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The Good, the Bad and the Beautiful

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In his set of diaries in which he reports on his early work in the discovery of plutonium, Dr Glenn Seaborg writes on 30 July 1943: "Bob (Wilson) returned the 200 microgram sample of plutonium-239, which he was guarding with his personal Winchester 32 deer-hunting rifle… With the sample in my suitcase, Helen and I took a bus from Santa Fe to Lamy, where we boarded a morning Santa Fe train for Chicago." Obviously, times have changed.

Today we find a comprehensive system of national and international safety and security regulations for nuclear materials transport, that encompasses packaging, carriers and documentary information. But how did we get from the wartime transport to the current system more geared for the nuclear fuel cycle and the radiopharmaceutical industries? On the occasion of the 25th anniversary of the Uranium Institute, let us look back to the roots of the nuclear transport industry. I have called this paper "The Good, the Bad and the Beautiful". At the end of the paper I think you will understand, and I hope you will agree.

So let's start first with "The Good".

In fact the early nuclear transport industry was not a haphazard development. With the dawn of the peaceful uses of atomic energy, a vision was born. In many ways, this vision of cheap power and unlimited use of atomic energy to serve mankind has hindered the development of the nuclear power industry, as the promise was not met. However, the promise of safe, reliable, cost effective transport of nuclear materials was met. Unfortunately, this fact is not well understood by the public, let alone our elected officials or even many in the nuclear industry itself.

It became obvious that in order to ensure a cohesive international transport regime a common approach to regulation needed to be developed. The initial transport of radioactive materials was developed in the USA, and to a lesser extent in the UK, to support military programmes. With the movement to civilian development through President Eisenhower's Atoms for Peace programme, it became obvious that other controls needed to be developed.

At this time, I believe the key decision was made: radioactive materials need to be incorporated into the normal transportation system and to be treated like any other hazardous material. This became the benchmark for the development of international regulations, and thus the sub-layer of corresponding national regulations.

In my early days within this industry, I spent much time with a key individual within the US government. He worked for an agency which would today be part of the US Department of Transportation. His name was Bill Brobst. Al Grella and many others succeeded him. They are referred to as "the competent authority". Each country as a signatory to the treaty establishing the IAEA was

required to establish such a competent authority. They are an extremely professional group of men and women, usually drawn from the transport industry, typically with a background in hazardous materials.

It was this group of people who early on decided that in order to move radioactive materials (because that was the goal), the industry needed a workable method to do so, just like other hazardous materials such as flammables, corrosives and others. To accomplish this, the materials needed to be rendered safe to the public and transport workers during transport and even during accident conditions.

In order to meet these goals, strong durable packages needed to be developed. This packaging was the first line of defence to contain the materials. Tests were developed, including puncture, drop, fire and immersion tests. The standards were rigorous and, for the most part, the packages which were developed were robust. In order to avoid duplication of regulation and testing, a method of multilateral approvals was developed in which countries accepted the package approvals of others. This system worked.

At first, many carriers were reluctant to engage in the transport of this new form of material. But as they became more informed, there was a growing acceptance of this clever system of protection through packaging. Of course, there were many other regulations regarding paperwork and, in some countries, carrier selection. Later, in the 1970s, when hijackings and terrorism became a security issue, it became necessary to establish certain security regulations as well.

In any case, each year millions of packages of radioactive materials, including those for medical and industrial uses as well as nuclear power purposes, were safely carried within countries as well as internationally. It was a good story, which showed how an industry could self-regulate, establishing and modifying regulations as needed.

But however well conceived the regulations and systems are, the nuclear transport industry is one which recognises that accidents will happen; and, of course, they did happen. Not often, but sometimes with major impact. It is this which I refer to as “The Bad”.

As I think back over more than 30 years involvement in this industry, three transport accidents stand out in my mind as significant. Two of them went little noticed to the public but had a major impact on the industry; the third, the sinking of the *Mont Louis*, had a wider impact.

A day or two before Christmas in 1971, a package containing a liquid radioisotope leaked on a Delta Airlines passenger aircraft. Because of the holiday, the recipient company did not discover that the package had leaked for five days. Meanwhile, the aircraft was in service with a contaminated cargo/luggage hold, and several workers and a few passengers who sat directly above the area were exposed to higher than usual doses of radiation.

No injuries resulted, but the accident pointed to the need to limit the shipment of liquids and, when transport was necessary, to ship them surrounded with absorbent material. An industry task force under the auspices of the then Atomic Industrial Forum proposed standards that were accepted, and to my

knowledge no other shipments of liquid radioactive materials has become involved in a similar accident. While it might have been anticipated, the accident did bring into effect the necessary new regulations.

My memory of the exact date of the second accident is incomplete and I could not find it in a literature search, but I believe it to be 1977. Exxon Nuclear had a uranium mine in Wyoming and one day a truck carrying uranium ore concentrate was involved in an accident that resulted in a number of the drums being breached. The accident was made worse by the wind that day. The uranium was spread over many acres, and because of the remoteness of the location emergency response was slow.

At that time, mobile phones were limited to the radio variety and were not in common usage, so help was not summoned immediately. It was a mess and it took days to clean up, including the removal of a lot of topsoil from Colorado. While local publicity was substantial, since the accident took place near the mining area, reaction was not so adverse. Nationally, there was little notice. There may have eventually been a Congressional hearing by the Joint Committee on Atomic Energy which led to more attention being paid to emergency response.

This too was a worthwhile development. We all understand the importance of the first responders, be they fire or police. They need to be trained to react to whatever they find at accident scenes. But more so, they need to have the necessary equipment to deal with the emergencies they face. To equip every fire and police department is a daunting task. Even though many routinely maintain certain equipment such as respirators, it was determined by an industry working group that basic emergency response equipment relevant to the material being shipped should be included in an emergency response kit to be included with the shipment. Thus respirators, spare valves, tarps and tools should go along with the shipment. This is an industry practice, not a regulation. I cannot say that all members of the industry abide by it, especially in these times of tightening budgets, but it is a good practice born of a bad incident.

The third and most significant accident was the sinking of the *Mont Louis* in the English Channel with uranium hexafluoride on board. This accident was notable not because of any spillage (there was none) or loss of life (none again), but rather for its visibility and the response from politicians. It became a huge news item internationally and was covered by all major news organisations. This was made worse by the salvage company, which delayed the removal of the last few cylinders in an effort to take advantage of the climate of press attention and to extract some additional compensation.

We had entered the era of instant media focus. Whether it is oil spills, storms or aeroplane crashes, press attention is more immediately focused than ever before. In fact, in this case there was no spill and no danger to people or even shipping, and the goods were recovered. Yet this was very bad news for the radioactive materials transport industry as it raised public awareness and also brought it more to the attention of the carriers who had been routinely carrying these materials. Of course, the entire nuclear industry has become more politicised, partly because of accidents but also because of general attention and public concern. The nuclear transport industry had started on the path of vulnerability and was often referred to as the "weak link". Nothing could be

further from the truth. The record of this part of the nuclear industry is remarkable for its safety.

So, now I come to "The Beautiful" in my history. This is the future part. I believe that this superb record of safety can serve the nuclear industry well in its revival. There are millions of shipments each year, including medical doses needed by patients. We need to educate the public about exactly how well we have done. Sure there have been accidents, and there will be more, but this does not stop people from flying. The same needs to be understood about the transport of radioactive materials.

We can not give in to those who would create an atmosphere of fear by referring to "mobile Chernobyls". I believe that the nuclear industry should begin a campaign to educate the shipping industry, including ocean carriers and where relevant air and land carriers. These organisations, along with the first responders, can act as effective advocates because they will be seen by the public as unbiased. Open houses and public demonstrations of the technology of nuclear materials transport, such as ship tours, are also an effective means of communicating our expertise.

I doubt if we will ever go back to the days of Dr Seaborg's style of transport; nor should we. However, we have a wonderful history, begun by a group of people who had a vision — a vision of a future for nuclear power and how to transport the materials needed within existing systems, using specialised packaging but normal in all other aspects. We need to build on this as we approach our beautiful future.