

## **Approaches for Communicating Technical Information – 16012**

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### **ABSTRACT**

Projects within the nuclear industry are generally complex and associated with high hazards. To achieve success there is often a necessity to apply innovation or adopt longer term strategies and solutions. Because of these long timescales and the fact that some approaches revolve around allowing natural radioactive decay to take place prior to visible action, the industry is sometimes perceived to be technically unable to make progress with its environmental and waste management obligations.

Work within the industry additionally takes on a high profile and invariably creates greater levels of anxiety and mistrust in the eyes of stakeholders than comparable projects from non-nuclear related industries. Many aspects of the industry are still seen as secretive, environmentally detrimental and “risky” and all components of the nuclear life-cycle are therefore open to external scrutiny. Although communication and engagement has increased greatly over the years, especially in developed countries, there is still room for improvement in this field. Such improvement might relate to the frequency and level of engagement, the subject matter or the actual process itself.

Communication with stakeholders is required throughout the various phases of the nuclear lifecycle whether the activity relates to mining/milling of uranium, fuel production, operational plant activities, decommissioning, remediation or waste management. The concerns and aspirations of stakeholders during these different activities will vary but need to be adequately addressed.

Some organisations now have a basic engagement program and convince themselves that they are carrying out true engagement. But just ticking a box to say that an engagement program is in place does not provide evidence of its appropriateness or success as on many occasions’ organisations might still not understand how to adequately engage and communicate technical information. It is not always the information we choose to communicate but that which might be withheld that is often perceived to be most relevant to the stakeholder community.

Communicating technical information isn’t as straightforward as it sounds, but still has to be undertaken, otherwise trust, understanding and acceptance of chosen options will not be achieved. I utilise what I call the “ten principles of engagement” which I believe can help when communicating technical Information in relation to nuclear and radiological matters. These are;

1. Develop TRUST!
2. Educating people and providing information in a transparent manner.
3. Develop an engagement process that is truly a two way process.
4. Openly discuss risk perception and risk communication.

5. Never try to trivialise risk.
6. Where possible, simplify the language you use.
7. Put background and naturally occurring radioactivity into context.
8. Explain how radioactive materials are often used in everyday life.
9. Try to demonstrate that you too are a member of the public.
10. Walk the talk – Try to undertake what you wish others to undertake.

Further research is being undertaken to determine if Mental Models might assist with the communication of nuclear and radiological information. A mental model is an explanation of someone's thought process about how something works in the real world. The mental model approach aims to investigate the judgment and decision-making processes of both expert and lay groups, thus allowing a comparison and visualisation of the different views to be made. It is undoubtedly worthwhile keeping a watching brief on the outcome of such research as we strive to improve our communication with the general public.

The aim of this paper is to highlight some simple principles and approaches that can assist with the communication of technical information.

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## **INTRODUCTION**

Communicating technical information, irrespective of the particular industry you work within, is never an easy task, whether it is to your colleagues, friends or family members. Undertaking such a task to the people that for various reasons you need to impact and influence is even harder. You are often caught somewhere between wishing to impress them with your vast knowledge and dumbing it down into a more simple language so that they can follow the conversation. Communicating such information from the nuclear industry is also often treated with suspicion and fraught with extensive counter arguments.

Our work within the nuclear industry generally takes on a higher profile and invariably creates greater levels of anxiety and mistrust in the eyes of stakeholders than comparable projects from non-nuclear related industries. Many aspects of the industry are still seen as secretive, environmentally detrimental and "risky" and all components of the nuclear life-cycle are therefore open to external scrutiny.

Projects are generally complex and associated with high hazards. To achieve success there is often a necessity to apply innovation or adopt longer term strategies and solutions. Because of these long timescales and the fact that some approaches revolve around allowing natural radioactive decay to take place prior to visible action, the industry is sometimes perceived to be technically unable to make progress with its environmental and waste management obligations.

Although communication and engagement has increased greatly over the years, especially in developed countries, there is still room for improvement in this field. Such improvement might relate to the frequency and level of engagement, the subject matter or the actual process itself.

The aim of this paper is to highlight some simple principles and approaches that can assist with the communication of technical information.

## **WHY WE NEED TO COMMUNICATE TECHNICAL INFORMATION**

Information comes in many different forms. Some of it is readily available on company web sites, in scientific papers and journals or increasingly via social media. Some of this information is factual in nature but some is also open to interpretation. Both types often need to be adequately explained and sustained if an organisation is going to gain support for the work it undertakes.

Communication with stakeholders is required throughout the various phases of the nuclear lifecycle whether the activity relates to mining/milling of uranium, fuel production, operational plant activities, decommissioning, remediation or waste management. The concerns and aspirations of stakeholders during these different activities will vary but need to be adequately addressed.

Some organisations now have a basic engagement program and are comfortable that they are carrying out true engagement. But just ticking a box to say that an engagement program is in place does not provide evidence of its appropriateness or success as on many occasions' organisations might still not understand how to adequately engage and communicate technical information. It is not always the information we choose to communicate but that which might be withheld that is often perceived to be most relevant to the stakeholder community.

Successful communication is crucial because the decisions we make regularly require approval. Project and strategy approval may be required from regulators, planning authorities and even the local community.

There are numerous activities within our industry that we need to communicate technical information around and each will be linked to varying degrees of awareness, concern or opposition from stakeholders. If we look at a typical site's lifecycle we know from experience that the various activities will have a slightly different profile to stakeholders. Table 1 below depicts the potential profile and interest that each activity might result in.

**Table 1 – Profile of typical activities during a nuclear site's lifecycle**

<b>Activity</b>	<b>Likely Profile</b>	<b>Interest or Concern</b>
Planning and siting of new facilities	High	There will be a lot of interest in the planning stages for new facilities, especially for new nuclear power plants.

		Because of potential opposition to such facilities and the lengthy process required to gain appropriate finances, technological and safety approval, planning approval etc., the communication of technical information is crucial and all proposals made have to be justifiable and watertight.
Construction	Medium	Once the approval to proceed has been successfully made the interest will generally reduce.
Operation	Medium	An operating site is required to be licensed and regulated and institutional control is in place so again in general the interest levels will reduce slightly.
Radioactive waste management	High	Radioactive waste management creates significant interest and potential concerns, especially when waste materials need to be disposed of in a new facility outside of the licensed site. Concerns around the disposal of HLW and spent fuel are far greater than those around the disposal of LLW and subsequently progress has been relatively slow in this area.
Transportation	High	The transportation of radioactive waste materials, irrespective of the level of radioactivity, generates significant interest.
Decommissioning	Low	Decommissioning activities generally create less interest because they are focussed within the licensed site boundary and institutional control is in place. Interest and profile will clearly increase if the site is a legacy site and/or offsite transportation of resulting waste material is required.
Environmental Remediation	Medium	Environmental remediation is in theory all about improving an existing situation but the activity still generates reasonable interest. This is primarily because people are interested in what contaminants might remain after the remediation process as well as the fact that such work will invariably create wastes which require subsequent disposal.
Accident and Emergency Situations	High	While accidents and emergencies are thankfully rare they clearly can result in high levels of concern and mistrust. An emergency situation might lead to the evacuation of communities and the

		rehabilitation process will be complex and lengthy. How the work and available funds are prioritised will be of primary interest to stakeholders. There is generally less institutional control associated with accidents and emergency situations whose effects spread beyond the site boundary.
Site Closure	High	Closing a nuclear licensed site will generate significant interest. The reasons for this vary but could be due to concerns about the designated site end state, waste management proposals and the loss of local employment.

## THE TEN PRINCIPLES OF ENGAGEMENT

Communicating technical information isn't as straightforward as it sounds, but still has to be undertaken, otherwise trust, understanding and acceptance of chosen options will not be achieved. Whenever I provide training or technical assistance around stakeholder engagement I now utilise and promote what I call the "ten principles of engagement" which I believe can help with the communication of technical information in relation to nuclear and radiological matters (irrespective of whether the project relates to decommissioning, radioactive waste management or environmental remediation).

### Principle 1 - Develop TRUST!

The first and perhaps most important principle revolves around the establishment of trust. We know that in any walk of life trust is extremely difficult to regain once it has been lost, and the nuclear industry is no different. If you have not developed trust your project is likely to fail.

Where possible it is always beneficial to utilise those individuals to engage with citizens who will have a greater chance to be trusted. These individuals may have a communications background and work within your organisation, they may reside within the local community or may have a medical or religious background/role. If the individual used for engagement does not live locally it will invariably be harder for that individual to be trusted. Integrity is also important in that you must undertake what you say you will and never promise something which you eventually cannot for whatever reason carry out.

### Principle 2 - Educating People and Providing Information In A Transparent Manner

People need to understand more about the work our industry undertakes and any potential impacts (if any) it might have on human health and the environment. This can be achieved through being more transparent around the decisions we make and the results of our work. We need to educate people more about background radiation, the use of radioactive materials in everyday life and how we utilise the principles of dose targets and risk in order to support decision making.

Although words like “educate” and “education” are reasonable we have to be very careful as these words can themselves be quite emotive to stakeholders. We have to ensure that such terminology is not interpreted in a way that makes scientists and decision makers come across as arrogant. It can be detrimental during engagement to give an impression that we think we are more intelligent than other members of the community or that we always know what is better for them. The communication of technical information needs to be undertaken with tact and sensitivity.

### Principle 3 - Develop An Engagement Process That Is Truly A Two Way Process

Merely informing people about your work and hoping that they understand and accept your point of view and the proposed solutions on a given challenge is not always sufficient. A two way dialogue is essential because the only way you can understand other people’s views, concerns, fears and aspirations is by listening to them.

It is important to allow stakeholders to understand all the potential options available before a chosen way forward is ultimately made. This allows them to view the process being undertaken and also to understand that there is always a trade-off between the many different attributes that require consideration. In many instances the potential solutions ultimately rejected would also have been rejected by the stakeholders. Through factoring in their concerns and preferences into the decision making process, stakeholders are more likely to be receptive to the suggestions and decisions put forward as they have had an opportunity to provide their own viewpoint.

### Principle 4 - Openly Discuss Risk Perception And Risk Communication

Because we utilise dose and risk assessment approaches to assist us with our decision making and in our determination of safety we need to communicate what we mean by such terms. The public generally perceive that risks from nuclear and radiological issues are far greater than other risks they might face in their everyday life or those that emanate from other industries. Everyone has their own perception of risk and an individual will invariably believe that they not only understand the risks that they take but that they are able to successfully manage them (usually from experience). When an industry like the nuclear industry places

a risk on individuals or groups they are less likely to accept that risk as they do not feel in control due to the risk being placed upon them by others.

Providing an explanation of the principles of dose assessment and how it links into risk is not a simple task but it is important to openly discuss what we mean by risk and put it into perspective with other risks that people might be more familiar with.

#### Principle 5 - Never Try To Trivialise Risk

As highlighted in Principle 4, scientists often use dose or risk rates/targets to justify the decisions made in relation to the amount of radioactive material that can be left in the ground or safely disposed of. We undertake these assessments and then present the results in a manner that usually provides supportable justification for the eventual decisions we make. The average citizen however doesn't understand the science behind the assessments and perceives that we can conjure up any result we wish to see if we have fed the right parameters into the "black box".

Although dose and risk assessments provide a logical approach to underpin decision making it is again important to communicate better what we mean by risk and how risks can be compared against each other. When we dispose of radioactive material in a disposal facility or leave some residual material in the ground after an environmental remediation program we often explain that the resultant risk is "low" or "within international guidelines".

For many stakeholders such an explanation is insufficient because they would prefer to see no risk at all rather than merely a reduced or minimal risk. We need to explain better that sometimes a balance needs to be made between the reduction of risk and other detrimental outcomes and therefore why sustainable approaches are sometimes adopted which may in many instances lead to some risk (albeit small) still remaining. An example of this relates to the land decontamination work following the Fukushima Daiichi accident in 2011 where greater decontamination efforts (and thereby dose reduction) led to enormous levels of waste materials. But people need to understand this at the outset.

So, on the one hand we need to put risk into perspective, but we must never trivialise it during the engagement process.

#### Principle 6 - Where Possible, Simplify The Language You Use

The nuclear industry uses an extremely complicated language as well as a plethora of acronyms. We are often accused of trying to confuse people with the language we use. Because our words sound important and technical we are again often perceived as trying to bluff our way through the communication process. Stakeholders do not understand terms like millisievert, gray, and becquerel so we need to somehow place such terms into context.

As the saying goes “a picture paints a thousand words” so try where possible to use pictures, tables, graphs, diagrams and signs rather than purely technical terms in isolation. Although not patronizing, designing presentations and communication material as if in mind for school children for example, can result in a greater visual appearance within the material.

#### Principle 7 - Put Background And Naturally Occurring Radioactivity Into Context

Principles 4 and 5 have revolved around communicating dose and risk assessment. Linked into this is the fact that we should stress that radioactive material and radiation is all around us. It can be found within soil, rocks, water, air and vegetation as well as our own bodies.

We should explain that Naturally Occurring Radioactive Material (NORM) emanates from the oil and gas industry, mining rare earth minerals, desalination plants, coal residues etc. The potential doses received from radon gas emanating naturally from underlying rocks or from mining activities often necessitates regular monitoring activities and in some instances even intervention.

People voluntarily visit thermal springs and baths believing that bathing in these waters is good for you. Although cosmic radiation exposure rates vary around a range of different parameters it has been scientifically proven that regular flying also contributes to the annual dose an individual will receive naturally. These are examples of activities which are again undertaken through an individual's own choice, so the perceived risk is low.

Explaining better about the doses we receive from natural sources can help to put the doses potentially received through man made activities into context.

#### Principle 8 - Explain How Radioactive Materials Are Often Used In Everyday Life

On similar lines to Principle 7 which revolves around putting background and naturally occurring radioactivity into context we should also remind people how radiation and radioactive sources are used in our everyday life. Good examples of this include radiotherapy, x-rays we might receive at the dentist, the irradiation of food, tracer tests and smoke alarms (Am241).

Explaining how such materials are utilised in many aspects of everyday life again allows us to put radiation into context and explain some of the technicalities around our own industry.

#### Principle 9 - Try To Demonstrate That You Too Are A Member Of The Public

When I provide advice and training on how best to communicate technical information and undertake dialogue with the public I suggest that it is useful to make them feel that you are one of them. If you are closely associated with the problem holder or decision maker there is the potential that an automatic barrier is immediately created. You are more likely to succeed in communicating a



technical subject if they feel you are no different to them and have similar desires and aspirations that they may have.

Like them, you are a member of the public and may have children of your own that you clearly wish to see gaining protection. If you live local to the problem or project you would have the same desire to see safety for yourself, your family and neighbours as well as the local environment. On the other hand if you live and work away from the affected region it is harder to demonstrate that your interests are the same as theirs as you will not be affected in the same way that they might be from any perceived negative outcomes.

This principle is therefore all about relating better to those you wish to communicate with.

#### Principle 10 - Walk The Talk – Try To Undertake What You Wish Others To Undertake

Principle 10, although never easy, revolves around demonstrating that you don't expect other people to endure something that you are not prepared to endure yourself. There is no benefit in explaining that dose rates citizens might receive are within acceptable limits if you the communicator live outside of the region in question. Working out of a local office can greatly assist therefore when communicating this type of technical information.

If your site or project is located in a region where there are concerns about locally produced crops, meat or fish being safe to eat then perhaps you should also demonstrate that you are prepared to eat them too.

This principle is therefore all about demonstrating that what is safe for others should also be safe for yourself.

### **PUTTING IT TO THE TEST**

The principles highlighted above are clearly applied to stakeholder engagement in general but from experience have been very useful when advising problem holders on the subject of communicating technical information. There are undoubtedly many other "principles" or approaches that can be utilised but in essence those I have listed all revolve around building trust, simplifying the language we use and demonstrating that we (like those we are communicating to) also have concerns and aspirations.

Testing these principles out on friends, colleagues and relatives when you are describing your work can prove to be a useful approach to assess their effectiveness and potential impact.

### **MENTAL MODELS**

The European Union (EU) is currently funding a project entitled "Enhancing educAtion, traininG and communication processes for informed behaviours and decision-making reLatEd to ionizing radiation risks" (EAGLE). The EAGLE project

is a Euratom FP7 "coordination action" of 3 years, launched under the work programme 2012 which will help identify and disseminate good practices in information and communication processes related to ionising radiation. [1].

A key component of EAGLE (within work-package 3) is focused on the investigation of mental models which the non-technical community (lay people) have regarding ionizing radiation in several EAGLE partners' countries.

Mental models are cognitive schemas (in cognitive science a schema can be described as an organized pattern of thought or behaviour that organizes categories of information and the relationships among them) through which people explain individual processes or phenomena in which they are participating. We all have and use such implicit models. Researchers believe that these representations help individuals to better interact with possible situations and also to predict the most probable evolution of the events in which they are involved. [2].

With respect to radioactivity specifically, the most relevant examples are the analysis of the mental models of indoor radon and work on mental models of ionizing radiation and radioactive waste with people's attitudes towards these materials.

The aim of analysing mental models in the general public with respect to the effects of ionizing radiation are to examine where there may be gaps, differences, misunderstandings and misconceptions between professionals in the nuclear area and the public. The results from these surveys will hopefully lead to an improvement in how this subject is communicated.

The work carried out to date has focussed on four European countries (France, Romania, Poland and Slovenia). In the research several groups of participants were involved within these countries and in order to create the expert model approximately 30 Slovenian and foreign experts from radiation protection, nuclear safety and radioactive waste management backgrounds were interviewed. To gain insight into the lay people mental models, interviews with approximately 15 lay persons were conducted in each of the four countries. A mixture of age groups, gender, education level and geographical area where they lived were taken into consideration within those interviewed. [2].

Some of the interesting conclusions drawn from this initial research include [2];

- Some significant discrepancies arise from the fact that all of the languages in the countries involved have their own word for "radioactivity", which seems much milder and not so threatening as the words "radiation" and "radioactivity" that are adopted from the English language. The term "radioactivity" is almost exclusively connected to something dangerous and threatening and mostly associates an accident with all its negative consequences. Rarely is the term "radioactivity" used in connection with medical treatments or industrial activities.
- The difference between ionizing and non-ionizing radiation is known to only few people, almost exclusively only to highly educated technicians or scientists.
- Most of the people know the fact that there is natural radiation all around the Earth. However the majority believes that there is a difference between

natural and artificial radiation. It is mostly thought that natural is absolutely harmless while the artificial is always dangerous.

- The majority of interviewees do or would accept the methods used in nuclear medicine. This reliance is based mostly on their trust to doctors and not on their own understanding of the underlying phenomena.
- Very few people are aware that radioactive waste also comes from industry and medicine rather than purely as a consequence of nuclear related activities.

This EU initiative is being highlighted because the final results and outcome have the potential to assist those of us who are required to communicate technical information related to the various facets of the nuclear industry. It is undoubtedly worthwhile keeping a watching brief on the outcome of such research as we strive to improve our communication with the general public.

## **CONCLUSIONS**

Communicating technical information with respect to nuclear and radiological issues is perhaps a greater challenge than that for other industries. This is essentially because of the nature of the materials we manage and the potential consequences (perceived or real) if something goes wrong. Building trust, utilising the most appropriate personnel and providing simplified messages can assist with this process.

The ten basic principles of stakeholder engagement highlighted within this paper can be easily applied to the communication of technical information.

There are a number of approaches currently being researched or adapted to assist with the communication of technical information in general and for the nuclear industry in particular. The EU's initiative looking at how Mental Models might be utilised is just one of these but it has been highlighted because of its potential to assist the nuclear industry in the communication of technical information.

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