny, particularly where few airlines serve key regions, then this does raise a serious issue. It potentially means that medical clinics and hospitals in specific areas are at risk from being denied essential medical supplies. For all these considerations, the increasing difficulties in delivering lifesaving isotopes require a quick and urgent solution for the international transport.

### **4.3 Negative economical impact**

Denial and delay of shipments produce many economical issues. It depends on the stakeholder involved on the matter, but economical problems are produced and increased from every situation. For instance in the case of companies as customers of the air and maritime companies, denial and delay of shipments produce economical problems. They produce lost of money, time and image for companies. Also there are problems with many air and maritime companies and also road companies. Instead of transporting radioactive material that needs many different documents and segregation, they prefer to transport goods with no so many exigencies and they win more money; they have less problems and they will not be exposed to problems with authorities.

Some air companies prefer to transport luggage of the passengers than to transport dangerous goods. Transportation of radioactive material means special training for personnel in each airport; audits from regulatory authorities; costs of insurance and perhaps problems to board in some harbor that affects economical issues.

In the world there are many hundreds of workers involved solely with transporting radioactive materials and many thousands of workers occasionally involved in such operations. There are millions of specially designed and manufactured containers and a large number of dedicated vehicles associated with the movement of radioactive materials.

Transport of radioactive materials is essential to the nuclear industry. Careful attention is given to all stages of the design, manufacture, testing, use and maintenance of all the equipment involved.

Radioactive materials are important to the economic and social well-being of the people. The safe transport of such materials is necessary for their continuing use. The denial and delay of shipments of radioactive material are generating many economical problems with a negative impact.

### **5. International Steering Committee**

Considering the problem of denial and delay of shipments of radioactive material and in response to the General Conference resolution, the IAEA Director General created a senior level Steering Committee including representatives from IAEA Member States, International Governmental and nongovernmental organizations and industry.

A strategy and an action plan were developed to significantly reduce cases of denial of shipment and alleviate the hardships due to denial and delay by reaching out to the concerned organizations and increasing awareness about the uses of radioactive material in public health, industry and power production; harmonizing national and international regulations; ensuring coordination among regulators within a State to minimize duplicative, overlapping and sometimes contradictory requirements; providing training and other educational programmes for cargo handlers and public officials on safety of transport of radioactive material.

A strategy for how the steering committee is to operate has been determined and includes the principles: promote education; make a collective effort to share information and experience; report of denials and delay of shipments. The strategy embraces notification, investigation, facilitation or mediation and reporting cases of delays and denials.

### **6. Regional workshop on denial of shipments of radioactive material**

The IAEA has identified that it is necessary to hold regional workshops. As part of its efforts to train workers on shipment of radioactive materials, the IAEA expects to hold regional

workshops on denial of shipments in China, Italy, Madagascar and Tanzania during the first half of 2008. A regional workshop in Uruguay last year was comprised of representatives from shipping companies, transport firms, customs offices, regulatory bodies and security personnel. The workshop held in Montevideo was the first of a series designed as part of the strategy in education, was the opportunity to address the problem at a regional level and it was intended to further the discussion on specific reasons. The results of the workshop should be a regional action plan to prevent or reduce instances of denials of shipments and to alleviate the hardships to users of radioactive material.

## **6.1 Montevideo´s Group**

Under the framework of the TC Project RLA/9/053 “Strengthening National Regulatory Infrastructures for the Control of Radiation Sources” a regional workshop on denials and delays of shipment of radioactive material was held in Montevideo, Uruguay, 12 and 13th July 2007. Thirty-two representatives of sixteen countries attended the meeting and they were a broad representation for the region.

Participants were senior technical staff from organizations undertaking the transport of radioactive material by all modes of transport, carriers, managers and senior technical staff from organizations providing advice to the competent authority. Officials of National Regulatory bodies also attended the workshop. Presentations from participants showed a number of causes and provided good basis for the discussions and preparation of a regional set of actions. It was considered that 2-days workshop did not permit to have enough time for discussion and preparations of proposals and a complete report. It was considered necessary to recommend to the IAEA that perhaps next similar workshop should consider a period of 3-days.

After the presentations the participants were divided in 3 groups, each one in charge of two out of the six areas of actions: harmonization, awareness, economics, education, communication, and lobby. Results from the working groups were presented and discussed in plenary. Conclusions and actions to minimize instances of denials and delays were as follow.

The participants considered that it was necessary to implement some specific actions.

After the mentioned meeting there was too much discussion among the members through electronic communication so it was necessary to pass from the words to the action in order to avoid “paralysis by excess of analysis”.

The technical group was called “Montevideo´s Group”. They implemented some specific actions:

Two technical coordinators were appointed. They are Mr. Lopez Vietri from Argentina and Mr. Mario Mallaupoma from Peru.

It was created a regional data bank on denials and delays of shipments and this actions was considered essential to the communication among countries as well as to allow the other regions to benefit from the experiences on the Montevideo group.

It was considered very important to organize working groups in members of Montevideo´s Group and establish a fluid communication. All the actors should be involved in the efforts to solve or minimize the issue of denials.

There were some conclusions of the Workshop in Uruguay. In order to minimize instances of denials and delays were considered the following aspects : there is a need for qualified information on transport of radioactive material. It seems to be the cause of misunderstanding and misinterpretation of requirements and denials and delays in

transporting this class of dangerous goods. Communication among authorities both at a country and at regional level is not satisfactory. A number of reported instances could be avoided if a efficient communication in the region could exist. Front line personnel (cargo handlers, customs, shipping agents, carriers) need education and training.

## **6.2 Specific actions taken by the Montevideo´s Group**

The first activity of the group was to adapt a little bit the Record Form performed by the International Steering Committee, which would permit countries to submit data on Denial of Shipment to the co-ordinators. It is noted that the Record Form is now available in English, Portuguese and Spanish languages to facilitate communication. Also was included an area for its codification and another area for observations.

The Montevideo's Group considered necessary to develop a Procedure to define the steps to be followed for submitting data in the Report Form, and to assign a code. Such code is intended to identify the country, the mode of transport associated to the denial or delay, the place of occurrence of the event, the type of package involved, the order number of the event assigned for each country, and the year in which the event occurred. At present various members of the Montevideo´s Group has made the respective report about denial and delay of shipment of radioactive material.

Communication among authorities both at a country and at regional level is not satisfactory. A number of reported instances could be avoided if a efficient communication in the region could exist. Besides it is very important the Communication among the entities involved in the transport of radioactive material. Taking in account all those aspects it has been developed a website. We can say that website has permitted to increase a better communication and the interchange of many heavy important documents. It is a good tool for communication.

Front line personnel (cargo handlers, customs, shipping agents, carriers) need education and training. The initiative of some members of the Montevideo´s Group like Brazil and Colombia has permitted the development of technical courses. The respective technical material prepared by Brazil has been put in the website of Montevideo`s Group for permitting the respective use by members if they need it.

It has been elaborated and developed a preliminar calculus page for analyzing the negative economic impact produced for the delay and denial of shipments and a simple Data Base to collect and storage the technical information of the record Form. Both documents were sent as a proposal to members of the Montevideo´s Group for their respective comments and now they are analyzing them for giving their respective comments.

## **6.3 Technical reports of denial and delay of shipments by Montevideo`s Group**

Two technical reports have been prepared in Spanish language by technical coordinators about denials and delays reported by members of Montevideo`s Group. One of them consider the period from September to December 2007. Another one consider the first semester of the year 2008. Between September 2007 and July 2008, a total of 48 reports of delays and denials of shipments (41 delays, 7 denials) were reported to the technical coordinators of Montevideo´s Group. Of these 47 reports concerned air transport , while one case concerned sea transport mode. In terms of the most common types of radioactive sources involved, 23 reports concerned iodine-131 (which has a half-life of eight days and is used in medical diagnosis), 14 fluorodeoxyglucose (a solution used for medical imaging incorporating fluorene-18, which has a half-life of just under 110 minutes); one cobalt-60 (which has a half-life of 5.27 years and is used in radiotherapy for cancer care, among other applications) and other cases consider other radioisotopes like iridium-192, a source emitters

of neutron ( Pu-Be). Besides 46 packages were type A and 2 packages type B. As we can observe from the reports basically radioisotopes used for medical, industrial and public health applications have experienced denials or delays in transportation.

Common reported reasons for denial of shipment identified are : perceived training needs of cargo handlers; lack of harmonisation of multiple regulations and authorities with different levels of knowledge concerning radioactive material; security requirements increasing and becoming more restrictive; increasing public perception that any radioactive material is dangerous; concerns about insurance in the event of a mishap during transport or storage; conflicts in legislation for different modals of transport and public perception about risk of transport radioactive materials.

On the other hand despite the excellent safety and security record, some shipping companies, air carriers, ports authorities have issued policies not accepting radioactive materials for transport or even in transit storage. In a broader view, some shipping companies decided for commercial reasons not to carry radioactive materials or to avoid the risk of losing more profitable business. The data shows that one of the main reason is airport infrastructure. It can be noticed too that the shipments containing F-18 and I-131 are the main concern because this material has a short half life and need to arrive in nuclear medicine centers on time to be used.

#### **6.4 The importance of the Regional work**

In a new strategy to avoid or decrease denials and delay cases it is necessary to consider a higher involvement of the regional work. The regional work should join forces to develop alternatives of solutions in common problems like this. Also the participation of stakeholders is very important. It is necessary greater integration of common efforts in different worldwide regions, and the participation of both governments and the private sector to find alternatives of solutions for the denials of shipment of radioactive material as a way of boosting social and economic development. It is necessary not only the starting with simple actions but also maintain a reviewed and updated strategy from the IAEA for the involvement of committed actors. Many important initiatives can be given by regional working groups. It will be required perhaps the integration of national, regional and international regulations.

#### **7. Conclusions**

- 1<sup>st</sup> A regional network would allow participants to share their experiences and lessons learned as well as identify and disseminate best practice. It is essential for resolving problems. The regional work will permit the exchange of information among senior specialists and this will lead to important findings that can be submitted to the IAEA's policy-making.
- 2<sup>nd</sup> It is necessary to focus the attention in improving the strategy against denials and delays in order to prevent the occurrence of them. Always it is better an appropriate prevention instead of remediation actions.
- 3<sup>rd</sup>. Successful communication and strong cooperation between a range of partners is another essential activity for avoiding or reducing denials. There is a need of better communication among carriers, consignors, competent authorities and local and World organizations like International Maritime Organization, International Civil Aviation Organization, International Air Transport Association and International Federation of Airline Pilots Association.

- 4<sup>th</sup>. It will be necessary to reinforce the participation of partners and stakeholders to identify strengths and weaknesses of the respective strategy against denials.
- 5<sup>th</sup>. It will be necessary to consider a new meeting for members of Montevideo's Group to analyze and discuss the results obtained in the implementation of the different actions.
- 6<sup>th</sup>. It will be necessary to analyze and evaluate the economical and social impact produced on denials of the transport of radioactive material.

### **Acknowledgements**

The author wishes to particularly thank Michael Wangler, Natanael Bruno, Jorge Lopez Vietri, Ana Celia Sobreira and Alejandro Nader for their invaluable help in the work developed by the Montevideo's Group.

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