TRANSACTIONS

Barcelona
8-12 February 2004

16th International Meeting of Nuclear Communicators:
Defining Tomorrow's Vision of Nuclear

http://www.pime2004.org
PIME is an annual meeting organised by European Nuclear Society. PIME stands for Public Information Material Exchange and was first launched in 1988. Since then, it has grown into the well-established international meeting of professionals, from all over the world, involved in informing the public about nuclear.

ENS PIME 2004 is held at the Fira Palace Hotel, Barcelona, Spain.

History of PIMEs:
- PIME'88, Montreux, Switzerland, January 24-27, 1988
- PIME'89, Montreux, Switzerland, January 22-25, 1989
- PIME'92, Annecy, France, January 26-29, 1992
- PIME'93, Karlovy Vary, Czech Republic, January 31-February 3, 1993
- PIME'94, Lucerne, Switzerland, January 30-February 2, 1994
- PIME'95, Lucerne, Switzerland, January 29-February 1, 1995
- PIME'96, Bruges, Belgium, February 4-7, 1996
- PIME'97, Bruges, Belgium, February 2-5, 1997
- PIME'98, Maastricht, Netherlands, February 1-4, 1998
- PIME'99, Avignon, France, February 7-10, 1999
- PIME'00, Ljubljana, Slovenia, February 13-16, 2000
- PIME'01, Evian, France, February 4-7, 2001
- PIME'02, Prague, Czech Republic, February 3-6, 2002
- PIME'03, Saint Julians, Malta, February 2-5, 2003

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SOME BASIC TRUTHS CONCERNING NUCLEAR

Nuclear power plants

Nuclear power plants - that presently produce around one-third of the European Union’s electricity - will continue to make a significant contribution to the enlarged Union’s electricity supply for many decades to come.

Much of our existing nuclear park will continue to operate for 20, 30 or 40 more years, especially as some new reactors have recently come on line (for example in the Czech Republic). A new nuclear power plant will start up in Finland before the end of this decade and might be expected to operate well into the second half of this century.

While only three of the present Member States do not have a moratorium or plans to phase out nuclear energy, this number will increase significantly after 1 May 2004. Few people do not expect a new order for nuclear plant in the EU in the near future.

So for the rest of my lifetime – and, most likely, for the rest of the lifetime of the youngest person in the room – nuclear power plants will operate in the European Union. They will need to be supported by many other types of nuclear facilities.

It is in all our interest that these plants are operated safely – throughout the Union.

Radioactive waste

We have been producing radioactive waste as a result of nuclear fuel cycle activities for around half a century – even longer if you include activities not specifically designed for electricity production. Over that time we have accumulated significant quantities of radioactive waste. Although small in comparison to many other hazardous waste forms, they must still be handled with care and safely managed for long, often very long periods of time.
While we have, in the European Union, already safely disposed of around 2 million cubic metres of such waste, much still remains in temporary storage at or near the surface. This includes all the high-level and long-lived waste.

The amount of waste held in storage will continue to grow over the coming decades, this is particularly true of the high-level waste until we find a safe and sustainable way of managing it for the very long term.

Regardless of any decisions to close or phase out nuclear electricity generation in some States, we will continue to accumulate increasing quantities of radioactive waste in temporary storage facilities over the coming decades.

**Decommissioning of nuclear facilities**

A wide range of nuclear facilities are already being decommissioned inside the European Union. In the coming decades, this number will increase and include many very big facilities such as the larger nuclear power plants, reprocessing plants and enrichment plants.

Decommissioning is an expensive activity. In addition, the money for decommissioning needs to be available often over a relatively long period of time after the facility has finished earning any income. This period of time can be several decades.

If sufficient money is not available when it is needed, the facility cannot be decommissioned safely. This could increase the risk to the public and/or require a major financial intervention by the taxpayer.

In countries with small or no nuclear power programmes, the cost of managing the radioactive waste from the installations is a very important – or even the major part – of the total liabilities.

Therefore, sufficient funds to cover all nuclear liabilities need to be collected during the economic lifetime of a facility and then managed in such a way as to we available when required, possibly over a period of several decades after closure of the facility.

**Nuclear energy**

Some facets of nuclear energy may be very important concerning its future development.

Nuclear energy does not produce any significant quantities of greenhouse gases. It has a very low dependence of imported materials (and those imports come from a range of sources that are regarded as politically more stable than for fossil fuels). It has had decades of protecting its installations from unwanted interventions that could disrupt their operation or the supply of electricity and protecting its sensitive materials from unlawful diversions.

At a time of ever increasing concerns about climate change and both security and safety of our energy supplies, these benefits are becoming increasingly recognised.
This could result in more nuclear power plants and more radioactive waste in the decades ahead.

The EURATOM Treaty

Over many years, under the EURATOM Treaty, the Community has built up a substantial volume of legislation covering health and safety aspects of nuclear energy. The large majority of this has been linked to the development and application of common European basic safety standards (BSS) covering maximum permissible doses and levels of exposure and contamination.

More recently – in December 2002 – the European Court of Justice concluded that it is not appropriate to draw an artificial distinction between the protection of the health of the general public and the safety of sources of ionising radiation. It went on to rule that there is Community competence in each of the following areas:

- the establishment of a legislative and regulatory framework to govern the safety of nuclear installations;
- measures relating to the assessment and verification of safety;
- emergency preparedness;
- the siting of a nuclear installation; and
- the design, construction and operation of nuclear installations.

This ruling opened to path to greater harmonisation in the area of nuclear safety at the level of the European Union.

THE BARE ESSENTIALS – THE NUCLEAR PACKAGE AND PROPOSED NEW LEGISLATION

The nuclear package

The nuclear package contained five sets of documents. Three of these were formally adopted by the Commission in November 2001:

- A Communication to the Commission « Trade in nuclear materials with Russia »
- A proposal for a Council Decision to raise the ceiling for Euratom loans for nuclear installations

The two other documents were draft proposals for new legislation that were adopted by the Commission in January 2002. They were:

- A draft proposal for a Council Euratom Directive « Setting out the basic obligations and general principles for the safety of nuclear installations » - known as the Safety Directive

The Safety Directive

In 2000, The European Council decided to undertake an evaluation of nuclear safety in twelve countries that had applied for membership to the European Union. A report was produced with recommendations to each country concerning improvements that needed to be made or should be made.

In brief, what the Safety Directive proposes to do is take the methodology that the Member States themselves used to evaluate or verify the level of nuclear safety in the candidate countries – a methodology based mainly on national reports and peer reviews by nuclear regulators - and to formalise it into European law. It could then be applied to all Member States – both old and new - in an enlarged European Union.

In slightly more detail, Member States would be required to produce regular report on all aspects of nuclear safety in their country and subject these to “peer reviews”. The results would be compiled into a regular report on nuclear safety in the EU. This reporting would be backed up by a system of verification that will rely mainly on the technical experts from national safety authorities. The focus of this verification system will be on checking the ways in which national safety authorities carry out their tasks. In this way, the Community could be assured that there is an equivalent level of nuclear safety regulation and control throughout the EU.

The Waste Directive

In the European Union – as in other regions of the world - the most hazardous and radiologically toxic forms of radioactive waste are presently held in temporary storage facilities. None has yet been disposed of. The situation is simply not sustainable. What in the past might have been regarded as technical reasons for delaying decisions have now become excuses for failing to make progress.

The main objective of the Waste Directive is to bring about progress towards the safe long-term management of spent nuclear fuel and radioactive waste. While the emphasis of the Directive is on high-level waste – including spent nuclear fuel that is to be disposed of directly – it does cover all forms of radioactive waste.

The proposed Directive requires that each Member State establish a clearly defined programme for radioactive waste management covering all radioactive waste under its jurisdiction and covering all stages of management including disposal. In particular, the programme shall specify an approach to long-term management and disposal with a definite timetable for each step of the process. A number decision points must be included in the programme. These include dates for authorisation for both development and operation of waste disposal facilities.
The Member States must report at regular intervals on their programmes and the Commission, with the help of national experts, will review these reports and publish its own report on the situation regarding radioactive waste management in the Union.

**Decommissioning funds**

In March 2002, the European Parliament voted with a large majority to adopt an amendment to a Directive on opening of the electricity market. This amendment called for decommissioning funds to be set up and managed in such a way that sufficient funds would be available when necessary for the safe decommissioning of all nuclear power plants, including for the management of the wastes.

Originally, the Commission planned to respond to this by issuing a Directive purely on the subject of decommissioning. But, rather late in the day, incorporated the elements of its draft Directive into the Safety Directive. In retrospect, this may have slightly clouded the issue.

The primary objective of the proposed legislation is to **make sure that sufficient resources are collected over the operating lifetime of an installation to cover all end-of-life nuclear liabilities**.

In order to meet the primary objective and other concerns, the proposal is that the funds be independent from the regular accounts of the operators and specifically earmarked for the decommissioning of their nuclear installations. In other words, the funds would be “segregated” or “ring-fenced”.

While the initial proposal referred to the funds as “decommissioning funds” for simplicity, they should cover all nuclear liabilities that remain at the end of an installations normal life. In other words, they should cover the management of any remaining spent fuel and radioactive waste, including disposal. They should also cover the decommissioning of all nuclear installations – not just nuclear power plants.

The proposal left a great deal of the detail concerning the size of the funds, how they are to be collected and how they are to be managed to the individual Member States.

**SOME SENSITIVE ISSUES**

The nuclear package and, in particular, the proposed new legislation has generated much discussion and some considerable dispute between the interested parties both inside and outside the European Council.

The most controversial issues – which are mainly, though not exclusively, the result of incorrect interpretations of the proposals - seem to be the **perceived** possibility of:

- Imposition of an extra layer of regulation on the nuclear sector
- Setting up of common European standards
- Reduction in authority of national regulatory bodies
- Sidelining the IAEA’s activities
• Identification of geological disposal as the unique method of long-term management of high-level waste
• Imposition of deadlines for siting/operating repositories
• Regional repositories – States being forced to take another’s waste
• Dumping of waste in less developed countries
• Penalising utilities that have already collected money to decommission facilities

In addition there is a great deal of debate about the need for legislation as opposed to some form of voluntary agreement between the Member States.

Many of these issues are the result of a genuine misunderstanding of what the Commission is trying to do with its proposals. Most can be simply explained away – if people are willing to listen and to keep an open mind rather than rely on preconceived ideas and formalised replies. (The presentation will address each of these issues in turn, report on the present status of the discussions in the European institutions and what the proposals look like on the day).

CONCLUSIONS

The nuclear package has raised the level of debate about nuclear – in particular nuclear safety – issues in the European Union. In doing this, it has already achieved an important objective that should, we hope, result in a better understanding of a very important energy source.

Adoption of the proposed new legislation should go further by helping to guarantee a high level of nuclear safety across an enlarged European Union. This is seen as a very necessary step, regardless of individual Member States’ policies concerning the expansion or contraction of the nuclear sector.

Continuing to oppose – or failing to adopt - the proposed legislation, even (or especially?) on the basis of misunderstandings or an inaccurate perception of what it is trying to achieve, could have a negative impact on the nuclear sector and, ultimately, on the Union’s future energy options.
PLENARY SESSION
Monday, February 9

FROM 2002 TO 2003:
POSITIVE TRENDS in FRENCH PUBLIC OPINION

ALAIN BUCAILLE
Special Adviser to the Chairman
AREVA
Paris, France
From 2002 to 2003 in France

Facts and Lessons from our experience
Public opinion on nuclear energy has greatly improved over the last year. Two-thirds of the French population stated that their opinion has changed over the last year. Two-thirds of these now support nuclear energy (16% versus 8%).

Scenarios which postulate maintaining or increasing nuclear capacity received 54% of the vote (versus 42% in 2002).

However, the percentage of “don’t knows” has remained unchanged at 55%.
In general, would you say that you are...

<table>
<thead>
<tr>
<th>2003</th>
<th>2002</th>
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</table>

- **For nuclear energy.**
  - 25% (2003)
  - 17% (2002)

- **Against nuclear energy.**
  - 55% (2003)
  - 55% (2002)

- **Not sure about nuclear energy.**
  - 20% (2003)
  - 28% (2002)

---

Which of the following statements best reflects your opinion?

<table>
<thead>
<tr>
<th>2003</th>
<th>2002</th>
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</table>

- We should keep existing nuclear power plants in service for the rest of their scheduled lifetime, but we should not build any new plants.
  - 47% (2003)
  - 35% (2002)

- We should maintain the production capacity of existing nuclear power plants, and to do this, we should build new plants as old ones are shut down.
  - 40% (2003)
  - 40% (2002)

- New nuclear power plants should be built to meet the country's growing demand for energy.
  - 14% (2003)
  - 14% (2002)

- We should shut down all nuclear power plants in operation as soon as possible.
  - 10% (2003)
  - 10% (2002)

- New nuclear power plants should be built to meet the country's growing demand for energy.
  - 9% (2003)
  - 9% (2002)

---

In general, would you say that you are...
We have no choice in France; we need nuclear energy to generate electricity.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
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<tbody>
<tr>
<td><strong>Sub-total in disagreement</strong></td>
<td>39</td>
<td>30</td>
</tr>
<tr>
<td>Totally disagree</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Disagree in part</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total in agreement</strong></td>
<td>62</td>
<td>70</td>
</tr>
<tr>
<td>Agree in part</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>Totally agree</td>
<td>23</td>
<td>27</td>
</tr>
</tbody>
</table>
Would you say that you changed your mind about nuclear energy in 2003?

- Yes
- No

If so, are you now...

- More in favor of it
- More against it

If you are more in favor, is it because you are...

- Concerned about climate change.
- Concerned about the war in Iraq and the Middle East.
- Concerned about oil spills.
- Better informed of the advantages and risks of nuclear energy.
- Concerned about climate change.
- Aware that other countries are building new nuclear power plants.
- Aware that other countries are building new nuclear power plants.

Total

%
2. \( \text{CO}_2 \) emissions, climate change, and energy (1/3)

In France, 9 out of 10 people believe that we have to do something about climate change, and most of them know that \( \text{CO}_2 \) emissions are largely responsible for the phenomenon.

But here, not contributing to climate change (no significant improvement and only slightly more than one-third (38%) think that it does not contribute to climate change) while practically no one (although the number has risen considerably since last year, 52% vs 44%) thinks that nuclear energy gives off only half of them “think” that nuclear energy gives off practically no \( \text{CO}_2 \).

In France, 9 out of 10 people believe that we have to do something about climate change, and most of them know that \( \text{CO}_2 \) emissions are largely responsible for the phenomenon.
<table>
<thead>
<tr>
<th></th>
<th>2002</th>
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<tbody>
<tr>
<td>Total True</td>
<td></td>
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<tr>
<td>Total False</td>
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<tr>
<td>Certain</td>
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<tr>
<td>Probably</td>
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<tr>
<td>Possibly</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Probably False</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certainly False</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Earth's climate is increasingly unstable.</td>
<td>64%</td>
<td>57%</td>
<td>77%</td>
<td>24%</td>
</tr>
<tr>
<td>Something must be done about it.</td>
<td>67%</td>
<td>24%</td>
<td>91%</td>
<td>24%</td>
</tr>
<tr>
<td>CO₂ emissions are largely responsible for climate change and must be curbed.</td>
<td>43%</td>
<td>34%</td>
<td>19%</td>
<td>3%</td>
</tr>
<tr>
<td>If we continue to depend to the same degree on oil, gas, and coal, CO₂ emissions will double over the next 30 years.</td>
<td>77%</td>
<td>4%</td>
<td>2%</td>
<td>91%</td>
</tr>
<tr>
<td>Nuclear energy gives off almost no CO₂.</td>
<td>77%</td>
<td>4%</td>
<td>2%</td>
<td>91%</td>
</tr>
<tr>
<td>CO₂ emissions are largely responsible for climate change and must be curbed.</td>
<td>77%</td>
<td>4%</td>
<td>2%</td>
<td>91%</td>
</tr>
<tr>
<td>If we continue to depend to the same degree on oil, gas, and coal, CO₂ emissions will double over the next 30 years.</td>
<td>77%</td>
<td>4%</td>
<td>2%</td>
<td>91%</td>
</tr>
</tbody>
</table>

**Climate change, and energy (2/3)**

**CO₂ emissions,**
Complementary nature of natural and nuclear energy sources

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
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</thead>
<tbody>
<tr>
<td>Total disagree</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total in agreement</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Total in part disagree</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Total in part agree</td>
<td>19</td>
<td>45</td>
</tr>
<tr>
<td>Total disagree</td>
<td>31</td>
<td>45</td>
</tr>
<tr>
<td>Total in agreement</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Total in part disagree</td>
<td>19</td>
<td>45</td>
</tr>
<tr>
<td>Total in part agree</td>
<td>45</td>
<td>19</td>
</tr>
<tr>
<td>Total in agreement</td>
<td>44</td>
<td>11</td>
</tr>
<tr>
<td>Total disagree</td>
<td>34</td>
<td>11</td>
</tr>
<tr>
<td>Total in agreement</td>
<td>27</td>
<td>42</td>
</tr>
<tr>
<td>Total in part disagree</td>
<td>27</td>
<td>42</td>
</tr>
<tr>
<td>Total in part agree</td>
<td>42</td>
<td>27</td>
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<tr>
<td>Total in agreement</td>
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<tr>
<td>Total disagree</td>
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<td>Total in part disagree</td>
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<td>Total in part agree</td>
<td>42</td>
<td>27</td>
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<tr>
<td>Total in agreement</td>
<td>42</td>
<td>27</td>
</tr>
<tr>
<td>Total in agreement</td>
<td>42</td>
<td>27</td>
</tr>
</tbody>
</table>

- Nuclear energy and natural energy sources (solar and wind) are not in competition (nuclear, solar, wind) should be adopted to replace carbon-based energy sources (carbon dioxide emissions) and control climate change.

- In order to reduce CO2 emissions, carbon-free energy sources (nuclear, solar, wind) should be adopted to replace coal, oil, and gas. There is no other solution. Nuclear energy must be developed to replace coal, oil, and gas.

- Natural energy sources and nuclear energy must be developed to replace coal, oil, and gas. There is no other solution.

- Natural energy sources and nuclear energy must be developed to replace coal, oil, and gas. There is no other solution.

- Carbon-based energy sources must be eliminated and replaced by nuclear energy.

- In order to reduce CO2 emissions, carbon-free energy sources should be adopted to replace coal, oil, and gas.

- Carbon-free energy sources should be adopted to replace coal, oil, and gas. There is no other solution.

- They are complementary.

- They are complementary.

- They are complementary.
4. The waste problem

In France, 8 out of 10 people say that their opinion about nuclear energy is conditioned by “the waste problem.”

Opinions are very divided as to the effectiveness of disposal methods.

If it weren’t for the waste problem, wouldn’t be so concerned about nuclear energy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total in agreement</th>
<th>Totally agree</th>
<th>Agree in part</th>
<th>Disagree in part</th>
<th>Totally disagree</th>
<th>In disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>22</td>
<td>42</td>
<td>36</td>
<td>16</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>2003</td>
<td>23</td>
<td>43</td>
<td>35</td>
<td>17</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>

This remains the main fear:
An openness to information

- The public should be told more about the positive effects of nuclear energy: helping to combat climate change, desalinating seawater, or developing non-polluting motors.
- An "Expert Advisory Committee" could help to examine every aspect of the nuclear waste issue, and provide the French public with an objective source of information. The public should be told more about the positive effects of nuclear energy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Totally Agree</th>
<th>Agree in Part</th>
<th>Disagree in Part</th>
<th>Totally Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>96</td>
<td>4</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>2003</td>
<td>91</td>
<td>8</td>
<td>1</td>
<td>41</td>
</tr>
</tbody>
</table>

- An openness to information
Some ideas that emerge from our experience
To integrate really what is deriving from marketing and human sciences.

This can be summarized as follow:

1. Everywhere in the world, those who achieve sustainable success in consumer products or in show business use communications anchored in the following triangle:

   - PERSUADE
   - REASSURE
   - SURPRISE AND ATTRACT
A balanced communication approach

Public Opinion Marketing

Unlike product or brand marketing, opinion marketing's third objective is not to "score." It is to make people think. This requires, as the French philosopher Blaise Pascal used to say, as much subtlety as science!

- EXPLAINING
- MAKING PEOPLE THINK
- LISTENING

is symbolized by the following triangle
To speak both to left and right part of the brain.

While some of the difficulties are typical of modern-day societies, others have a strong emotional content and can play to the rational background behind the emotional response.

As we know, emotional responses may either be general and found worldwide, or specific to each country, reflecting its history, dominant social concepts, forms of expression, etc. It is therefore impossible to analyze the various components of public acceptance without professional guidance.

In any setting, it will take a combination of geopolitical, environmental, technological, economic, communicative, marketing, and social science expertise to address such a complex issue. Needless to say, it is a challenge to assemble such a diversity of professional talent. This is why it is, indeed, a new approach.

While some of the difficulties are typical of modern-day societies, others have a strong emotional content and can play to the rational background behind the emotional response.
as far as France is concerned the context is featured by public storage in impermeable clays, and association with reprocessing assets.

If there is a solution that is both safe and satisfactory, we must focus on how to tell it, by both being:

- scientifically rigorous,
- scientifically rigorous,

To clarify the waste issues
There exist geological formations that are completely impermeable (salt) or almost impermeable, dating back hundreds of millions of years in which cracks close up (due to creep) whenever the slightest geological movement occurs. These formations can be monitored by satellite and used in conjunction with reprocessing, containers and repositories to ensure that 50,000 years from now, no radioactivity will be dispersed X meters from the repository (to be validated with the ministry for research and the French National Assessment Committee (CNE)).

Thereafter, very small amounts of water will seep into these areas but the radioactivity level will still be lower than that of a uranium mine. Rock formations advantages of reprocessing and disposal and why turn our attention again to the
The future was long ignored in most debates. Nuclear power has long been presented as a means of generating electricity. This is, of course, fundamentally true. But nuclear power may be even more important to tomorrow’s world.

Hydrogen may become accepted as a new source of energy. Hydrogen seems to realize this much more than France. The United States seems to realize this much more than France.

Low-cost electricity will be vital for water treatment or to desalinate seawater.

- or in fuel cells (opportunity 3).
- or as raw material for the oil industry (opportunity 2).
- either in addition to natural gas (opportunity 1).

Nuclear power was long ignored in most debates.
The future was long ignored in most debates. It will be possible to sell the heat produced near large urban centers. New breakthroughs in the storage of electricity may also be achievable. Just as oil is indispensable to our economies, nuclear power is vital to balanced energy supply and demand and combating global warming. But the debate on whether or not we can dispense of nuclear power must be closed. The answer is clear: we cannot. The difference between these two assertions (nuclear is desirable/nuclear is indispensable) is absolutely critical in terms of communication. The United States reached similar conclusions when they reviewed energy supply challenges. And New breakthroughs in the storage of electricity may also be achievable.
A new approach requires a better communication to business circles (including finance).

Nevertheless, you cannot defend the other interests against their will or notwithstanding their indifference. In other fields, you cannot defend the other interests, you overestimate the understanding of people, that work.

An other key success factor is linked to the convictions of the business.
Anti nuke is a brand that we must face as a brand. Every country has to structure its answer to this brand, but anti nuke is not exactly a brand, because three of its attributes are not specific to him.

Lot of consequences are to be drawn from these considerations.

Nuke is not exactly a brand, because three of its attributes are not specific to him:

- Unfeasibility of worldwide governance, if it leads too much uncontrolled price stability, which neither China nor US can accept;
- Middle-East issues;
- How to fight the warming of the planet?

But anti nuke is a brand that we must face as
A systematic approach: Where we are now?

We implement an approach comprised of studies and action plans relying on:

1. Local information commissions.
2. Independent experts who may act as mediators in the event of controversy.
3. Sustainable development teams to communicate with stakeholders and associations.
4. Public acceptance surveys borrowed from the consumer products industry.
5. Communicating on waste issues in scientific terms as well as in terms understandable to the general public.
6. Spokesperson training.
7. Phased deployment of a public opinion marketing plan.
8. Communicating with business and financial community leaders.
9. An advertising and communication program that is consistent with our overall public acceptance program.
10. Work in progress: what is the truth regarding climate change issues? Have we made sufficient progress to go back to 3 GtC by 2050?
Conclusions
Towards a systematic approach

To confront opposition in a variety of forms, in France we gradually developed a broad range of tools and methods geared toward:

- Improving understanding of nuclear energy
- Fighting propaganda designed to stir up trouble, to feed on fears of nuclear power or simply to spread misinformation.
- Define the issues at stake.

That a systematic approach is available to:

Based on our experience we came to the conclusion:

- Improving understanding of energy issues
- Define the issues at stake.

Towards a systematic approach
All these steps were critical for reversing the trend.

- Killing the opacity climate around nuclear activities,
- Defining a legal framework for research on wastes (how to do better by 2006),
- Maintaining legitimacy and ambitions of research institutions,
- Maintaining legitimacy and ambitions of research safety authorities,
- Giving credibility to the independence and expertise of safety authorities,
- Creating local information commissions,

If we look back at what happened in the late 5 to 7 years, we have succeeded in:

This has been a gradual process.
A communication problem.

Yes but…

We have been considering for long time that we faced a communication problem...
A communication problem.

Yes but...  

A communication problem.

1. It is wrong at the world-wide level – the trend is positive.
2. This communication is definitively old-fashioned and out-dated.
3. It shows a lack of understanding of what we have been trying to stress.

They should take care and think about:

...policies...

Some in Europe speak always about a declining industry, about policies that are anti-nuclear...
DEEP REPOSITORY AND ENCAPSULATION PLANT FOR
SPENT NUCLEAR FUEL - CONSULTATIONS AND
COMMUNICATION

STEN KJELLMAN
Senior Vice President
SKB, Swedish Nuclear Fuel and Waste Management Co
Stockholm, Sweden

Abstract

After completed feasibility studies in eight municipalities, site investigations aimed at
identifying an appropriate location for a deep repository for spent fuel in Sweden
were started in 2002. In addition to the deep repository, the site investigations also
aim to locate an encapsulation plant. SKB plans to submit permit applications for the
encapsulation plant in 2006, and for the deep repository in 2008.
The goal of the initial site investigation is to identify the site within the two proposed
areas in Forsmark and Oskarshamn that is deemed to be most suitable for a deep
repository. The purpose of the complete site investigation is to gather detailed data
required to select one of the sites and apply for a permit to place the deep repository
on this site.

Early consultations were convened during the spring of 2003. Following this
consultation, the county administrative boards have decided that extended
consultations with environmental impact assessment is required before an
application can be submitted. The extended consultation shall take place with the
county administrative board, other government agencies, and any municipalities,
members of the public and non-governmental organizations who may be concerned.

SKB is now working on scoping reports describing which investigations are planned
and the proposed scope and boundaries of the EIS, plus a preliminary table of
contents for the EIS. As the siting investigations and design process progresses and
different surveys are carried out, the design of the facilities and their adaptation to
t heir surroundings and impact on the environment will be refined and improved.
Results of investigations and surveys as well as proposals for facility design will be
presented at the consultation meetings. Participants will be given an opportunity to
offer their viewpoints on SKB’s proposals.

The documentation that is to be presented to government agencies and the
Government in conjunction with an application for a permit to site and build the deep
repository on a designated site is very extensive. The consultations for the encapsulation plant and the deep repository will go on for about seven years, and this will be, by far, the most extensive EIA exercise that has been undertaken in Sweden – and probably in the world.

SKB will, in addition to the work with the formal consultations, also face a number of new communication challenges. One example is that we have to maintain a positive public interest in our project during the whole, extended consultation period. We cannot afford to lose public participation in the project. If we do, we will be back to square one when we eventually submit the applications.

Another communicative challenge arises from the fact that there is, today, insignificant opposition against our project. We know, however, that the potential for conflict can flame up. The Environmental Code provides the opportunity for all concerned to formally question our EIA work, and we know for a fact that when it is time to hand over our permit applications, the project will be in the spotlight again. Our communication strategy counsels us to act very proactively. Our aim is, however, to carry out as much of this dialogue as possible within the framework of the consultations.

This paper briefly describes the framework in which SKB envisions working for upcoming consultations for the encapsulation plant and the deep repository, as well as the essential features of the communication strategy we have drawn up for the consultation period.

General background

About 50% of the electricity in Sweden is generated by means of nuclear power. Eleven reactors are currently in operation, and one reactor at Barsebäck nuclear power plant was phased out at the end of 1999. With around 70 TWh of electricity generated from nuclear power each year, and with less than nine million inhabitants, Sweden is one of the most nuclear-intensive nations in the world.

The first commercial reactor was put into operation in 1972, and the most recent reactor began operation in 1985. About 4,100 tonnes U of fuel have been used in power production. If all reactors are used for 25 years, a total of 6,300 tonnes of spent fuel will be produced. If, on the other hand, they are in operation for 40 years, it will result in a total of 9,000 tonnes.

The Swedish system

SKB has now developed a system that ensures the safe handling of all kinds of radioactive waste from Swedish nuclear power plants for a long time to come. The cornerstones of this system are:

- A transport system with the ship M/S Sigyn which has been in operation since 1983.
- A central interim storage facility for spent nuclear fuel, CLAB, which has been in operation since 1985.
- A final repository for short-lived, low and intermediate level waste, SFR, which has been in operation since 1988.

This effective system has now been working smoothly and without problems for more than 15 years. The missing link in the system is the final approval of a method, and
the location of a site, for the final disposal of high-level waste, i.e. the spent fuel, as well as a final repository for long-lived intermediate waste.

The plan for the final disposal of spent nuclear fuel is to encapsulate it in durable copper canisters to be placed (embedded in bentonite clay) in a deep repository about 500 metres down in the bedrock (the KBS-3 method). Much of the technological development is performed in the Åspö Hard Rock Laboratory and in the Canister Laboratory in Oskarshamn. Full-scale deposition tests are undertaken in the Åspö Laboratory at a depth of 340 - 460 metres in the bedrock. The development and testing of sealing methods for the canisters takes place in the Canister Laboratory.

Figure 1 The Swedish system

Site investigations – another step on the way to the deep repository

The work of siting a deep repository for spent nuclear fuel in Sweden was begun in 1992. Since then, SKB has conducted feasibility studies in eight municipalities to evaluate the potential for the siting of a deep repository. In 2000 we proposed three siting alternatives where we wanted to proceed with the next step: site investigations. In November 2001, the Government decided to give SKB the go-ahead to commence site investigations at these sites.
In both Östhammar and Oskarshamn, the municipal councils decided to allow SKB to conduct site investigations. However, the third proposed municipality, Tierp, declined further participation, so SKB discontinued its activities there.

With these decisions, we entered the site investigation phase. During 2002 site investigations were commenced in Oskarshamn and Östhammar. The site investigations will be carried out in two stages. The purpose of the initial investigations is to determine whether the feasibility study’s assessment of the suitability of each site stands up in the face of in-depth data. The initial site investigations are expected to be finished around the end of this year. They will be followed by the complete site investigations, which are intended to provide the additional data needed for the design of the facility and the safety assessment.

So far we have drilled 4-5 deep cored boreholes at each site down to a depth of 1,000 m. We plan to drill a total of 15-20 deep cored boreholes at each site. The purpose is, of course, to be able to determine the suitability of the bedrock for the deep repository. But the site investigations also involve other activities than drilling. We will also do the following:

- Inventory of natural and cultural values in the area.
- Investigate the environment, land and bedrock using various methods.
- Examine how a deep repository affects the community.
- Consult with nearby residents, public authorities and other concerned parties.
- Design a hypothetical facility tailored to the site as regards bedrock, groundwater, environment and the viewpoints presented in the consultations.
- Conduct a safety assessment for the hypothetical facility based on the data obtained in the investigations.
The consultation process

Our goal is to obtain permits to site and build an encapsulation plant and a deep repository for spent nuclear fuel. Basically, three different permits/licences are required for both the final repository and the encapsulation plant: a permit under the Environmental Code, a licence under the Nuclear Activities Act, and a building permit under the Planning and Building Act. We plan to submit applications for the encapsulation plant in 2006 and applications for the deep repository in 2008. If the licence for the deep repository is then decided upon in 2010, we expect to be able to deposit the first canister in 2017.

The licensing process begins with a consultation process whose main purpose is to optimise the prospects of obtaining a good environmental impact statement (EIS). The consultation starts with an early consultation with the county administrative board and private individuals who are likely to be particularly affected. When it has been concluded, SKB compiles a consultation report, which is sent to the county administrative board. Early consultations have already taken place separately in Forsmark/Östhammar and Oskarshamn.

The two county administrative boards concerned have then decided that the activities can be assumed to lead to a significant environmental impact. Following this, an extended consultation with environmental impact assessment will be conducted. A much wider circle will be invited to the extended consultation: other government agencies, and any municipalities, members of the public and non-governmental organisations who may be concerned. SKB is thus responsible by law to interact with the local population, the elected decision-makers in the municipality, the local and national NGOs and the authorities involved on the local, regional and national level.

Extended consultations for both Oskarshamn and Forshmark were commenced during 2003. An extended consultation can be divided into three phases: *scoping*, *investigation/design* and *verification*. 

Figure 3 Licensing process for the deep repository system
During the initial phase of the extended consultation, SKB will prepare a scoping report describing which investigations are planned and the proposed scope and boundaries of the EIS, plus a preliminary table of contents for the EIS. The scoping report will form the basis for extended consultation with all consultation parties concerned. We are now in this initial phase and are working with the scoping reports.

- **Overview**
- Part 1 Non-technical summary
- Part 2 Introduction
- Part 3 Premises
- Part 4 Method
- Part 5 Deep repository on selected site
- Part 6 Deep repository on alternative site
- Part 7 Safety
- Part 8 Environment and health
- Part 9 Impact on community
- Part 10 Supervision and follow-up
- Part 11 Information and consultation
- Part 12 Overall assessment
- Part 13 References
- Part 14 Appendices

**Figure 4** Proposed structure and contents of an environmental impact statement

An EIS should be capable of being read and reviewed by a number of different target groups, each with different interests and backgrounds. This means that we plan to take up a very wide range of questions for investigation, and also topics such as various kinds of impacts on the community, health impacts and other sorts of non-technical aspects.

There will be constant feedback between ongoing investigations, surveys, design work and consultations. As the siting investigations and design process progress and different surveys are carried out, the design of the facilities and their adaptation to their surroundings and impact on the environment will be refined and improved. Results of investigations and surveys together with proposals for facility design will be presented at the consultation meetings, and the participants will be given an opportunity to offer their viewpoints on SKB’s proposals.

**Figure 5** Stakeholders involved in the extended consultation
During the extended consultation, SKB solicits viewpoints regarding the scope of the environmental impact statement. When the site investigations are concluded and the necessary investigations have been completed, an EIS will be compiled for the site which SKB, after careful evaluation, chooses to proceed with. Before permit applications are submitted, SKB intends to verify with the concerned consultation parties that the EIS meets the requirements of the Environmental Code. Only then can the permit/licence application, including EIS and other appendices, be finally

**The external communication**

The communication activities described so far make up the formal part of SKB’s external compiled and handed in to the Environmental Court and to the Government. SKB will, however, also face a number of new communication challenges in addition to the work with the formal consultations.

SKB has now been working in the site investigation regions for more than 10 years. We feel that the residents generally have trust in our work. SKB has occasionally commissioned opinion polls on people’s attitudes towards a deep repository.

![Figure 6](image)

**If a suitable site for a deep repository will be found in your municipality, what is your opinion about the establishing of the repository in the municipality ?**

<table>
<thead>
<tr>
<th>Municipality</th>
<th>For</th>
<th>Uncertain/No reply</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>46</td>
<td></td>
<td>47</td>
</tr>
<tr>
<td>Oskarshamn</td>
<td>69</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Östhammar</td>
<td>64</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

*Figure 6  Result from opinion polls May 2003*

One of the clearest tendencies is that people with the most knowledge about SKB and the deep disposal method are the ones who are the most positive. This is particularly clear in the municipalities where we have performed feasibility studies and where the issue has been discussed for a long time. Around two thirds of the people in Oskarshamn and Östhammar are in favour of building a deep repository if a suitable site will be found in their municipality. This is a confidence in our project that must be maintained.

One challenge is that we have to maintain a positive public interest in our project during the whole, extended consultation period. We have to continue to keep up the public interest in our project. The residents in the site investigation municipalities must look upon SKB as a natural and obvious part of the community.
It is necessary for us to inform and educate people constantly about the nuclear waste project. There will be two regular elections to the Parliament and to the municipal councils during this period. Before our applications are filed and decided on, many of the politicians, officials and other decision-makers who have been working with the project will withdraw. They resign, move from the region or take up positions in other fields. New and not so well-informed people replace them. We must inform and educate the newcomers.

The same is true for many of the residents in the site investigation municipalities. For example, the schoolchildren, who are now attending secondary schools, may belong to the electorate, if a local referendum about a deep repository is arranged around year 2010.

We cannot afford to lose public participation in the project. If we do, we will be back to square one when we finally submit our applications.

There is, today, insignificant opposition against our project. We know, however, that the potential for conflict can flare up. The Environmental Code provides the opportunity for all concerned to question our EIA work formally, and we know for a fact that when it is time to hand over our permit applications, the project will be in the spotlight again.

Another important challenge, which is of a quite different character, is that some groups that oppose our project prefer to act outside the formal consultation process. They favour discussions at public meetings and in media, where they have the possibility of picking out the topics for debate. Within SKB we feel a responsibility to conduct an honest and regular dialogue, based on facts and continual contacts. Our aim is, however, to carry out as much of this dialogue as possible within the framework of the consultations.

It is important to understand that the closer we get to the “sharp time points”, i.e. the application and licensing times, the more sensitive and value-related the discussions will be. It is obvious that a consultation process of this size, concerning the sensitive issue of siting a deep repository, could generate an almost overwhelming amount of facts, data, results, estimations, value judgements and viewpoints. SKB will strive to structure all this information as transparently as possible, in close consultation with the different stakeholders. In that context the perspectives of factual information, value-related judgements of such facts, and expressions of values will have to be described and unfolded as far as possible. Only then can a clear and transparent basis of decisions be developed.

SKB’s record of siting-related activities includes a wide variety of experiences, and we have learned from all of them. Over time have we identified a number of basic conditions, which are fundamental for a stable and successful siting process. We now meet new communication challenges, but key components of the communication process are the same:

- The siting process shall be transparent and based on voluntary participation. It is easy to be suspicious of people who are not open about their plans, and it is very difficult to regain trust once it is lost. Municipalities must have the ultimate conclusion about our continued work within their boundaries.
- A clear division of responsibilities between stakeholders is a key question. The implementing party cannot pretend to be a neutral player, and it is therefore important that another player adopts this role.
• It is important to maintain a constant dialogue and to express it in comprehensible terms. It is not sufficient to simply supply a constant flow of information along a one-way channel.
• Respect other opinions, anxieties and fears. Demand respect in return.
• A step-wise and adaptive approach to the implementation of the disposal system. Allow scope for possible changes or improvements to the project. You cannot be expected to know everything from the start, and constructive criticism should be welcomed.
• Give the process the time required. It takes time to build confidence, and one single attempt to speed up the process might ruin much more than you gain.
• Despite all non-technical aspects of communication, the continued good performance of operating facilities and of R&D work to guarantee top-quality technical systems is a must. You must always be able to clearly demonstrate that the nuclear waste will be handled with care and skill.
GERMAN VIEWS ON NUCLEAR POWER

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Summary

Since nuclear energy was first used in 1961 German nuclear power stations have generated as much electricity as is consumed in all 15 EU countries together in a period of eighteen months. In the process, not one person in Germany has been killed or badly injured by the effects of radiation. Germany’s strict safety management and nuclear expertise enjoy a high reputation worldwide. And yet there is scarcely a country in which the thorn of mistrust of nuclear power pierces as deep as it does in Germany. The euphoria of the 50s and 60s, particularly in the political world, for nuclear power as a virtually inexhaustible source of energy gave way in the 70s and 80s to a phase of discussion, often ideological in nature, while in the 90s the social debate took on a more sober and pragmatic dimension. Finally in 1998 a government came to power whose two coalition partners, the SPD and Alliance 90/The Greens, are pursuing a policy of phasing out nuclear power. After lengthy negotiations the Federal Government and the energy utilities reached an agreement in June 2000 on the continuing operation and disposal of nuclear power stations in Germany. This agreement led in 2002 to the new Atomic Energy Act. At the core of this legislation is the listing of fixed volumes of electricity, transferable between installations, that can be produced by the different reactors.

Most Germans believe, however, that the agreement is reversible and could be changed by another government in the future. This was the finding of a survey conducted by the Institut für Demoskopie Allensbach in August 2001. Indeed, leading opposition politicians are announcing that, if they win the next Bundestag election, they will retain nuclear power in the future energy mix. In general young adults appear to be better disposed to nuclear energy. In a poll carried out by the TNS EMNID Institute commissioned by the P.M. journal in June 2003, an average of 45% of those surveyed responded affirmatively to the statement “I believe that nuclear power is an acceptable source of energy”. Yet at the same time 46% also say that “all nuclear power stations should be shut down”.

Clear pro and contra views are also evident among journalists as key opinion multipliers. In recent years German economics journalists have been continuously polled about their attitude to nuclear power by the Dr. Doeblin Gesellschaft für Wirtschaftskommunikation mbH. While in 1995 42% were still opposed to a phasing out of nuclear power, in 2003 the figure had dropped to 34 %. The conclusion to be drawn from evaluating a variety of surveys is that the population is split on the issue of nuclear power into opponents and supporters. There is very little movement in either “camp”, while the mass of people in between the two positions are undecided, but tending towards opposition.
PUBLIC ACCEPTANCE AND COMMUNICATIONS PROGRAMME

CLAUDIA LEMIEUX
Canadian Nuclear Association (CNA)

Summary

The CNA is implementing a three-year intensive strategic national communications program to promote the benefits of nuclear energy with the objective of improving political support through greater public acceptance of nuclear technology. The program is funded by the industry and began in 2002 and will continue to 2004 and beyond.

The main objective of the strategy was to target positive messages to Members of Parliament, government officials, opinion leaders, the media and the public to influence decision makers in supporting nuclear industry initiatives.

Prior to this strategic Communications initiative, nuclear energy was rarely mentioned positively by politicians, government officials or the media, and even with the extensive public debates on issues surrounding clean air and climate change, nuclear was not discussed.

Select key messages were developed and tested to promote clean energy, clean electricity, the benefits of nuclear medicine, waste management, safety, security, the economics of nuclear energy for electricity generation, CANDU technology and future applications for nuclear technology in the hydrogen economy etc…

Tactics included public opinion polling and analysis, research and information on nuclear facts, dissemination of bilingual communications materials and publications, electronic newsletters and direct mail, a Website, pro-active media relations, an annual conference attracting MP’s, government officials, opinion leaders, decision makers and the media, an economic study on the industry and its benefits to Canada and promotion of the finding across Canada, media and political briefings, sponsorships of select high profile events to promote messages, political lobbying, speaking at conferences and forums, print, radio and television advertising and the development of an education program targeting schools and teachers beginning in 1994.

After 18 months, public acceptance for nuclear energy in Canada was at its highest level with over 50% support nationally and 64% in Ontario for nuclear energy for electricity generation.

The combined effect and linkages between the various tactics and media relations has brought nuclear energy into the national forum. The program is continuing in 2004 and appears to be achieving more positive media coverage, greater awareness, understanding and acceptance of nuclear issues by the public, and more favorable public policy decisions, in spite of performance issues and cost overruns in refurbishing nuclear power plants in Ontario.
MINATOM OF RUSSIA: PEOPLE GET EASIER ACCESS TO NUCLEAR INDUSTRY INFORMATION

“ATOMINFORM” of Minatom of Russia:
EVGENY FATEEV
Chief Editor of Minatom Internet Portal
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YURY BYSTROV
Director General Assistant

Summary

Minatom of Russia, not so long ago one of the most access-restricted agencies of the country, has recently started to allow more and more of its information become available to public. Several factors helped this:
- Leaders of the Ministry are ready for a more open dialog with public and mass media;
- More active involvement of Minatom in implementing the “E-Government” National Project;
- Governmental decrees on ensuring access to the information of the Federal bodies of executive power;
- Opening of many unduly classified Nuclear Industry activities to the public;
- Ever-growing information content and interactive environment of www.minatom.ru. (Minatom Website)

The readiness of the Russian Nuclear Industry leaders for open dialog with the public is an important factor. “People are always right” - says Minatom’s Minister Aleksandr Rumyantsev - “and if they ignorantly oppose some of our nuclear projects, it is us who are wrong, because we have failed to convince them otherwise, and it’s our fault”.

The establishing of the Ecology Public Council in Minatom (in autumn 2003) is a further step to improve dialog. The Council members are prominent scientists, experts, representatives of public organizations concerned with the issues of nuclear safety, environment protection and radiation safety. Quite a few are strong opponents of Minatom and Nuclear Industry in general.

In accordance with the E-Government Program, all over Russia, and in Minatom as well, all levels of management are being transformed based on new IT tools. The range is wide: from agency-to-agency interaction to government-to-public interaction. All categories of public are getting ever wider access to information concerning the activities and services of state bodies, using for this purpose various electronic means of communication, and most of all – Internet.

The Government of Russia plays, as always, a strong regulating role in the country. In spring of 2003 the Russian Government decreed to ensure access for public and organizations to information concerning the activities of Federal executive bodies. Under that Decree the Minatom was ordered to review its information policy in many respects.
A BRAND APPROACH FOR THE NUCLEAR INDUSTRY TO AMPLIFY POSITIVE ATTITUDE AND FAVOURABLE MINDSET IN PUBLIC OPINION

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The nuclear industry makes an essential contribution to prosperity. It should therefore be reconfirmed as an essential component in the quest for sustainable development.

A strong opinion brand for the nuclear industry

The impact of efficient branding is lacking in the nuclear sector. Actual brand attributes in public opinion are reduced to the negative interpretation of the concept of “nuclear”, enshrined in competitors and opponents territories as explicitly negative. Opposite opinion brands use the rejection of the “nuclear” concept as a condition to sign on their own personality and thus become referential in public opinion.

Opinion brands enable transactions of complex information

The information age drives social adoption of strong brands and life agents. People have to process more and increasingly more complex information. To take position thereon, the initial screening is kept to the essential. The transmitters personality (the brand) determines the meaning of the message and the goodwill for information transfer.

By loading opinion brands properly with the elements that guide the underlying value proposition, complex information is conveyed to the target public in an efficient, condensed way.
The brand as the essence of personality

To function on the playground of society, the nuclear industries opinion brand must be the blueprint of its consistent personality: it must carry the requisite functional attributes. The delineation of a unique personality, from reason-why and envisioned future to value proposition, gives shape to a brand capable of arousing the necessary response capacity (meaning, assignment and selective recognition) to contribute to enhanced society goodwill for the nuclear industry.

The discourse on nuclear power is shaped exclusively by its opponents

The image deficit of the nuclear sector in public opinion is due essentially to the fact that the sector does not take the initiative to express itself in an adequate manner. As a result, this image is determined almost exclusively by opponents and competitors. The nuclear industry is thus pushed into the defensive that discredits any argument from the outset, although it constitutes a competitive, attractive and profitable force among the range of available resources. As the nuclear industry is hesitant to confirm itself in an assertive manner, waste, military applications and accidents dominate the image of the sector, as they are the only occasions when the industry makes headlines.

Towards a coherent brand approach for the nuclear industry

A conducted brand approach is necessary to gain a stronger position in the energy debate and create more goodwill for society to adopt (accept) the “nuclear” concept. By loading a brand properly with the various elements that guide the underlying offer (value proposition), we can convey complex information to the target public in an efficient and marked, yet simple way.

The meaning of 'nuclear'

In public opinion, the interpretation of the concept 'nuclear' is strongly loaded with negative values and emotions. In one respect, nuclear is associated with uncontrollable risks, danger and the problem of waste. On the other hand the nuclear industry and all related activities are considered outdated and without future. Charged with this negative personality attributes, the nuclear industry is strongly limited to communicate in a constructive way. All arguments and messages are associated with the negative image of the sender and considered as expressions of a suspected sector trying to enforce its survival.

Less is more: Complex information transferred by strong brands

The information age is driving the social dynamics of strong brands and concepts: because people constantly have to process more and increasingly more complex information, and to take a position thereon, the initial screening is kept to the essential: the first phase is a weighing of the (brand) personality, followed by relation validation, information transfer and interaction (dialogue) related thereto. The
transmitter (the brand) determines the meaning of the message and the goodwill for information transfer. The transmitter issues a licence for dialogue, as it were.

**Personality: A precondition to being recognised**

To be capable of conveying complex, rich information efficiently, brands must have sufficient selective drive, individuality and recognition, i.e. brand personality. The selective recognition manifests itself chiefly in the degree to which the target environment is capable of giving meaning to the brand expressions. This meaning comprises its own brand territory for identification, adoption or rejection. The stronger the brand (the meaning and assignment of the brand according to its own personality), the easier it becomes for the target public to take a position, and the richer the information transfer.

**Greater impact with a strong brand**

The force of a strong brand is decidedly lacking in the nuclear sector. The brand is in fact reduced to the negative interpretation of the concept of “nuclear” or “atom,” which is enshrined in the territory of others (direct and indirect competitors and opponents) as explicitly negative. In other words, other brands use the rejection of the “nuclear” concept as a condition to sign on their own personality and thus become relevant.

**The brand as the essence of personality**

To be able to function in a communication environment, a brand for the nuclear industry must be complete. This means that it must have the requisite functional attributes. Otherwise, it cannot possibly convey the reason why, the rationale (mission, vision) of the underlying organisation, let alone help to achieve them. Some of these attributes are:

- The physical characteristics: the form under which the offer manifests itself in concrete terms, distribution channels, information sources and achievements. e.g. nuclear stations, radiography, nuclear medicine, faculty of nuclear sciences, but also a stand at a trade fair, etc.
- The historical background: milestones, achievements, incidents.
- How do we describe the culture of our sector? What are the dominant characteristics?
- What self-image do we project to people, organisations and companies that are associated with the nuclear sector?
- What do others, i.e. the reference environment, think about these people, organisations and companies?
- What kind of relations do we wish to enter into and cultivate with our environment, our society, our direct and indirect target publics?
- What value proposition do we make to the society in which we operate?
- What added value do we wish to offer, both rational and emotional?

A delineation of a consistent, own personality, from reason why to final communication attributes, creates a brand capable of arousing the necessary
response capacity (assignment and selective recognition) to contribute to enhanced goodwill on the part of society for the nuclear industry.

Framework and stakes

Promising line: public opinion is not against nuclear power; however, the discourse on nuclear power is shaped exclusively by its opponents

The image of the nuclear sector in public opinion seems to be purely negative. This image deficit is due essentially to the fact that the sector does not take the initiative to project itself in an adequate and efficient manner. As a result, this image is determined almost exclusively by the opponents and competitors. The nuclear industry is thus pushed into the defensive that discredits any argument from the outset, although it constitutes a competitive, attractive and profitable force among the range of available resources. The very winning assets of nuclear power make it a real threat for other sources of energy; by way of reminder, the direct or indirect control of such sources is de facto an essential source of power. Seen in this light, the disinformation efforts should not come as a surprise, nor should the fact that public opinion is manipulated to demolish and stigmatise nuclear power as an economic competitor. As the nuclear industry is hesitant to project itself in a positive and assertive manner, waste, military applications and accidents tend to catch the attention of public opinion and dominate the image of the sector, as they are the only occasions when the industry makes the headlines.

Objective

Promising line: Establish a positive image for the nuclear sector (= energy).

The nuclear sector can count on a far larger number of latent proponents than on active opponents. This makes it able to obtain the public support it deserves if a well thought out and coherent approach is implemented. The nuclear industry may thus emerge as a credible source of energy – a status compatible with this adhesion by the public and the underpinning values and standards. Under these conditions, the nuclear sector can take part in the debate on energy, sustainability and the environment from a strong position all its own. It will then be capable of exerting influence on this debate by asserting the pertinent criteria. The nuclear sector is a positive and indispensable part of the way our society can project itself in the future. If it can so project itself and show its strong points, its sense of responsibility and its leadership, it will be recognised as such. The nuclear sector will then be rightly considered for what it is: an essential contributor to the well being of all.
Approach

**Give concrete form to the significance and importance of the “nuclear” sector through attractive and representative branding.**

This branding corresponds to a concept that musters a series of distinct values: basic values, identity features and brand personality. Giving tangible form to value propositions (those followed by the sector, which are of a rational, but also emotional, nature), branding enables the sector to project a dynamic, prospective, motivated and motivating identity. The distinctive characteristics of the brand call for identification: an attractive brand opens new avenues on the territory embedded in modernity, with a firm grip on reality. Adherence to this brand image by the public will lead to a positive choice, one open to the future.
DO WE HAVE THE RIGHT ARGUMENTS?

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Summary

One of the main goals of every company is gaining a positive image, the trust of its partners and the approval by the general public of its activities.

Nuclear power field is a vulnerable domain mostly exposed to the attacks coming from the opponents.

It is the domain which needs an appropriate way to reach public's heart and mind using the best arguments and methods.

On the other hand the nuclear power communicators have to know the best answers and methods to answer the attacks of the opponents.

The paper tries to answer the question whether nuclear power communicators use the right arguments in their day by day activity.

The paper also tries to present the arguments that “Nuclearelectrica” applies in obtaining the approval of nuclear power by the Romanian people.
NUCLEAR PLANTS ARE MAKING THE WORLD SAFER BY ELIMINATING NUCLEAR WARHEADS

A powerful new theme
for gaining public support for nuclear power

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Summary

It is time to think about the unthinkable - a terrorist nuclear weapon constructed from stolen or black-market nuclear warhead material. A weapon small enough to be smuggled into any major city in any part of the world. These are the scenarios being publicly talked about and the subject of motion pictures and television reports. Obviously the public is concerned and alarmed by this.

A little known fact is that the commercial nuclear power industry is actively helping to reduce the possibility of such a scenario. Bomb-grade nuclear material is being recycled into fuel used to generate electricity in many of the world's commercial nuclear power plants. In fact, nearly 8,000 potential nuclear warheads have been eliminated to date, and the resulting nuclear fuel could power Spain for 13 years. This program is called Megatons to Megawatts.

Opinion research has determined that the Megatons to Megawatts message is a powerful and persuasive pro-nuclear message for use in public information programs.

Opinion research

Message testing of the Megatons to Megawatts program was undertaken by USEC to determine if these messages were regarded positively by the public and would enhance the acceptance and reputation of nuclear power operations. A leading public opinion research firm conducted 10 focus groups around the United States. The results were beyond expectations. Focus group participants placed Megatons to Megawatts at the top of the list of positive attributes for nuclear power, favoring it over such nuclear industry-tested messages as helping to meet growing demand for electricity, ensuring energy independence and ensuring clean air.

Conclusions: Megatons to Megawatts can be a highly significant public acceptance point for nuclear energy when combined with other positive industry messages. The program has strong appeal, including to those not convinced by nuclear energy's other messages.
Opportunity for alliances

Megatons to Megawatts also presents an opportunity for attracting new allies for the expansion of nuclear power. The goals of nuclear power advocates clearly coincide with those of nonproliferation and environmental advocates. An alliance with these interest groups could accelerate both the expansion of nuclear power and the elimination of more bomb-grade material. Nuclear power will be helping to reduce the threat of global climate change, supporting energy security and making the world a safer place by reducing the threat of nuclear weapons.
Transparency & Dialogue: The Keys of Nuclear Transport Issue

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Abstract

Today, public opinion, local actors, organizations and associations are expecting a transparent information on nuclear activities. The fact is, a great number already has daily instant access to information and is able to share it very quickly, thanks to new technologies.

Public opinion’s sensitiveness is growing, and risk remains at the center of public concerns. The discrepancy between objectively assessed risks and perceived risks is a permanent challenge for Acceptance of nuclear energy. The opponents are also using it, to build their misleading strategy.

When anti-nuclear groups are claiming for an increasing involvement in the decision making processes, they also get there the most efficient means to tackle our activities, namely operational information on the nuclear transport activities.

In this specific context, two key events have implied a nationally concerted and additional effort in order to supplement “transparency”, in 2001 and 2003.

As an example, let’s focus on the resumption of nuclear transport between Germany and France. In May 2001, locals concerns were expressed, particularly in Alsace (France), a region which is regarded as the “gate” to/from Germany for nuclear materials transportation (Spent Fuel and High Active waste from/to France and United Kingdom).

• Firstly, mayors had expressed the need to be more informed on our activities. As a consequence, we have participated in an information Committee in Strasbourg, involving Authorities, Mayors, media and industries.
• Secondly, French Authorities, as well as industry representatives, were invited to present a more detailed information on nuclear transport activities at the Annual French Mayors Congress, in November 2001.

In 2003, anti-nuclear organizations have focussed their actions on sensitive material activities, and launched a new dedicated website (with an attempt of unveiling the truck’s registration numbers as well as the nature and details of their content and routes,…).

• Early last year, opponents have carried out an action against a sensitive materials road transport to try to attract once again media attention.
• Other additional actions from opponents took place in front of COGEMA-La Hague plant and COGEMA LOGISTICS’ railroad terminal located at Valognes (France), just before the French national Debate on nuclear energy.

In order to tackle this challenging issue, COGEMA and its parent company AREVA are engaged in improving their information policy. It has been extended to international and national transports commissioned by COGEMA LOGISTICS. Regarding the most recent transport operations, specific information policy has been implemented at the national and local scale through media (TV, radio, interview,…), information committees (ANCLI, CLI, CSPI,…), trade unions,… But, on the one hand, this policy is facing limits: transparency and openness stop where sensitivity and confidentiality start. On the other hand, opponents are building a challenging process, which is "more and more". Whatever the industry efforts are, opponents will remain unsatisfied.

Consequently, we need to assume responsively this new role through a proactive policy in the field of the safety of the nuclear materials transportation. But above all, this policy must be dedicated to the public opinion. It must not be a way to answer to opponent’s attacks. The industry's transparency and information must support public opinion's understanding of the important issues which are on progress: preservation of the environment, providing the cleanest industrial energy to the world, acting against the CO2 effects.

Our challenge: enforcing an efficient operational transparency and information policy, supported by an optimized communication policy.
Introduction

COGEMA LOGISTICS has been transporting nuclear materials for 40 years, at national and international levels. National transports are daily implemented in France and there is not so much opposition to them any more. Things are quite different in the field of international transports. Let's focus now on our national experience and the last events.

Risk is at the center of contemporary public concerns. In a world perceived as more and more "menacing" and stressful, public opinion sensitiveness to environmental and health dangers is sharpened. People are willing to understand better the society they live in, to be deeper involved in the decision making process … They want to accept their risks by themselves.

In order to fill the gap between assessed and perceived risks, we have to take into account the formation process and the structure of perceived risks. Perception of risks is more the result of a public opinion building process, than the conclusion of a rational analysis.

Through this paper, we will try to analyze the mechanism of the opponents policy against nuclear transport activity, and the information policy applied by COGEMA LOGISTICS.

Background : French context, opponent strategy

1 - Nuclear transport sensitiveness: finally low level of mobilization

As any industry, the nuclear one has its distinctive features. However, these specificities should not be considered as fundamentally different compared to others. In the information area, every day, current events show us that there is a worldwide demand for transparency. Through the last opinion poll implemented by IRSN\(^1\) in 2002, nuclear activity is compared to other concerns from public opinion\(^2\).

Today the trend is favorable to nuclear energy. Nuclear issues is opened to all citizens, politics, industries, and associations, to make sure that everybody is able to be involved, can dialogue and access freely and openly.

2 - Disjunction raises concerns

There are two distinct fields: an ideological one occupied by opponents, and a rational one occupied by pro-nuclears. There is no overlapping and no space for constructive and objective debates, the different approaches drives to a failure.

Facing a relatively confident public opinion, opponents create media interest from emotional and sensational addresses. They build their strategy on a growing gap between the assessed risk and perceived risk. This existing gap with no possibility for exchange creates confrontation. In this context both fields are only linked through interconnected means of communication (media, web,…).

Beside that, public opinion doesn't ask initially so much. When it is stimulated by media interest, this public opinion becomes interested more in confrontation between the two parties than by the content of the issue itself. In this context, opponents know how to create media interest, through a "network" more and more efficiently organized.

3 - Opponents policy relies on NON-EVENT culture

In the context of the industry safety record of many usual transports, opponents have no other choice than to activate their confrontation process through a non-event strategy, which means to create interest from unfounded assumptions and scenari.

4 - Two different stakes: discrepancy between opponents and industrials
Regarding the "nuclear information", opponents don't have to report to anybody: no shareholders, no international legal agency, no authorities,.... They can build their scenario based on non-events with no constraints.
Industry is extremely controlled, has to report to safety authorities\(^3\), and must respect international and national regulations…

5 - Emotional: the key of the opponent communication policy
In France, in the past, some decisions regarding nuclear energy have been taken without providing sufficient explanation to the public. Therefore, progressively some doubts have raised generating sometimes the feeling that there was no room for dialogue. This concern was reinforced by the Chernobyl catastrophe.
From this experience, it has become easy for opponents to base their strategy on an unanswerable coup: mystification, scary pictures (Hiroshima, Chernobyl,…), ... emotional coup !!!

6 - Opponent behavior diverts assets from a right use
Due to opponent policy, the transport organization sometimes becomes more and more complex:
- mobilization of large police forces,
- a regulatory pressure, while our transport are among the safest and the most controlled ones,
- a media pressure, build on non-events ....
Resources dedicated to limit the opponent interference are not bringing any added value for the benefit of the general interest and its safety.

French Nuclear industry: Implementing our strategy

1 - Our experience is based on 2 ways…

Information duty: A strike force provides the right information at the right time and the right place
- COGEMA presence and availability to media
- COGEMA response through media, local information committees, trade unions committees,…
- COGEMA capability to deliver information quickly

Communication policy for making available the information to everybody
- Thanks to Internet, AREVA & COGEMA have become pioneers by installing about 10 webcams on its La Hague site (shut down since September 11th). More than 20,000 connections to these websites were registered each month. Real time data on production and transport programs are put on line.
- The AREVA policy is encouraging the public to come and visit us by developing visit access on our production sites (25,000 visitors/year). This "open door" policy is also addressed to opponents. But since the September 11\(^{th}\) events, security constraints have strongly restricted this policy.
- A large choice of information tools is available to the public.

\(^3\) French Safety Authority under control of Ministry of Health, Ministry of Environment, Ministry of Industry
2 - Our policy is facing limits…

In 2003, opponent's organizations have focussed their actions on our transport activities:

- Early last year, opponents have carried out an action against a sensitive material road transport to try to attract media attention once again.
- Other additional actions from opponents took place in front of COGEMA-La Hague plant and COGEMA LOGISTICS' railroad terminal located at Valognes (France), just before the French national Debate on nuclear energy.

In order to tackle this challenging issue, COGEMA and its parent company AREVA are engaged in improving their information policy. It has been extended to international and national transports commissioned by COGEMA LOGISTICS. Regarding our most recent transport operations, specific information policy has been implemented at the national and local scale.

But, on the one hand, this policy is facing limits:
- Communication scheme is based on short and synthetic messages, and it's a challenge to apply this policy on a so complex and technical high technology area. Moreover nuclear industry has a technical and rational message different from the opponent.
- "Nuclear" could be (is?) a tool of pressure from certain local actors
- Transparency and openness stop where sensitivity and confidentiality start.

On the other hand, opponents are building a challenging process, which is "more and more". Whatever the industry efforts are, opponents will remain dogmatically unsatisfied.

3 - Why confidentiality?

The two main reasons are:
- To protect transported materials from any hostile actions
- To protect commercial information sensitiveness like in any other business (high technology, patents, …)

4 - Do we need to communicate on each transport?

When a global communication on our transport activity is important, a specific one for each transport has not so much interest and sense due to:
- what has already been globally explained
- routine aspect of these transports
- security constraints
- no added direct benefit

Our engagements are proactively oriented to communication related to industrial operation which are carried out, commercial contracts, …

We need also to assume responsively our role through a proactive policy in the field of the safety of nuclear materials transportation. But above all, this policy must be dedicated to the public opinion. It must not be a way to answer to opponent’s attacks. The industry transparency and information must support public opinion's understanding of the important issues which are on progress: global access to the energy, preservation of the environment, providing the cleanest industrial energy to the world, acting against the CO2 effects.

In order to touch the public opinion we cooperate with politics, mayors, media and others in order to deliver a better information for a better understanding.

Our challenge: enforcing an efficient operational transparency and information strategy supported by an optimized communication policy.
Conclusion

Risk perception has its own logic, therefore we cannot translate technical models into a communication tool (user instruction, …). There is no "standard" public (politicians, citizens, media, opponents, scientists, …). Each group needs a specific type of information. Nuclear industry cannot change the opponents position but can respond to concerns from other groups and particularly local actors. It's the reason why, we try to focus more and more on local action at the core of nuclear concerns. We try to emphasis the human face of the industry. Nuclear industry needs to break the scientist's stereotype in order to develop the "neighborhood attitude", through the trust as cornerstone for a better understanding about perceived and assessed risks.

In spite of the efficiency of the opponents to tackle our activity and thanks to our capacity to answer to opponent attacks, we are able to have a more balanced consideration from the public, politics, associations, … In majority, French public is confident regarding nuclear activity (IRSN survey - 2002). Nuclear industry has a global (not merely technical or economic) responsibility towards the public: being totally law-abiding is not enough. We need to go further … to maintain a close monitoring of the local concerns in order to take up the ground, to have a proactive attitude in order to pursue our business in best conditions. Our aim: the alarmist speeches over "floating Chernobyl" or "nuclear bombs on rails" must find no response any more among responsible leaders.
WORKSHOP
STAKEHOLDER DIALOGUE:
ADDRESSING DIFFERENT INTEREST GROUPS
Monday, February 9

Moderator:
Torsten Bohl, Ringhals AB, Sweden

COMMUNICATION INTO THE NUCLEAR FIELD:
A BALANCE BETWEEN INTERNAL AND EXTERNAL
COMMUNICATION

TEODOR CHIRICA
MIHAEL STIOPOL
LUMINITA STANCIU
Societatea Nationala Nuclearelectrica
Bucharest, Romania
Communication into the Nuclear Field
A Balance between Internal and External Communication

Teodor CHIRICA, Mihaela Stiopol and Luminita Stanciu
SNN SA, ROMANIA

PI ME 2004
BARCELONA, SPAIN
Vision:
- SNN SA to be perceived as a trusted source of factual information on all aspects of nuclear power

Main targets:
- education and building the credibility on the nuclear power
- education and building the credibility on the Romanian nuclear power program and on the Cernavoda Nuclear Power Plant, as a feasible and safe alternative for electricity production

Parameters considered:
1) the target audience to which an attention should focus on;
2) items of interest;
3) methods for education, information and communication.
TARGET AUDIENCE

• Broad target audience, including:
  › General public from Romania
  › Local public – living around the nuclear site(s)
  › Mass-media reporters
  › Young generation (kindergarten and schools, students etc.)
  › Different professionals: teachers, doctors etc.
  › Women
  › Politicians: national and local authorities, mayors, elected representatives

• Special attention should be paid to the people living around the site, as well as to the young generation.
• Politicians represents a special target, sometime their interest may not mach with the nuclear industry
• Women are very important audience

ITEMS OF INTEREST

• Radioactivity and impact over the health; Tritium releases
• Nuclear accidents – reactor safety: Nuclear reactor = nuclear bomb?
• Nuclear weapons proliferation
• Radioactive waste management, storage and final disposal: lack of confidence in long term technical concepts
• Cooling water impact over rivers and aquatic species
• Efficiency of nuclear power – impact over tariff and life conditions
• Source for a clean environment: avoidance of CO₂ and other gaseous products from thermal power plant – climate change and global warming
• High availability on nuclear energy for customers; security of supply
METHODS

1. Written information: pamphlets, bulletins, annual reports, calendars, yearbooks etc.
2. The relationship with mass – media
3. Education of the young generation
4. Informing politicians and decision-makers
5. Public debates
6. Cooperation with the civil society (professional and nuclear industry non-profit making associations):
7. Internal communication programs
8. Site visits
9. Materials and displays
10. Company Web-site

WRITTEN INFORMATION

Information for all categories of target audience
- Leaflets, making - up an "ABC" on the nuclear energy
- Pamphlets, folders, brochures: CANDU type reactors, Cernavoda NPP, in Romanian and English
- Posters to educate and present various aspects related to Cernavoda Nuclear Power Plant

Informing children:
- Booklets for children, such as “The Wonderful Land”, “The History of the Nuclear energy” or “A Happy Kingdom” telling about nuclear energy option, prepared for grammar school pupils or the “Color Book with Puzzle”

Informing politicians, local authorities, experts, partners in business, mass-media representatives and own staff
- Information bulletins, Company profile and facts, Annual Reports
WRITTEN INFORMATION (cont’d)

Training seminars for journalists on topics like the worldwide status of nuclear energy, the history of the Cernavoda NPP, nuclear fission, nuclear power generation, CANDU type reactor presentation – safety aspects, efficiency and performances, waste management, radiation levels, INES and other

The Romanian nuclear utility presence in mass-media:
- Producing support documentation for radio and TV programs;
- Radio and TV programs, round tables, live talking to the listeners, etc;
- Press releases for a prompt information of the public concerning events occurred during the operation of nuclear power plant
- Interviews provided by top management for radio, TV, newspapers
- Publishing “Advertising” articles on company activity
- Facilitating interviews with personalities non direct involved
Lectures for the education of the young generation in view of the correct perception and understanding of all and various aspects related to the nuclear energy applications.

- Site visits at Cernavoda NPP and other nuclear sites like fuel fabrication plant, research institutes.

**Drawing contest** organized every year starting with 1994

- Prizes offered, in cooperation with the Romanian Nuclear Society (AREN) and Romanian Atomic Forum (ROMATOM);

**Support to local schools from Cernavoda town**

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**EDUCATION OF THE YOUNG GENERATION (cont’d)**

- Drawing contest for children and teenagers, organized jointly with AREN and ROMATOM under the motto “The Nuclear Energy is saving the Environment”
INFORMING POLITICIANS AND DECISION MAKERS

• Site visits: President of the Republic, Prime Minister of Romania, European and Romanian parliamentarians

• Providing information on a prompt and regular basis about all the aspects concerning the nuclear energy;

• Participation of VIP as invited to the national and international emergency planning drills organized at Cernavoda site

• Informing and cooperating with the local decision makers

“PREPAREDNESS OF THE GENERAL EMERGENCY DRILL”

The drill involved: employees, public from community, authorities, schools.

PR Group was involved in the procedure communication activities and keeping informed the employees and community about the status of preparing the drill.

For this drill, the media helped in preparing the public to respond to emergency plans and drills, explaining the purpose, how the drill is organized, controlled and evaluated; finally, the published the results.

PR Group kept informed the employees and the community through:

- Meetings with the Mayor and the City Council, and with the Cernavoda High School establishing the details;

- A short informational movie on local TV cable;

- Informational bulletins.
PUBLIC DEBATES

Public debates: Cernavoda Unit 2 Environmental Impact Assessment, as per the Romanian and International Law

Information distributed to the public:
- Project description and benefit of the Project implementation;
- Environment Impact Assessment (EIA)

Five meetings: open debates, local leaders, independent experts

Matters of concerns:
- Radiation doses and effects on the ecosystem;
- Effects related to the interim dry spent fuel dry storage; and
- The water usage in the area.

Results:
- Distribution to the media of the quarterly environmental reports;
- Additional thermal aquatic study for U#1 & 2
- New evacuation route in case of emergency;
- Completion of an Intermediary Dry Spent Fuel Storage; and
- Extension of the EMS from U#1 to U#2.

THE ‘PRO-NUCLEAR’ CIVIL SOCIETY

MAIN ROMANIAN NGOs promoting nuclear energy:
- Romanian “Nuclear Energy” Association - AREN
- Romanian Atomic (Industry) Forum – ROMATOM

NGOs rather positive for promoting nuclear energy:
- Romanian Society for Radioprotection – SRRp
- Energy and Environment Foundation
- Romanian Association of Electrical and Thermal Power Consumers etc.

OTHER METHODS OF COMMUNICATION

Materials and displays: badges and trinkets, collages, and bags, note - books and calendars etc.

Organizing site visits: Cernavoda NPP and Nuclear Fuel Factory Pitesti

Company website:
FROM INTERNAL COMMUNICATION TO THE EXTERNAL COMMUNICATION

- Use the relations between staff, suppliers, clients, subcontractors and local players
- Do not forget the obvious: the staffs and contractors who live in the area and have their own network of family, friends and acquaintances
- Added value bring by the retired staff
- Insiders interested to contribute need to be properly informed; insiders should have access to the database of events and to the list of players.
- Suppliers may offer an introduction to some key local players

MAIN DIRECTIONS OF INTERNAL MESSAGES:
- The scope and the perspective of the organization;
- The role of each employee within the organization;
- Activities - the involvement in educational and recreational activities is necessary for the employee’s moral condition;
- Updated information - a well-informed employee, as regards the general communication policy of the company, is a more efficient one.

SNN SA - LEVELS OF INTERNAL COMMUNICATION
1. Through the employees;
2. Between the three branches and headquarters staff;
3. Inside the branches
LEVELS OF INTERNAL COMMUNICATION

1. Internal communication achieved among the employees

Printed materials: info bulletins and NucNet summary

Monitoring the newspapers: and providing prompt reply and clarification, if the case may be

2. Internal communication between the three branches and headquarters staff: maintaining a basic level of information among the branches and between the operational branches and the head-office

Only one ‘official’ channel of communication to mass-media and public

3. Internal communication inside the Branches of SNN SA (Cernavoda Unit 1): INFOPLUS Bulletin, INTRANET, Management communication, dedicated leaflets, station performances

(Cernavoda Unit 2): QA and Safety News Bulletin

“2003 PLANNED OUTAGE”

The 2002 Planned Outage Booklet consist of:

- The Cernavoda NPP Director message
- Objectives
- Major responsibilities of the co-ordinators
- Important modifications on systems
- Important works on systems
- 2002 Planned Outage organisation chart
- External technical assistance
- External communication plan

PLAN DE COMUNICARE EXTERNA

RESPONSABILIZAREI COMUNICAREI EXTERNAE

Lascu BĂDĂU – aprobare comunicate de presă, realizare interviuri

Dumitru SACHLENSCHI – furnizare informații pentru realizarea comunicatelor de presă

Informații realizarea comunicate de presă, urmărirea realizării, realizarea comunicate din presă

- PREPAREDNESS OF THE PLANNED OUTAGE – based on the information received in the technical meetings, PR Group was editorial board of the first planned outage booklet for Cernavoda NPP.
Cernavoda NPP
Unit #1
Since in Service

Station Performance

<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Generated Power (gross)</td>
<td>5,400,856</td>
<td>5,307,101</td>
<td>5,108,668</td>
<td>5,058,751</td>
<td>5,445,890</td>
<td>5,212,419 MWh</td>
</tr>
<tr>
<td>Total Power to Grid (net)</td>
<td>4,936,057</td>
<td>4,816,831</td>
<td>4,813,027</td>
<td>4,202,035</td>
<td>5,044,277</td>
<td>4,168,555 MWh</td>
</tr>
<tr>
<td>Gross Capacity Factor</td>
<td>87.37%</td>
<td>86.19%</td>
<td>84.51%</td>
<td>88.98%</td>
<td>83.25%</td>
<td>80.57%</td>
</tr>
</tbody>
</table>

Lifetime Station Statistics

| Gross Capacity Factor since In Service | 86.36% |
| Total Generated Power (gross) | 38,612,509 MWh |
| Total Power to Grid (net) | 35,638,189 MWh |

Commercial Operation in 2002

<table>
<thead>
<tr>
<th>Month</th>
<th>Generated Power</th>
<th>Net Power to Grid</th>
<th>Gross Capacity Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>529,874 MWh</td>
<td>491,515 MWh</td>
<td>101.20%</td>
</tr>
<tr>
<td>Feb</td>
<td>479,636 MWh</td>
<td>445,232 MWh</td>
<td>101.28%</td>
</tr>
<tr>
<td>Mar</td>
<td>525,003 MWh</td>
<td>486,684 MWh</td>
<td>100.27%</td>
</tr>
<tr>
<td>Apr</td>
<td>510,241 MWh</td>
<td>472,895 MWh</td>
<td>100.65%</td>
</tr>
<tr>
<td>May</td>
<td>269,163 MWh</td>
<td>249,461 MWh</td>
<td>51.30%</td>
</tr>
<tr>
<td>Jun</td>
<td>0 MWh</td>
<td>0 MWh</td>
<td>0%</td>
</tr>
<tr>
<td>Jul</td>
<td>471,652 MWh</td>
<td>432,911 MWh</td>
<td>89.78%</td>
</tr>
<tr>
<td>Aug</td>
<td>374,558 MWh</td>
<td>344,949 MWh</td>
<td>71.32%</td>
</tr>
<tr>
<td>Sep</td>
<td>181,602 MWh</td>
<td>167,136 MWh</td>
<td>35.74%</td>
</tr>
<tr>
<td>Oct</td>
<td>522,574 MWh</td>
<td>484,840 MWh</td>
<td>99.42%</td>
</tr>
<tr>
<td>Nov</td>
<td>512,671 MWh</td>
<td>475,873 MWh</td>
<td>101.42%</td>
</tr>
<tr>
<td>Dec</td>
<td>528,689 MWh</td>
<td>489,922 MWh</td>
<td>101.28%</td>
</tr>
</tbody>
</table>

Total Generated MWh 4,905,663 4,541,618 79.52%

Unit 2 - QA and Safety News Bulletin

- QA and Safety News Bulletin has been developed and published; the news bulletin is issued every three months.
All target audience is important in building the confidence, but some categories deserve special attention, considering the today priorities of the company:

- Local public, including local authorities – as far the anti-nuclear NGOs started a strong campaign against Cernavoda 2 and further development of the site
- Mass-media representatives, increasing the co-operation with local newspapers, as well as with the national ones
- Politicians, considering this year elections, and the re-drafting process of the political strategies of different parties
- Improving the internal communication developing INTRANET and EXTRANET channels, and extending social events inside the company

Company has enough flexibility to re-define the target audience considering possible future reallocation of priorities

REFERENCES

4. Unlocking Local Knowledge to Benefit Public Acceptance Work, Pascal Etcheber, The Uranium Institute 1999
7. How we can explained the facts about nuclear energy through the internal communication, Mihaela STIOPOL, Iosif Constantin BILEGAN, Luminita STANCIU, SNN SA, International Symposium on Nuclear Energy, SIEN 2003, Bucharest
THE ATTITUDES OF YOUNG CZECH PEOPLE TOWARDS NUCLEAR ENERGY

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The last month of 2003 and the first month of 2004 saw an opinion poll surveying the attitudes of Czech secondary school students to the power industry, and more specifically nuclear energy. The opinion poll followed a series of debates and lectures that the CEZ power company has been organising at schools within the framework of an educational programme entitled “Energy for Everybody”.

Student debates about nuclear energy have already been held in the whole of the Czech Republic for three years. Over this period, we have visited 1 300 schools (secondary schools, and lately also some senior years of primary schools). In February 2004, these discussions will reach the jubilee number of 50 000 students. Seven debates were also held in the Austrian border areas and eight in Bavaria.

The debates take 2 hours and consist of a lecture, film projection and presentations, and the main body of the programme – a discussion ignited by questions from the students. The debates are presided over by the employees of our power plants, teachers and students of the Department of Nuclear Energy from the Czech Technical University of Prague. Schools have shown such a great interest in these debates, that we are almost unable to meet the demand for them. The students show extraordinary interest in the issues covered by the debates.

To verify the real attitude of young people to nuclear energy and its potential development, we are now also asking the students to fill in opinion poll questionnaires before the debate begins. These are the most significant results of the survey:

The questionnaires were completed by a total of 2 314 respondents aged 13 to 18, half of them male and half of them female.

• When asked the question “What do you think about the relationship between the standard of living and energy consumption?”, 53,5 % of students replied that the energy consumption had to increase if we were to improve our standard of living, 41 % think that the standard of living can be improved even without increasing energy consumption. Only 5.4 % of respondents ticked the option “If we are to reduce energy consumption, our standard of living must inevitably drop”. Obviously, few want this scenario.

• Another question was formulated in the following way: “Which energy source do you regard as the final solution to the energy demand of humankind?” 57,1 % of the students chose solar energy, wind power, sea torrents, etc., 38,8 % opted for nuclear energy, fission and fusion. Energy generated by fossil fuels
was chosen by a negligible percentage of respondents (4.1 %).

- When assessing the nuclear-power share in the Czech energy industry, about 14 % students think that the nuclear-power share should be reduced, 58 % would prefer preserving the status quo and 28 % would like to see an increase in the share of nuclear energy. There is a considerable difference between the male and female responses to this question – 38 % of male students and only 17 % female students would like to see the share of nuclear energy increase, while 10 % of male students and 18 % female students would like to see it decrease.

- The students chose the following most significant benefits of nuclear energy: It does not generate any greenhouse gasses and thus does not contribute to the global warming process (63 %); coal and petroleum are too precious raw materials to be combusted unnecessarily (20 %); there is sufficient raw material base for the production of nuclear fuel (17 %).

- The following factors were earmarked as the most significant disadvantages of nuclear power industry: nuclear wastes (65 %), risks of accidents (28 %) and large investment costs (only 7 % of the respondents).

- 66 % of the respondents think that the arguments of the opponents of nuclear energy must not be overlooked, 21.5 % regard them as just (a larger percentage of female students – 25 %) and only 12.5 % regard them as unjustified (20 % of male and only 5 % of female students). This clearly indicates that female students are more likely to believe the arguments of the opponents of nuclear energy. We can also trace other factors which influence the decision-making process, such as age, and consequently also better awareness and a higher level of education: 30 % of under-15's consider the arguments of the opponents of nuclear energy as justifiable, compared to only 15% of over-15's, 12% of under-15's think that the arguments are unjustified, compared to 15.5% among the older ones.

- “People should prioritise the use of those energy sources with the smallest negative environmental impact.” – 82 % of the respondents agree with this statement. 13.8 % would prioritise the sources that ensure energy production for the longest period of time and, surprisingly, only 4.6 % prefer sources that generate the cheapest energy. Age of respondents plays no role.

- “What do you regard as the most serious risk for the future of humanity?” More than half of the respondents (59 %) think that it is global warming, 23 % think it is the world's growing population, and only 18 % ticked the option “lack of energy sources”.

- In the next question the students were asked to tick three environmental changes that they consider the most serious issues today. Damage to the ozone layer was chosen as by far the most significant factor, followed by the pollution of the sea and climactic changes – these three options were always ticked by over a half of the respondents. It is interesting to note that the fourth most frequently ticked option (37.4 %) was radioactive contamination resulting from nuclear power plant accidents. 22 % of students were concerned about acid rain, 15 % ticked the shrinking areas of virgin nature, and 14 % the spreading of deserts.

- We also tried to establish general awareness of the Chernobyl accident in the 1980's. 57.4 % of the respondents knew the true cause – a series of subsequent mistakes of the servicing personnel, while 20.4 % think that the catastrophe was caused by a technological failure. 22 % admitted that they
28.6% of the respondents were afraid that there could be a nuclear accident in our country (13.8% answered yes, 14.8% probably yes), 71% were not afraid (27% no, 44% probably not). Female respondents show anxiety about this issue twice as much as male respondents (40% of female students compared to 18% of male students).

The next two questions tested the knowledge of the students. The question “Which of the following materials does not contain natural radioactivity”, was a teaser question, as all of the substances contain some radioactivity. Only 16% students chose the correct answer, otherwise respondents tended to tick “drinkable water” (45% of them think that it does not contain any radioactivity), but 12% also ticked “coal”, 9.5% chose “meat at a slaughterhouse” and nearly 9% even ticked “radon”. The mistakes were more frequently made by younger students, while most (27%) correct answers were given by the oldest students – which seems to be clearly linked to their higher level of education.

Furthermore, we tried to discover how much young people know about exposure to ionising radiation. The respondents thought that we are most exposed to ionising radiation during a single X-ray examination (58%), 18% chose “a one-year living in the vicinity of a nuclear power plant in standard operation”, 18% ticked “a five-hour flight at the altitude of 10 000 metres and 6% ticked “a one-year stay in a concrete building.”

Finally, we asked the respondents what electricity supplier they would prefer. The two top preferences had almost identical percentages. 46% of the respondents would go for the supplier of the cheapest available electricity and 47% would opt for the supplier able to prevent electricity dropouts. Only 7% would prioritise a supplier whose electricity is not generated by nuclear power plants.

It is interesting to observe the development of the students' attitudes over the past 11 years. In 1992 and 1993, the Czech Republic hosted an international project aimed at surveying the knowledge and opinions of secondary school students. It was held in June 1992, in seven countries simultaneously: Japan, France, Germany, Sweden, Switzerland, Great Britain and Czechoslovakia, and was initiated by JAERO (the Japan Atomic Energy Relations Organization). The survey involved 1 030 students aged 15 to 18. The following charts show the comparisons between the results of the 1992 survey with the recent results.

The students ticked the following statements regarding the connection between the standard of living and the energy consumption: 74% thought that our standard of living could be improved without increasing energy demand, 24% regarded the increase in energy consumption as an inevitable accompanying feature of improving the standard of living. 1% of respondents agreed with the statement “We want to reduce energy consumption, which will inevitably result in lowering our standard of living, and 1% regarded the current standard of living and energy consumption as satisfactory. The current opinion polls, held ten years afterwards, indicate that the views of young people are more realistic and twice as many young people see the inevitability of increasing energy consumption.

Which type of energy should be developed in the future? 55% students mean that it should be solar energy, 29% chose the energy of sea torrents, waves, temperature
gradients, etc., 7% ticked nuclear energy, the same percentage of respondents chose geothermal energy and only less than 2% opted for the future development of fossil fuels, oil, coal and natural gas. A decade later, there is a significant increase in the expectations of nuclear energy – from 7% up to 39%.

The students gave the following answers regarding the nuclear industry in Czechoslovakia: 41.2% – the nuclear share should be reduced, 35% – the status quo should be preserved. 12.4% of respondents were unable to find a proper answer to this question. In these questions there was no gender bias. In comparison, recent surveys show that the percentage of opponents has shrunk by half (and the percentage of supporters has risen by half), and they also indicate a considerable difference between male and female students.

When giving the reasons why the nuclear industry should be further developed in the future, 43% of nuclear energy supporters chose the reason that nuclear energy does not generate any gasses causing acid rain or global warming. 23.5% of the respondents supported nuclear energy because of the future scarcity of fossil fuels like coal and oil, while 12.5% believed in nuclear energy because they thought that our country has excellent technology. 8.5% opined that our country has sufficient safety measures, the same percentage opting for the statement that “nuclear energy is safe”, and 4% pointed out the fact that there had been no serious nuclear accident in our country. The current opinion polls indicate that the greatest benefit of nuclear energy consists in the fact that it does not generate any greenhouse gasses.

The interviewed students chose the following three phenomena as the most significant environmental changes: the damage to the ozone layer by freon gases (almost all respondents ticked this option), radioactive contamination resulting from accidents at nuclear power plants (over a half of the respondents) and depletion of forests and the acidity of lake water caused by acid rain (one third of the respondents). Approximately one quarter of the respondents ticked the following options: deterioration of our natural environment due to the cutting down of tropical forests, global warming caused by the combustion of coal and petroleum, and the contamination of the sea. The shrinking of virgin nature and the spreading of deserts seemed to be regarded as less significant phenomena. The replies to the same questions a decade later reflect, at least in my opinion, the issues which are most frequently discussed in the media. It used to be acid rain, but now the attention has shifted to climate changes and the contamination of the seas. However, people still have the lingering impression that the Earth is threatened by radioactive risk from accidents at nuclear power plants.

When asked to choose two substances that emanate natural radioactivity, the students ticked the human body (almost all of them), two thirds ticked iron, water and plastic, and surprisingly, only a half of them chose granite. This question was formulated a little bit differently in the recent opinion polls. However, it is evident, that people are still uncertain or ignorant of the occurrence of radionuclides in our world.

Students were also asked to choose the source which exposes us to the strongest radiation throughout our entire lives. 27% of respondents opted for nuclear power plants in standard operation, 23% ticked concrete and other construction materials,
20% chose radiation sources used for medical treatment in hospitals, and just a tiny percentage opted for our food (8%) and air travel (2%). 20% were unable to answer this question. The recent opinion poll generated more responses “medical treatment – X-ray” and “air travel”.

The opinion poll was carried out by means of user-friendly questionnaires which the students completed before the debate. We would like to repeat this practice more frequently throughout the whole year and compare the responses of the students before and after the debate. We would like to use the results in our future work with young people and the general public, with a special focus on the information and arguments which proved most essential.
Introduction

The Bulgarian Nuclear Society (BgNS) was founded in 1991. The priorities of the BgNS activities were clearly outlined during its more than ten years of experience. Organizing conferences, seminars, scientific sessions where discussions are freely deployed the BgNS assists the professionals and lays out its stand on particular matters, related to the nuclear energy development, radiobiology and radiation protection. The BgNS events are always open to the public. Journalists and representatives of governmental and non-governmental organizations are involved. The information policy of the society is focused on extending the knowledge and culture of the population about nuclear power and radiology issues. A wide range of communication approaches is used, such as publications, meetings, discussions, exhibitions, media events and Internet. The BgNS experts provide competent assistance to the state authorities and non-governmental organizations for finding optimal solutions in nuclear technologies and atomic energy. The “BgNS Transactions” has an authority among the specialists connected with that sector of industry.

The BgNS carries out constructive co-operation with national nuclear societies in Romania, Ukraine, the Czech Republic and Russia. Since its foundation the BgNS is a regular member to the European Nuclear Society.

Contributing to the development of nuclear science and nuclear energy in Bulgaria, the BgNS keeps its priorities for extending the information exchange between professionals on national and international level and for providing the Bulgarian population with information about the up-to-date nuclear technologies in the variety of their aspects.

The BgNS is a non-governmental organization aimed at multilateral development of science, technology and practice for safe use of atomic energy for peaceful purposes. It contributes for creating of attitudes and right climate of opinion about nuclear power matters.

BgNS incorporates prominent scientists, physicists, engineers, chemists, medical men and other specialists who work in the nuclear field and in the application of nuclear methods.

The BgNS concentrates its efforts on:

- Establishing of forum for exchange of knowledge, ideas, and experience and helps for professional qualification improvement of its members;
• Encouraging the extension of the safety use of nuclear science achievements for the well-being of the society;
• Keeping open dialogue with the public on nuclear science and practice issues and promoting the radiological culture of the population;
• Cooperating with the state authorities, industrial companies and non-governmental organizations on matters of nuclear science and practice by its experts.

The BgNS is one of the founders of the BULGARIAN ATOMIC FORUM (BULATOM), non-governmental organization established in June 2001, representing engineering and construction companies, those engaged in equipment supplies, the Kozloduy Nuclear Power Plant, Nuclear Research Institute and experts in nuclear field.

**Events organized by the Bulgarian Nuclear Society**

As one of the most advanced technologies, the nuclear reactors management requires high qualification and professional skills. Keeping a high level of competence and enlargement of knowledge in the field of safety use of nuclear energy for peaceful purposes are unconditionally needed for those who work in of nuclear science and industry. Organizing forums on national and international level for the scientific and practical exchange of information is the major priority of the BgNS.

The BgNS organizes discussions and round tables with the involvement of journalists, representatives of non-governmental organizations and individuals. The events initiated by or hold with the active participation of the regional sections are numerous. The most important of them are listed below:

<table>
<thead>
<tr>
<th>Month, Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>November 1991</td>
<td>Seminar “Construction of Nuclear Unit 7”, Sofia</td>
</tr>
<tr>
<td>March 1992</td>
<td>Seminar “Kozloduy NPP” Acceptance of the BgNS Platform, Sofia</td>
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<tr>
<td>May 1992</td>
<td>Press conference. Presentation of the BgNS Statute and Platform, Sofia</td>
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<tr>
<td>October 1994</td>
<td>Scientific Conference “20 Years Kozloduy NPP”, Kozloduy</td>
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<td></td>
<td>Special session “Nuclear Energy – Current State and Outlook. Information about Unit 1 of Kozloduy NPP”</td>
</tr>
<tr>
<td>March 1995</td>
<td>Seminar “Completion of Belene NPP – Current State and Outlook”, Sofia</td>
</tr>
<tr>
<td>April 1995</td>
<td>Seminar “Storage of Spent Fuel from Kozloduy NPP. Current State and Outlook, Kozloduy</td>
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<tr>
<td></td>
<td>The BgNS Statement was adopted and addressed to all State Institutions and the mass media</td>
</tr>
<tr>
<td>May 1995</td>
<td>Visit of scientists from the Bulgarian Academy of Science in Kozloduy NPP</td>
</tr>
<tr>
<td>June 1995</td>
<td>Public discussion together with the Club of intellectuals, Sofia: “Radiation Environment at Kozloduy”, “State of Health of the Workers at Kozloduy NPP”</td>
</tr>
<tr>
<td>Month</td>
<td>Event</td>
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| October, December 1995 | Participation in:  
- Exhibition “Bulgaria for sustainable world”, museum “The Earth and the People”, Sofia  
- Exhibition at the Third Ministerial Conference “Environment for Europe”, Sofia  
- ECO’95 Exhibition, Plovdiv |
| October 1995 | Annual Conference, Kozloduy  
Special Session “State of the Kozloduy NPP Unit 1 Reactor Vessel”  
Round Tables:  
- “Nuclear Energy in the Electricity Demand Balance of the Republic of Bulgaria”  
- “Informing the Public on the Use of Nuclear Power” |
| November 1995 | Press Conference “State of Kozloduy NPP Unit 1 and Reactors of Type WWER”, Kozloduy  
February 1996 | Seminar “Hydropower Complex CHAIRA Pumped Storage Power Station – Present and outlook”,  
“Decommissioning of Nuclear Energy Facilities. Projects and prospective”, Sofia |
| April 1996 | Scientific session “Chernobyl’s accident effects”, jointly with other institutions – “St. Kliment Ohridski” Sofia University, INRNE BAS, etc.  
Presentation of the brochure “What About After Chernobyl” |
| November 1996 | Annual Conference, Sofia. With the European Nuclear Society support.  
Special Session “RTV Embrittlement and Reactor Dosimetry”  
Round Tables:  
- “Problems Connected with Radwaste”  
- “Nuclear Energy and Young Generation”  
June 1997 | Press Conference “Unit one of Belene NPP, Sofia”  
June 1997 | Participation in the IAEA Regional Seminar “Unachieved Reactors”, Ledenika, Vratsa  
September 1997 | International Seminar of WGRD “WWER Dosimetry”, Sandansky  
April 1998 | Press Conference “WWER-440 Reactors, Units 1-4”, Sofia  
June 1998 | Seminar, jointly with BNIF “Nuclear Energy Development and Solving the Problems with the Spent Nuclear Fuel and Radioactive Waste”, Sofia  
June, Yearly | International Seminar on the Theory of Atomic Nuclej, jointly with INRNE BAS, Gyulechitza |
November 1998  
Annual Conference, Sofia  
Round Table “Radiation Education and Radiophobia – Safety – Public Confidence”.  
Decision taken for elaborating the Strategy for Nuclear Energy in Bulgaria, to be used for the Nuclear Energy Strategy elaboration up to year 2020.

December 1998  

March 1999  
Press Conference “Safety of Kozloduy NPP”, Sofia

April 1999  
Press Conference “IRT-2000 Research reactor and the War in Yugoslavia”, Sofia

May 1999  
Seminar “Information on the OSART Mission at Kozloduy NPP”, Sofia

September 1999  
XIII International School for Young Nuclear Physics, Neutron Physics and Nuclear Energy, Varna  
Lecturers from Bulgaria, Russia, Germany, USA, France, UK, Czech Republic, Romania.

October 1999  
Press Conference BgNS MEMORANDUM on the Accident at the Japanese Nuclear Facility”, Sofia

November 1999  
Annual Conference “25 Years of Kozloduy NPP”, Kozloduy  
Round Table “Future of Nuclear Energy in Bulgaria”.  
The Conference adopted a Statement and a Declaration of BgNS in relation to a closing down nuclear reactors in Kozloduy NPP. The Declaration was sent to the President’s Office, the national Assembly, the Council of Ministers and the Bulgarian News Agency.

May 2000  
Discussion on “Strategy for the Development of Nuclear Energy in Bulgaria”, Ledenika, Vratsa

May 2000  
Seminar “Radon as a Source of Human Risk”  
Lecturers from “St. Kliment Ohridski” Sofia University and NCRRP, Sofia

October 2000  
Press Conference “Decommissioning of Nuclear Reactors”, Sofia

October 2000  
Annual Conference “Decommissioning of Nuclear Reactors”, Sofia  
Round Table “Strategy for the Development of Nuclear Energy in Bulgaria”.

January 2001  
Scientific session Depleted Uranium” in cooperation with other institutions

April 2001  
Press Conference “Impact of Kozloduy NPP on the People’s Health”, Sofia

April 2001  
Discussion “Basic Norms for radiation Protection”, Sofia

January 2002  
Press Conference on “Defense of Bulgarian Nuclear Industry”, Sofia

April 2002  
Meeting of nuclear energy experts and representatives of non-governmental organizations from the Balkan countries, organized and held in KNPP - Kozloduy
June 2002       Energy forum, Varna - co-organization with BULATOM and other organizations
July 2002       Press Conference on “Regain Kozloduy NPP for Bulgaria and Europe”, Sofia
June 2003       Participation and co-organization of International Nuclear Forum “Nuclear Energy – Challenges and Prospects”, organized by BULATOM in cooperation with FORATOM, Riviera Holiday Club, Varna
November 2003   International Conference “Radioactive Waste and Spent Fuel Management”, Plovdiv, organized by BgNS together with ENS, Fund “Safe Storage of Radioactive Waste” of MEER, NPP Kozloduy, NRA, BULATOM and others

BgNS assesses the global significance of the issues related to the nuclear science and technologies, the safety use of nuclear energy and the risk protection. The Society establishes and carries out fruitful relations with international organizations and foreign national nuclear societies involved in the peaceful use of nuclear energy. Representatives of European Nuclear Society, WIN GLOBAL, British Nuclear Industry Forum (BNIF) and other international and national societies and companies (Russia, Romania, Yugoslavia, Macedonia, Czech Republic, France, UK, Spain, Belgium, Italy, Ukraine) attend different BgNS forums. BgNS members participate in events initiated by ENS, IAEA, and other societies and organizations.

Expert activities

The Bulgarian Nuclear Society has a strong potential of experts in various sectors of the peaceful use of nuclear energy. Through scientific and technological research development activities and statements, the society is able to assist the State authorities in taking decisions referring to the peaceful use of nuclear energy.

In 1996 a Commission for expert activities was established in the BgNS. More important R&D activities and statements prepared by the Commission or with participation of members of this Commission are listed below:

- Statement concerning spent fuel storage of Kozloduy NPP, submitted to the President’s Office, National Assembly, Council of Ministers of the Republic of Bulgaria and to the Bulgarian News Agency, 1995;
- A draft law on amendments to the “Law on the Use of Atomic energy for peaceful purposes”, under contract with Bulgarian Regulatory Body, 1996;
- Phase one of the Project for elaboration of Ordinance on the Fund for Radioactive Waste Storage, under contract with Bulgarian Regulatory Body, 1996;
- Statement of the Ministry of Energy and Energy Resources concerning the construction of Belene NPP, and Statement concerning the completion of Belene NPP construction addressed to the President of the Republic of Bulgaria, 1997;
- Strategy for the safe use and development of nuclear energy in Bulgaria, under contract with Bulgarian Regulatory Body, 1999;
- Statement and Declaration on the Closing down of Kozloduy NPP units 1-4, submitted to the President’s Office, National Assembly, Council of Ministers of the Republic of Bulgaria and to the Bulgarian News Agency, 1999, 2000;
• Statement on Basic Norms for Radiation Protection, submitted to the Bulgarian Regulatory Body, 2001;
• Statement for the role and place of the nuclear energy in the energy strategy of Republic of Bulgaria, November 2001.
• BgNS contribution to the Green Paper, 2002.
• Statement in relation to closing out of units 3 & 4 of Kozloduy NPP, submitted to the Prime Minister of the Republic of Bulgaria, December 2002.
• Statement addressed to the Presidents of the Nuclear Societies of the European Union Members and the Presidents of ENS, American NS, Czech NS, NS of Slovenia, Romanian Nuclear Energy Association, NS of Russia, Ukrainian Nuclear Society, Yugoslav Nuclear Society for support and assistance for conduct of a safety peer review in Kozloduy NPP Units 3&4, January 2003.
• Statement for defense of Kozloduy NPP for Bulgaria and Europe, December 2003.

Publications

The BgNS TRANSACTIONS is a science and technology journal, issued since May 1996. Up to now, 8 volumes are printed. More than 85 scientific and technological papers, 8 surveys, 30 communications from BgNS conferences and International Schools have been published in the journal, as well as many information materials about BgNS events and other materials. The authors of the papers are Bulgarian and foreign scientists and experts.

The journal is distributed to the National Library, the Bulgarian Academy of Science for international exchange and among individual and corporate BgNS members.

Conclusions and challenges

Being a civil association of Bulgarian scientists, specialists and citizens having close attitude to the peaceful usage of nuclear power, the Bulgarian Nuclear Society cannot stay indifferent to the future of the nuclear power industry, including the Bulgarian one.

Bulgaria, being a country included in Annex I to the Kyoto Protocol is directly interested in such a solution of the problem, which could provide a worthy future of its citizens. The economical prosperity criteria being the major criteria for the European Union membership cause urgently to be ensured a sustainable development for the Bulgarian economy in the future market conditions in order to withstand the competitive pressure of other countries economics.

When analyzing the newest tendencies in the world energy generation process and the economical criteria for European Union membership, BgNS has recommended to the Bulgarian government to reconsider thoroughly the Energy Strategy of Bulgaria, which currently is directed to reducing the nuclear power generated energy and to increasing the share of the polluting electrical power plants based on burning of
lignite.

BgNS states that one of the basic elements of a competitive Bulgarian economy is the development of a cheap, clean and stable electricity-generating industry. It should be based on the environmentally friendly and rehabilitating impact of the safe nuclear power industry together with maximal utilization of effective renewable energy sources. So far, there still exists some misunderstanding by the European public about the Bulgarian nuclear reactors safety. Widely spread is the opinion that these types of reactors are non-upgradeable and due to this reason, they should obligatory been closed.

Since 1991 till now, using predominantly self-financing and also financial support from European banks and funds and with active participation of western companies and experts, the Kozloduy NPP has eliminated the major non-compliances of the plant design with more recent safety requirements.

Since the beginning of the year 2000, all the attention and financial resources were concentrated on the modernization of Units 3 and 4 in order to bring them into compliance with recent nuclear safety requirements. Over this period, the plant completed the implementation of the most important measures on the Complex Program for modernization, including the so-called Jet Vortex Condenser, which eliminates a major deficiency of these units, namely lack of capability of the existing confinement to cope with a design basis accident as defined in IAEA standards, namely break of largest diameter pipe.

In June 2002, upon the request of the Bulgarian Government, an IAEA safety review mission was conducted for KNPP Units 3&4. The conclusion of the team of experts was that operational and design safety is commensurate with the level of improvement achieved in plants of the same generation. This has proved the lack of substance in the statement of 1992 that the WWER 440/230 type of the reactors are not subject to modernization at reasonable cost and has given ground for reconsideration of the claim for earlier closure of Units 3&4 of Kozloduy NPP.

The BgNS is confident that nuclear power is the only alternative in the next 50 years to achieve steady, environment friendly generation of electricity independent from external factors such as climate, transportation, intergovernmental, etc. It will help both Bulgaria and the EU countries to honour their obligations on the Kyoto protocol and the associated taxes on the use of fossil fuels (oil, gas and coal), which is foreseen as a measure to overcome changes in the climate.

“The alternative to nuclear power is the safe nuclear power”
Summary

It seems that the future of the nuclear industry depends on several things. On the one hand the scientific and technical development in the last decades worked up sufficient nuclear safety and radiation protection. On the other hand there are some other interesting questions, like Human Resources and the public acceptance of the nuclear energy still lying ahead of us. The communication might be one of the most important things in the nuclear industry in the future.

The Hungarian Youth for Nuclear (FINE) was established in 1998 as the Hungarian branch of the Young Generation Network. Our purpose is to remove misconceptions and fears arisen around the nuclear techniques and mainly the nuclear energetics and to reply the questions brought up by the Hungarian youth in this topic. In this paper our experience is delineated what we drawn with the help of our programmes about the attitude and the knowledge of the youth.

Our experiences showed that young people usually heard about the biggest accidents but they did not have clear conceptions about the causes and consequences. In the other topics, their level of knowledge was rather low or they had a lot of misconceptions, which could be even worse in some cases.

The experiences after the serious incident in the Paks NPP in April 2003 will be delineated as well.

We found that the youths were very open when they were addressed in their own language. We could attract the attention with our demonstrations about the problems of the nuclear energy. The communication was youthful, human-centered and professionally correct both in personal level and on the Internet.
SAFETY IN THE CONTEXT
OF THE ENLARGED EUROPEAN UNION

JUDITH MELIN
Director General Swedish Nuclear Power Inspectorate
Stockholm, Sweden

I would like to start my presentation by addressing some safety challenges we have to face in Europe, in the existing member countries of the European Union as well as in the enlarged Union. I will then continue about the co-operation evolved between European safety regulators to address some of these challenges.

Safety challenges in the enlarged Europe

Changes in the economic conditions to produce electricity
Several countries or regions are underway to deregulate their electricity market. This development is a result of economic as well as political interests. In some countries, such as Sweden, we can observe a changed behaviour of the nuclear industry to meet the new market demands. Structural and organisational changes in the companies and optimisation of the operation of the plant are examples of such changes. Another example is the tendency of increased international ownership of the power plants and with that the merging of different cultural influences on how the power plants are managed.

I would not say that these changes have a negative impact on safety per se. It is however necessary for the licensee to have the capability to analyse the safety implications of the changes keeping in mind that safety is a priority. The regulator will be facing new areas and with that introduce new competence in the regulatory body on how to oversee that the licensee takes its responsibility for safety in the course of introducing changes due to the deregulation of the electricity market.

Ageing of the existing reactors
We can expect that many reactors will be operated beyond their “technical lifetime”. World-wide there are about 30 reactors operating with an age above 30 years. In five years we might have additional 80 reactors with an age above 30 years. This implies that age related degradation could be expected to occur in many reactors in the future. Damages like inter-granular stress corrosion cracks in certain material are known phenomena. Other age related damages are less well known or perhaps not known at all. For example we know only little about the ageing phenomena of the concrete containment.

The challenge for the licensee is to have a preventive approach in his work. This means that the licensee must have comprehensive maintenance and intensive
inspection programmes in place to detect ageing related phenomena before any severe damage appears. The licensee must be able to identify components and material that are sensitive for damage and have the resources to change them before any damage appears. In this respect it is essential for the licensee to have appropriate analytical tools and well developed test methods, capable to identifying early indications of damage and of estimating safety margins. There is certainly room for improvements and additional development with respect to existing analytical tools and test methods.

The regulator has to adopt its oversight strategy to make sure that the licensee has a preventive approach in his work with respect to ageing related phenomena.

**Modernisation of existing reactors**

There are several reasons behind licensee’s modernisation projects. Safety issues have become known during the operation of the reactor, which were not considered when the nuclear facilities originally were constructed. Economic considerations related to increased demands for control and test of ageing parts of the facility is another reason for modernisation. Thus, modernisation can be initiated by the licence holder or be required by the regulator. Introducing new digital technique in instrumentation and control including control-rooms is one example of modernisation carried out in facilities.

The challenge for the licence holder related to the modernisation programme is to have knowledge about the original design and the rational behind it, the changes made during the period of operation as well as knowledge about new technical development e.g. in the area of software. In addition the licence holder must have the capacity and competence to assess the safety of the plant, as well as to feed into this process all the experience gained worldwide on safety issues.

Here again the regulator has to adopt its oversight strategy to make sure that the licensee has the capacity to perform safety analyses with respect to the changes introduced in the plant.

**Decommissioning of nuclear installations**

In general there is a time span between the decision to close a reactor, the actual closure and the decommissioning of the plant. One of the challenges for the licensee is to maintain a high safety performance in the time-span between the decision and the actual closure. He has to ensure that safety culture, competence and capacity is maintained for several years in a plant, not to be used in the future. This might be one of the most difficult tasks for the licensee.

Another challenge for the society is decommissioning costs. Who is paying and how are funds established to finance decommissioning? In addition, waste facilities have to be established to take care of the arising different waste categories. It is important that all these issues are clarified in good time before decommissioning starts.

**Human assets**

The Nuclear industry has developed from a time when design and construction were the main tasks into toady’s production-phase. In this period the competence and resources available in the nuclear industry and at the regulatory bodies have
changed. Even if we today no longer are in the design and construction phase, I believe that the nuclear discipline still is an intellectual challenge for students who have a technical interest. We also have to recognise that people working in the nuclear field are well educated and trained enabling them to be employed also outside the nuclear field. Therefore we have to attract and be able to keep skilled co-workers.

The challenge for the society is to evaluate the competence needed now and in the future and to ensure that education and professorships at universities are available in specific critical areas. But this is not enough. It is also essential that universities find means to attract students and for licensees and regulators to be attractive employers. We have to compete with other technology industries in recruiting, as there is a decreasing tendency for students to engage in technical studies.

Co-operation between safety regulators in the enlarged European Union

More or less all these changes take place or will in the near future take place in the counties of the enlarged European Union with nuclear power. The safety implications of the changes have to be addressed by all regulators on a national level as well as by the industry. It is necessary to have a regulatory framework addressing the issues at a national level.

How do we as regulators address these challenges?

Plants have been constructed individually and they meet safety in different ways. One way is not necessarily better than another. Therefore safety judgements require a thorough understanding of how various safety factors interface and integrate to a whole. It requires an in-depth knowledge of safety related technical and physical issues as well as of design details of each nuclear facility. It is equally important to have knowledge of the culture in which the plant is operated. This knowledge of individual technical and cultural issues as they apply to each plant is fundamental for someone who takes on the responsibility to regulate and supervise nuclear safety. Such knowledge exists today with national nuclear regulators.

Essential input towards maintaining and enhancing a high level of safety derives from that information and experience is exchanged from research activities, from events and from day to day operation of an international, a regional as well as of a national level. In addition national regulators must have the power to promptly react to new safety concerns that are identified. To support the national regulators in their oversight there has to be a national legal framework.

All countries in the enlarged European Union use the IAEA safety standards to formulate national regulations. These standards have to be seen as good practices or tools for benchmarking. They can not be used as national legal requirements without appropriate adaptation.

The IAEA safety standards are the result of the international experience in nuclear safety since the first nuclear power reactor was constructed and taken into operation.
There is world-wide respect of the IAEA safety standards— all experts are involved in the work to elaborate these standards. The standards are written to express best available safety practices with a clearly stated objective to enhance the level of nuclear safety world-wide. The IAEA standards form a common platform, used by regulators to elaborate national regulations.

There are several international review mechanisms in place to help member countries in assessing safety performance.

- The Nuclear Safety Convention and the Joint Convention put special requirements/duties on the state party to the convention. Both are incentive conventions. You report, you make a self-assessment and other parties are reviewing your report and your answers to questions posed.
- IAEA service, International Regulatory Review Teams

The mission of WENRA
There were two main reasons why the head of regulators for nuclear safety decided to start a co-operation in 1999 in the framework of WENRA (Western European Nuclear Regulators Association). Firstly nuclear safety was included in the EU enlargement criteria and secondly national safety approaches have been developed from IAEA safety standards, the Convention on Nuclear Safety, but independently.

The main objectives of WENRA at that time were to develop a common approach to nuclear safety and to provide an independent capability to examine nuclear safety in applicant countries.

In 1999 WENRA comprised of nuclear regulatory bodies from 10 countries. Today (from March 2003) we are 17 countries represented in WENRA. This means that we have access to more experience in nuclear safety as well as the access to knowledge and experience from additional reactor designs.

The reason behind the studies in 1999 and 2000 on nuclear safety in applicant countries was that our governments asked us, as individual regulators, about the status of nuclear safety in applicant countries. To carry out this task we decided to use our common knowledge we had attained by bilateral co-operation with the applicant countries. The joint efforts resulted in two reports making a comparison between reactors licensed in the existing European Union and the reactors licensed in the applicant countries. In addition we compared the legal systems and the mandate and power of the nuclear regulators. The WENRA reports were used for the preparation of the report on nuclear safety in applicant countries issued by Working Party of Nuclear Safety (WPNS) under the Atomic Questions Group of the European Council. The result of the WPNS report was expressed as recommendations in the negotiations of the accession of the new members to the European Union. The countries acceding have in agreement with the accession negotiations, taken adequate measures to fulfil the requirements in the recommendations.

In March 2003 the objectives of the co-operation within WENRA was extended to become a network of chief nuclear safety regulators in Europe exchanging experience and discussing significant safety issues. Some of the issues to be
addressed in the forthcoming meetings are related to safety culture as well as to requirements in relation to the use of contractors. A large part of the co-operation in WENRA for several years to come is the work on a harmonised safety approach.

Two working groups have been launched to harmonise safety approaches between countries within the enlarged European Union, one on rector safety and one on nuclear waste safety.

The mandate of the working groups is to analyse the current situation and the different safety approaches, compare national approaches with the IAEA safety standards, explain the differences, propose a way forward to possibly eliminate the differences without impairing the final resulting level of safety. The proposals should be based on the best practices among the most advanced existing requirements.

The mission of the Working Groups does not include an all-encompassing scrutiny of the issues important for the safety of nuclear installations. Furthermore, the end goal is not a set of requirements applicable throughout the European Union. We have confirmed that the adopted working manner towards harmonising nuclear safety approaches in the European Union is viable, manageable and fruitful and we also recognise that it is ambitious and resource intensive.

When the working groups have finalised their work in 2005/2006 WENRA members will decide to what extent common safety levels can be reached-possibly up to unified agreed technical safety approaches.

I can understand the merits for industry to have common regulations within Europe, especially with regard of a more international ownership as well as of the use of common contractors and suppliers. I am sure that by regulatory bodies participating in safety-related work in international and regional organisations as well as the more informal co-operation between the safety authorities in member countries a harmonised approach and many times also a similar regulatory framework will be reached in Europe. It is however important to recognise that forced harmonisation of legal safety regulations will not give the necessary capability for regulatory bodies to promptly react on identified safety concerns as they emerge.
CORPORATE SOCIAL RESPONSIBILITY - A NEW WAY TO COMMUNICATE WITH STAKEHOLDERS?

PHILIP DEWHURST
Director of Corporate Affairs
BNFL
London, United Kingdom
Corporate Social Responsibility - A new way to communicate with stakeholders?

Philip Dewhurst
Director of Corporate Affairs, BNFL

10 February 2004
Developing a reporting programme for Corporate Social Responsibility

• Why do we report on CSR?
• How do we report on CSR?
• Best practice
• Our experience
• Why do we report on CSR?
Companies are increasingly being judged on more than financial performance.

**Stakeholder Expectations and Pressure**

- **Economic Stakeholders**
- **Social Stakeholders**
- **Environmental Stakeholders**

**Business Performance**

**Increasing Expectations of Good Corporate Citizenship**

Why?
1. Identify Reporting requirements

2. Ensure data quality

3. Prepare report

Continuous improvement and maturity of reporting

How meaningful is the information?
• How comprehensive is the measurement of the information?
• How consistent is the measurement of the information (organisational coverage)?
• Is it a true and fair view of stakeholders?
• How accessible is the report to stakeholders?
• How meaningful is the information?
• How accurate is the information?
• How consistent is the measurement of the information?
• How meaningful is the information?
• How comprehensive is the measurement of the information?

• What is the current best practice in reporting?
• What do our stakeholders want us to report?
• What do our stakeholders want us to be verified?

• How meaningful is the information?
• How comprehensive is the measurement of the information?
What do they want to know?
What do we want to say?
Who is it aimed at?
What can we report on?
What should we report on?
What must we report on?

For BNFL's First CSR Report
We aimed at internal audience, key decision makers. We wanted to describe what CSR means to BNFL; how it will be embedded in the company and how it will be managed. We used the National Stakeholder Dialogue, key stakeholder research, MORI survey results to find out what our stakeholders wanted to know.
Our experience

Key issues from stakeholder surveys:

- Trust
- Transparency

What should we report on?

It was recognised that the report must reflect the stage of development of CSR within BNFL.

- Strategy work on CSR
- Data used for EH&S Report and financial report
- Issues:
  - Performance reporting framework (triple bottom line)?
  - CSR in our business operations and the next step
- Our commitment:

Report contents

- Issues:
  - Data used for EH&S Report and financial report
  - Strategy work on CSR

In order to gain trust and demonstrate transparency it must be a true and fair view

Did not use a set reporting format e.g. GRI

- CSR

What should we report on?
Our experience: Verification

Verification ensures that the report is based on fact rather than "myths and legends." It can also identify areas where the report understates a company's performance.

Verification consisted of:

- Corporate interviews
- Site visits
- Text verification

Consistently used Ernst and Young because they are our financial auditors.

Considered essential in demonstrating transparency.
Our experience: The Next Steps

Establishing a platform of trust

- Increasing the role of verification
- Expanding the approach to stakeholder dialogue
- Footprinting exercise to improve information on impact of sites
- Feedback form included in report

The NEXT STEPS
The industry has a clear role in sustainable development:
– generation of carbon free electricity
– cleanup of legacy waste (restoring the environment)

However, society has a range of issues with the nuclear industry that they want someone to be accountable for:
– lack of trust of society in industry, governments, science
– society has a range of issues with the nuclear industry that they
  want someone to be accountable for

In order to demonstrate to society that it can be sustainable, the industry must:
– show that it is effectively managing these issues
– be transparent about its performance

Reporting is part of this process

Issues for the Nuclear Industry
CSR Best Practice

CSR reporting still relatively new

- Should be an integral part of an organisation’s operations
- Demonstrates that economic, social and environmental benefits are all possible at the same time
- Not a fad - it is the way to do good business

Out of the UK FTSE 100 Companies in 2003:

- 55 have a full HTML CSR web section
- 29 produced a printed Full CSR report, 14 more than last year
- A further 16 produced a printed combined environmental and social report

*Research by CGI Brandsense
HOW COULD WE HAVE DONE IT BETTER?

Communication of an incident

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On 10 April, 2003 there was a serious incident in the cleaning pool used for the chemical clearing of the fuel assemblies placed temporarily in a pit in the reactor hall of Unit 2 at Paks Nuclear Power Plant. Radioactive gas release was detected by the monitoring systems. There was an unsuccessful attempt to remove the cover of the tank located 10 ms under water. The incident resulted in a hardly detectable, low discharge, but without exceeding the limit value. The incident was ranked 2 on the INES scale. On 16 April they managed to remove the cover and it was then when it turned out that 30 fuel assemblies had been damaged in the tank. Then the incident was re-ranked 3 on the INES scale. Following an investigation there were several personnel changes at the company and in order to remove the damaged fuel assemblies a recovery project was also set up. On the competent minister’s request a ministerial officer was also appointed helping the co-ordination of the recovery tasks.

The parliamentary opposition initiated to set up an investigation committee and its duty also included the scrutiny of the communication of the plant during the incident. These are the facts and events in brief.

The presentation will be going into the details of what the communication department of Paks Nuclear Plant has done during the incident and will show tools used possibly for the first time in order to provide the citizens and the public with ample and the most accurate information. We hope that with the help of the participants we shall get a better answer to the question of how we could have done it better.

There is another huge task ahead of the information department of the plant, that is the communication of the recovery project.
Presentation:
Now I am going to describe the series of events following the incident along with its communication given in order to recognise the proper and the possible improper steps by analysing them.

10 April - Radioactive gas discharge was detected in Paks Nuclear Power Plant during the night. It came from the cleaning system - used for the removal of the surface deposit on the fuel assemblies - of Unit 2 located temporarily by the reactor which was being under its annual maintenance at the time. The works were stopped right away. The incident was ranked 2 on INES scale and this was also approved by the Hungarian Atomic Energy Office.

10, 11 April - There was a press release on the incident containing brief facts and placing main emphasis on the fact that the plant and its surroundings were not in danger. There were collective texts messages sent to the regional majors of 72 settlements within 30 kms distance.

12 April – The incident is hot news in the Press
16 April – The removal of the cover of the cleaning tank. Since the removal had been unsuccessful before there was no information relating to what might have happened inside.

17 April – Press release: having had new information of the incident it was ranked 3 on the INES scale – called a serious incident. There was an intensive media reaction indicating the lost of trust and fear. Since during the previous communication the definition of the different INES ranks had not been made clear the re-classification suggested a more serious problem than it had been assumed beforehand. Numeric information about the radioactive conditions were expected. Measurements of the background radiation at the plant were made by the Austrian environmental organisation called Global 2000 – no abnormality was found. It was communicated in the media as well. The head of the communication department gave 71 interviews on that particular day!

18 April – The environmental expert of the major opposition party initiated to set up an investigation committee.
The Greenpeace protested in the media demanding accurate data.

19 April - The rate of the economic loss became known (50 000 000 Ft per day, approximately 200 000 EUROS). The company announced its claim for compensation at FRAMATOME ANP, who had designed, built and run the system.

22 April – Press release took place in the reactor hall of Unit 2 in the presence of journalists in order to calm the public as there had been permanent panic mongering news in the press.

23 April – The national electric grid control organisation made up an emergency plan to sustain the safe energy supply. The government was permanently attacked for inadequate communication.

30 April – The Environmental Committee of the Parliament questioned the Chief Executive Officer of the Plant and the Director General of the Hungarian Atomic Energy Authority.

01 May - The minister of Economy paid a visit at the Plant. The Greenpeace and the Austrian social democrats pressed for an international investigation because of the inadequate information to the neighbouring countries. Nevertheless the information was given the right time in accordance with the related agreements.

03 May – During hydrazine addition there was some gas production in the damaged tank.
06 May – One of the daily papers said that there had been gas production due to improper addition of chemicals in the tank. The article was later taken over by other papers as well, the Plant informed the Authority, the government and the press only after the publication of the first article (considering the event as a routine procedure consequently did not find the information necessary). The delay caused further loss of trust in connection with the communication.

07 May – The Prime Minister requested urgent information on the event from the leaders of the company and the Authority. One of the detectors indicated a higher radioactivity in the background than the normal level and it was ascribed to the fault of the measurement.

09 May – A Ministerial Officer was appointed to help the effective co-operation between the company and the official organs.

10 May – A full page paid informative material was published in the national papers (1 000 000 copies) in which the company apologised the people of the country for the serious incident. The article described the incidents in details.

11 May – The company got ready its own report on the incident stating that the cause of the incident had been due to the fault of the improper design of the tank. The report was placed on the Internet, too.

12 May – The introduction of the daily press conference. The upcoming afternoons the management of the company would be holding a press conference at which the journalists could take part using a video conference system.

13 May – Before the daily press conference the activists of the Greenpeace held a silent demonstration against the license renewal of the plant in front of the main entrance of the plant

14 May – The Economic Committee of the Parliament had a session in Paks and it took place several times again later on as well

19 May - An Austrian tabloid published an article on the incident saying the plant was operating illegally. On that particular day one of the instruments near the plant measured higher radioactivity in the background than the usual again following 07 May. Investigating the case it came in light that there was a test using isotope near the instrument which was the case two weeks earlier also so it was not the fault of the instrument then either. Again the trust was even more shattered in the authenticity of the information. The firm carrying out the test had not informed the plant about the work previously so it could not have known what might have caused the significant deviation in the level of radioactivity.

21 May – Some members of the staff were withdrawn due to the investigation made on the incident, the Safety Manager of the plant resigned and the Recovery Project was set up.

22 May – The Hungarian Atomic Energy Authority requested the International Atomic Energy Agency to carry out an independent investigation.

28 May – A rumour in the form of text message circulated all over the country stating that one of the departments of the plant had exploded. The news was invented by a kindergarten teacher living in Budapest (she had learnt it form children at the kindergarten) and later spread by a journalist, but the plant denied the allegation promptly and firmly.

30 May – The Hungarian Atomic Energy Authority published its report but in the media it did not get any attention in the shadow of the rumour. Furthermore the report stated the responsibility of the plant as well.

6 June – The organs of the government owing and managing the plant issued a joint press release – this was the first time they communicated with the public.
10 June – The plant published its most recent result of a public opinion poll: the acceptance of the plant had not changed but some trust seemed to have been lost in the safety of the plant. The environmental organisations protested against that the company, which had designed the tank, would take part in the recovery project.

12 June – Outside the plant the activists of the Greenpeace protested against the licence renewal of the plant, the police dispersed the demonstration, which caused damages as well.

14 June – The first video recordings inside the tank were completed and all the 30 fuel assemblies were found damaged. The steps of the recovery were sketched out for the press.

19 June – The International Atomic Energy Agency began his investigation in Paks.

25 June – According to the report of the IAEA the plant and the authorities also made mistakes besides the manufacturer.

01 July – Two offers were handed in for the recovery project: one made by the Russian company, which had produced the fuel assemblies and another by the French consortium, which had designed and manufactured the cleaning tank. The contract for the work was awarded to the Russian company because its bid was more preferable from all aspects.

After 6 weeks the end of the daily press conferences, weekly press conference.

11 September – Setting up the parliamentary investigation committee. It would be investigating the cause, the consequences of the incident along with the responsibility of the communication. After the investigation period of sixty days there was no agreement on the report of the committee so the work ended up without accepting one.

After the parliamentary committee had finished its work, the press lost interest so the routine of the daily – later weekly – press conference was suspended following a final one on 26 Nov, which was the 50th in row. On this occasion a three-dimensional CAD model was presented showing the condition and the location of the fuel assemblies in the tank as well as the order of the recovery works.

In Hungary the communicational obligations concerning the nuclear plant are regulated by the following:

The constitution: everybody has the right to get to know the facts of public interest.

Atom law: The public, the authorities and the regional majors should be in formed of all the unusual incidents at once. It is considered an unusual incident if any unplanned release of radioactive material occurs or might occur. (This is the reason why the system of a collective text message has been come into force.)

Law on the publicity of information of public interest:

The quick and accurate information of the public should be promoted and all the data of public interest should be made available to anybody.

Nuclear Safety Code made by the Hungarian Atomic Energy Authority.

Each safety related event should be reported. In case of an immediate report information is supposed to be given on the phone within two hours and a suggestion to INES ranking has to be made within 16 hours.

In case of INES 1 or any higher-ranking public has to be informed within 24 hours.

Paks Nuclear Power Plant kept all the regulations and laws in all cases though it can be pointed out that the public would have expected quicker and more detailed information.
The authority was first informed at 00:30 a.m. on 11 April and the communication with them has been continuous ever since. The plant gave three press releases on 11, 12 April along with informing of INES categorisation, too. The IAEA was informed of the condition of the fuel assemblies on 17 April though this is not included in the regulations.

The number of publications related to the incident came up to 12,000. The Plant held 50 press conferences.

Note that each press release, report, informative material, animation and public opinion poll were placed on the Internet immediately both in Hungarian and English for the sake of the more efficient communication. The incident has made it clear that although the website of the Plant (www.npp.hu) carries a lot of information, it is not suitable for satisfying the demand for data in case of such incidents and the build-up needs updating.

By listing the events and their communication side by side it seems that the attitude of the Plant was of follow up nature and it turned out to be defensive and occasionally it was not accurate, definite and proactive enough.

The incident has shed light on the serious deficiencies of the communication inside the Plant since sometimes even the experts working on the communication toward the public did not have the most recent information at hand. Many times there were details published in the press with the help of unnamed inner sources sooner than the Plant could have given official information on them.

The manual of the crisis management at the Plant has already been updated but the working up of the documents and experiences piled up during the incident as well as drawing the conclusion and the development of the contents and the organisation of the communication will take much more time.
PUBLIC POLICY IN THE EVENT OF A TERRORIST THREAT

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Last summer top officials of the United States--federal, state and local--conducted a nationwide terrorism exercise called TOPOFF-2. It got a lot of newspaper and television coverage in the states. The news reports focused mostly on the simulated detonation of a dirty bomb in Seattle, Washington, and the simulated dispersion of plague in Chicago, Illinois.

But a few days before either of those two simulated terrorist attacks, there was a simulated terrorist threat against the Columbia Generating Station near Richland, Washington. The reason that didn't get press coverage was because the play was limited to only the Federal Bureau of Investigation, the Nuclear Regulatory Commission and the nuclear power plant owner, Energy Northwest. So it was not part of what was briefed to the press.

I'm going to discuss in some detail what happened in that unpublicized part of the exercise because it contains an important lesson in what to do, and what not to do, in our opinion, in dealing with the press and public in such a threat situation. (I might just mention, in passing, that at the time I was Director of Public Affairs for the NRC. I retired at the end of the year.)

Let me stress the fact that these exercises are designed to seriously challenge the players--in part to come up with lessons learned that will enable all of us to perform better in the event of a real threat.

The world, post 9/11, has changed, and we all must be mindful of its implications. I'm not going to go into the elaborate TOPOFF intelligence scenario involving the specific threat information, all labeled Secret for purposes of the exercise, as it would have been in the real world. Suffice to say there were multiple intelligence reports which lent credence to the strong possibility that Columbia Generating was a terrorist target. In fact, for purposes of the exercise, the intelligence community evaluated it as a "credible threat," although in the real world they would not have been so quick to do so.

For historic context, let me point out at this point that since 9/11 there has not been a single credible threat against a specific nuclear power plant in the United States. There were two instances, however, that were taken very seriously, with security enhancements quickly implemented, until it was determined that the threats were not credible. More on that in a moment.

Getting back to the TOPOFF scenario, the specific threat information was such that the NRC directed the licensee to raise its security to the highest level on the chart--
Level Five (or what amounts to "Red" on the Department of Homeland Security threat index).

At the same time, the local FBI office, the Governor of the State of Washington, the National Guard, the state police, the Air Force, the Federal Aviation Administration and others were alerted, so they could take actions commensurate with the threat. The FAA ordered a no-fly zone over the plant. The Aerospace Defense Command dispatched jet fighters to fly air cap overhead. The Governor directed the state police to immediately dispatch troopers to the site and alerted the National Guard to deploy some units as well, to augment the plant's security force.

At the same time, the plant--following the pre-arranged checklist in such situations--called in additional security officers, and began an evacuation of non-essential workers, among other actions.

Now we come to the Lessons Learned part of my remarks.

There was a lot going on and Energy Northwest felt the need, appropriately, to say something to the public. When the FAA declares a no-fly zone over a nuclear power plant, that's public information. When state troopers rush to the plant and suddenly jet fighters appear overhead, that's something people will notice. When non-essential personnel are sent home, they're going to get in touch with family and friends and--some of them--with local news media.

So Energy Northwest promptly issued two press releases.

The first said it had declared a so-called Unusual Event "based on a credible security threat" to the plant. The second said it was setting up a Joint Information Center which would provide "24-hour information services," featuring frequent press briefings.

Now, at the same time, the FBI and the NRC were being very cautious about what we were saying. At the NRC, I decided not to issue a press release, but I was prepared to answer questions to indicate that a security threat against Columbia Generating was being taken seriously, until such time as it could be conclusively determined whether it was credible.

These were some of our considerations:
If you tell the public there's a "credible terrorist threat" against a nuclear power plant in the neighborhood, some people are going to jump to the conclusion that a hijacked aircraft is about to slam into the plant, or that a force of terrorists is massing for an attack with heavy firepower. Some people will hyper-ventilate, pack the kids and the dog into the car, and race as fast as they can out of town. We certainly don't want to incite panic--which could lead to traffic casualties, heart attacks, and so forth.

Or, there might be intelligence indications of a possible insider threat. There was in the case of the Columbia Generating scenario. By going public you make it more difficult for the security authorities to follow the individual and see with whom he's in contact, and whatever preparatory steps he may be taking. Or you could spook him into fleeing, or into precipitating a serious act of sabotage.

The press releases that Energy Northwest put out were exactly the right ones to issue if there had been a safety event. However, in a possible terrorist threat,
those steps would have been **precisely the wrong ones** to take--absent coordination.

Okay. Coordination with whom? In our country, with NRC headquarters. We keep track of intelligence threat information around the clock. We're in continual contact with the FBI, the CIA and other appropriate agencies. We participate in the evaluation of threats to nuclear facilities. We're aware whether the threat is site-specific, or if it involves more than one site, and so forth. In terms of public statements, we check with FBI headquarters to coordinate what might be said in public, to ensure it does not interfere with the Bureau's intelligence gathering or law enforcement activities.

But we also have a clear responsibility to see that the public is informed, within the bounds of legitimate security.

Had the initial Columbia Generating press release said something like: "Prudent measures are being taken in light of a possible security threat, which is being evaluated. Further information will be provided when it becomes available," that would have been much better. It would have been well to add: "Just to be on the safe side, we're taking enhanced security measures, as an act of prudence. Be assured that protecting public health and safety is our highest priority."

That would have been accurate, and reassuring. It would have in no way interfered with FBI activities.

And, in that instance, the Joint Information Center should not have been established, with the expectation of frequent briefings. Not, at least, until events played out and it was determined whether the threat was real and was carried out. In the case of the TOPOFF-2 scenario, several key arrests were made and the attack never came off.

Now let me provide some real world context:

On Oct. 17, 2001, barely five weeks after the World Trade Center/Pentagon attacks, I was called at home during the middle of the night and told that there was a threat against the Three Mile Island nuclear power plant and that when, in response, the Harrisburg, Pennsylvania, International Airport was ordered closed, someone said that was being done because of a "credible threat" against TMI. I was asked whether the NRC could use a similar characterization? "Absolutely not," I said. "For one thing, we don't know at this moment whether it is credible or not."

In that particular instance there had been very specific intelligence suggesting the nature of the attack, the time window, and some other details. So it was taken seriously and security enhancements were quickly put in place.

But some hours later when the intelligence community got back in touch with the original overseas source, he said he was hypothesizing what could happen, not relating an operation he'd heard was about to be carried out.

So, it turned out, the threat was not credible. But on the theory that since it was specific and detailed, better to be safe than sorry, a number of prudent security measures were taken, by the plant operator and by various federal, state and local agencies.
There was a second, somewhat similar situation last March involving the Palo Verde nuclear power plant in Arizona, but for reasons of time, I will not go into that one.

To sum up: That's the new situation we face, in an era of serious terrorist threats around the world. The black cloud of terrorism could hang over us for a very long time. As communicators, it's important that you think through--in advance--how to handle the public side of dealing with such a threat.

It's in our mutual interest to inform the public--without causing panic. Panic, after all, would only help the cause of the terrorists.
Public acceptance of nuclear energy

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Public acceptance of nuclear energy

Nowadays nobody can deny that nuclear energy offers a safe and reliable technology, economically competitive and respectful to the environment. That is to say that it ensures a production of electricity free of CO2 emissions and therefore essential in obtaining the environmental goals of all countries and ensuring the development of our society.

With a contribution percentage to the world’s electricity supply of almost 20% and its presence in more than 30 countries, nuclear energy has been consolidated as one of the most important energy options in the world. However its public acceptance continues to be an object of discussion and controversy.

There are certainly a series of facts which determine the nuclear image. One of them was the warlike use of the atom which has become the constant link between nuclear energy and military use. On the other hand, it is a very complex and difficult technology for the general public to understand. This is why certain groups take advantage and make use of the unawareness of the general public to confuse and direct public opinion, with a clear ideological objective against nuclear energy.

Therefore, the great matter pending in the nuclear sector has been and continues to be the promotion, improvement and acceptance of its image in the presence of public opinion. It is to this point where we must move the technological and operational reality from a global perspective which will identify social-economical aspects and of general interest, as well as, other specific perspectives for those more controversial subjects such as waste, safety, environment and so on.
These communication activities, despite their difficulties, have been developed sensibly in Spanish nuclear power plants up to the sad events of September 11th 2001. Before this date, more than one million people had visited the Information Centres of the Spanish nuclear power plants and what is more important; they had had the opportunity, at least in Cofrentes Nuclear Power Plant, of visiting the area of the nuclear buildings, seeing closely the reactor, fuel, turbine and cooling towers buildings, defusing in this way the nuclear subject and giving them a real perspective of things.

These types of visits have always been seen favourably by the visitors, who dispelled any doubts about the condition of the plant and its activity.

However, as you all know, after the events of September 11th 2001, the situation has changed considerably. In the case of Spain, the Nuclear Security Council (as the regulator body for our country and also responsible for ensuring the physical security of the nuclear power plants), requested the plants companies to remove these types of visits, limiting them only to the Information Centres ambit.

This measure, apparently easy, has had however important repercussions in the number of visitors and the quality of the visits. These visits have come exclusively to depend on audio-visual means, models, mock-ups, and simulators of the Information Centres; which have motivated a considerable number of visitors to consider the information given insufficient if the site was not going to be visited. Therefore they have even refused to visit, especially schools, as they contend that with the use of didactical material and their own resources available in the schools; it was possible to show the students the performance of a nuclear power plant without the need of travelling hundreds of kilometres.

In observing this important decrease in the number of visitors, we have had to look for solutions that allow us to mitigate this situation as much as possible.

At present, Cofrentes NPP, offers the visitors access to the Information Centre which involves: audio-visuals, information panels, mock-ups, and interactive simulators; and as a novelty the visitor can see the interior of the plant by means of photographs on the screen and completing it with very short videos displays of some important activities, such as the refuelling manoeuvres.

After the display, the possibility of seeing the nearest possible nuclear buildings from the bus is offered to groups of visitors, but always from outside the fenced area.

This proximity to the buildings complements the information received and compensates for the actual prohibition of visitors entering the nuclear power plants.

**Recovering the lost ground**

In Cofrentes, we think that with this measure we can recover the normal situation that we enjoy before September 11th regarding visits. We cannot and we must not open our doors widely because of evident security repercussions, but within the possibilities we have, we have orientated the visits with the clear objective of maintaining our acceptance levels on a transparency basis.
After September 11th it was evident and logical that measures of physical protection had to be taken for our nuclear power plants. This, therefore, and from the point of view of the visitor, was to mean an important restriction, as a good part of what was possible to visit before, has now been restricted to both the visitor and the Information Centres.

We had had to rethink the means to offer information to the visitor within our existing limits and the best possible approach to the site, with the purpose of not giving a negative image and not concealing information. This would have represented a backward step at a time when the nuclear industry had managed to create an informative and transparent climate.

To cover the needs of information of the nuclear industry to obtain adequate results directed towards public opinion is not an easy task. To be able to overcome this difficulty and to let people know the advantages of nuclear energy, we must establish adequate strategies, clearly identifying the subjects to communicate. At the same time, bearing in mind the worries of the general public we must create messages to reach a wide range of the society.

The Information Centres must be a permanent reference for the general public to access nuclear information. They must also establish the necessary channels to obtain an atmosphere of mutual trust and transparency with the media, local, regional and national institutions.

**Information centres NPP**

Our mission is to transmit information to the general public in a reliable and accurate basis regarding nuclear energy and particularly about Cofrentes NPP.

The first Information Centres in Spain came into operation in the 70s when many nuclear power plants were being constructed, and since then they have without doubt been one of the tools that have most powerfully contributed to spreading information about nuclear power in our country.

We are aware of the public’s general sensitivity towards nuclear matters and this is why the following are inescapable criteria which should be key precepts in the communication policy of our Information Centre:

- Opening in May 1978 (25 years) before construction of de Plant.
- Receiving 11,000 visitors per year to 1998. Now receive about 4,000 visitors per year.
- Accumulated visitors up to December 2003: 245,000 people.

But the Information Centre activities do not stop at entertaining groups of visitors. Information Centre usually have a staff 2 or 3 people who work exclusively for the Centre and who, under auspices of the power stations Communications Sections, take part in talks, conferences and debates about nuclear power; organize social,
cultural and sporting activities in the immediate surroundings of the power station, and bring out publications: brochures, magazines, leaflets and so on, each following clearly distinct information criteria and aimed at a particular public.

**Policy of transparency and availability with the media**

The media (both the press and radio and television) are given special treatment under the power station’s Communication policy due to their importance and their influence on society.

The aim of approaching the media is to create an atmosphere of mutual trust, for which it is vital to maintain the accuracy and quality of the information provided as well as total transparency at all times.

The existence of a Spokesman for the power station facilitates the sometimes problematic communication process between journalists and technicians.

To iron out these problems, Cofrentes NPP carry out activities directed at the Media such as:

- Technical seminars in the site (periodic: annual, for refuelling...)
- Visits to the site regarding general and essential issues.
  - Refuelling outage
  - Transport of low and medium radwaste
- Daily request of information
- Periodical delivery of documentation (sending or handing over information: publications, reports, studies, requests for information and so on).
- Press conferences (for incidents, anniversaries...)

The technical conferences at the power station, coinciding with some notable event and with technical papers given by experts over a weekend.

The link with the Media is much more dynamic and the aim is that requests for information should be urgently met in all cases.

An immediate response to all requests for information from any of the Media, at any time and any place, is considered to be an extremely important aspect of our public relations.

To sum up: the information system established with regard to the Media is founded on veracity and accuracy, and keeping communications channels constantly open results in mutual trust.
Local and autonomous institutions

To make up the power plant into its immediate environment is not an easy task, due to the wide range of socio-economic variables involved in the operation and social perception of the plant.

To facilitate this aspect of local relationships, increasingly frequent and closed contacts are cultivated with local corporations and associations with the aim of establishing the good neighbourliness that makes it possible to set up joint projects that are to the advantage of the areas where the power stations are located.

Cofrentes NPP has established a permanent cooperation for the economical and social development in her influence area through a good vicinity policy and information:

- Half yearly meetings with the local communities associations (handling over reports).
- Collaboration with combined projects to jobs generation.
- Attendance to autonomous institutions to inform about the plant operation.
- Combined performances with Institutions (Valencian Nuclear Emergency Plan).

To sum up, power stations cannot forget that their presence in a particular region involves a role in promoting and evaluating, together with local institutions, the setting up of programs that may contribute to boost social, cultural and economic activity around the plants.

As for Autonomous Institutions, relationships with them are governed by a set of regulations for a range of specific situations in which official reports on the operation of the plant are demanded.

Leaving aside the official relationship, power stations offer information through channels that go beyond the strictly official domain and that is of great interest to regional institutions: Government Offices in Autonomous Regions, Nuclear Safety Committees in Regional Parliaments; Provincial Directorates for Industry, Regional Industry and Environment Ministries.

Special mention should be made of joint enterprises and information exchanges with institutions involved with the Spanish Nuclear Power Plant’s Nuclear Emergency Plans. There is a wide range of joint activities to inform the population in emergency situations.

Universities

The link between universities and private enterprise is the result of a constant concern to keep in touch with the advance of scientific research.
This concern takes the form of collaboration agreements regarding equipment calibration and project research; taking part in environmental watch programs; Postgraduate scholarships at the power station; residential two-month summer scholarships at the power plant with several universities; and visits to the plant.

Thus close cooperation is kept up with these institutions that have so much weight in our society.
VISITOR CENTRES: WHAT NEXT?

New thoughts to facilitate communication

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All we are probably aware of the fact that information campaigns in the nuclear industry do not bring harvest immediately. It is a long process of educating the public, with results sometimes seen years later. This is the case especially when the target public are teenagers or adolescents. We have electricity enough at present, but predictions show that in 10 or 20 years the situation will be different. We will certainly have to build up new power plants to avoid additional emissions of greenhouse gases and to keep the rates according to the Kyoto protocol, and maybe it is just the current young generation who will make final decisions in a few years on what kind of energy resources will be exploited in the future.

We have a saying in Slovak: ‘what you learn as young, you will utilize as adult’. Therefore the external communication work at Močovce is concentrated on the young, who form no less than 90% of our visitors. The rate of visitors nicely grew every year since the Information centre was established in 1990, however the growth stopped in 1998 after the commissioning of the 1st unit and now is balanced at about 12,000 a year. Our regional public opinion poll showed that the people are “oversaturated” with nuclear information and do not bother to come to the nuclear power plant again, because “it’s all the same”.

At this stage one must critically look back at what kind, quality and form of information is offered to the people and whether it is useful to keep the information programme unchanged. Is it really valuable for people to come back again to listen to and to see the same? This experience forced us to come up with something new that would attract the public again.

As the Information centre is the most attractive source of information for those who are really keen to learn something new about nuclear and are not lazy to move their bums from the comfort of internet, we firstly thought about building a new Information centre in a separate building at the power plant entrance. No less than 4 architectural studies were developed in 5 years, each becoming more expensive than the previous one. After all the corporate management pushed this idea aside as too expensive. So we landed and proposed a project of an economical and cost-effective alternative of the new Information centre. Reconstruction of the ground floor of the existing building from the first idea to end of reconstruction took about one and half year, and we managed to open the new visitors centre just a week ago on the February 2nd (2003). It’s no problem to do good things with huge budget. We had less than EUR 200,000 available to cover overall costs, including designing, reconstruction, new audio and
video equipment, exposition panels, etc. The reconstruction provided us the necessary space to extend the capacity of the visitor centre. Currently, we have about 2 or 3 buses a day, with the new one we'll be able to double the capacity with much better quality of information transfer.

In the attempt to attract more people to the power plant we recently launched another project - the Prehistoric Park Mochovce. Two years ago we received a proposal from a University, which we co-operate with very well, to participate at a pre-historic village reconstruction project right on the location of the former Mochovce village. The village was put down in 1980 due to the power plant construction and at that time a lot of valuable archaeological findings, such as pots and cups (mostly broken, however), were recovered on the site. It took a year to prepare the design documentation. At the first step we made ground levelling works and planting at the site. In the autumn students of archaeology organised a volunteer job, and built up the first building - the smith's house. For spring we plan to raise other two or three buildings and in this way we'll continue step-by-step every year until the prehistoric site is completed.

The philosophy of the both projects is simple - it will attract people who can on the way stop at the Information centre and make a tour of the power plant, and vice versa. This project will finally close the historical loop at Mochovce - from the Stone Age to the Nuclear Age.
Summary

During the 10 years of its activities the Nuclear Information Centre in Slovenia has served to the general population, especially the youngsters, as a primary source of information about nuclear energy, radioactivity and related issues. In this time some 58,000 youngsters with their teachers have passed through it, listening to the lectures, seeing the exhibition and the research reactor and receiving a set of information materials. Every year some 900 visitors were polled with the same set of questions before they listened to the lecture. Though our polling results show a generally favourable attitude towards nuclear energy in Slovenia (83% of polled population agrees with NPP Krško operation until the end of its life cycle and 10% accept construction of another nuclear power plant in Slovenia), we must still ask ourselves about our successes and failures and possible improvements in our information activities:

- NPP Krško plant has moved outside the sphere of politics. Opposition to NPP Krško operation remains low. Perhaps we can claim some credit for defusing the political argumentation by patiently informing the young generation and spreading knowledge about nuclear technology.

- Beneficial environmental implications of nuclear power in Slovenia are recognized though less clearly than they deserve to be. Global warming issues and Kyoto agreements should become an important part of information activities.

- Misconceptions about radioactive waste repositories and danger of radioactive waste remain high. This is certainly one of our failures (also very common elsewhere in Europe) that warrant emphasized information activities.

We are currently trying to improve our informational methods by evaluating results of preliminary polls that we conducted among the teachers.
“Sustainable development” and “environmentally friendly” are good, positive messages for nuclear communications. Nuclear energy is, we claim, contributing to sustainable development; it has low external costs (comparable with the best renewables) and does not cause emissions of the greenhouse gases responsible for climate change.

At PIME, sustainable development has been the subject of plenary sessions and workshops many times.

The nuclear industry has been advocating that nuclear energy is sustainable and environmentally sound for years.

At the workshop, participants will be given the opportunity to assess and discuss how effectively the industry has used the sustainability argument for political and public acceptance gain. Questions to stimulate discussion include:

- How do nuclear companies and organisations use the sustainability argument?
- What are the most effective key messages, to use consistently throughout the world, which argue that nuclear is an indispensable energy source for sustainable development?
- *How persuasive and effective are our arguments?*

- *Could we be monitoring our progress?*

Conclusions from the workshop will be presented to the plenary session on Wednesday morning.

| Workshop participants are invited to bring examples of nuclear energy and sustainable development communications. |
CLIMATE CHANGE AND NUCLEAR POWER OPTION
FOR ITALY

ENRICO MAINARDI (Ing. Ph.D.)
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Introduction: Italy & climate change discussion

Italy is one of the eight most industrialized countries particularly committed to discussions on climate change and environmental issues. Not only is it open to discussion (e.g. hosting the present ninth session of the Conference of the Parties (COP9) to the United Nations Framework Convention on Climate Change) but also taking some actions (e.g. Sundays without cars to reduce carbon dioxide (CO₂) levels). Further dialogues and actions are still needed, not only at a national and European level, but in a world-wide scale. Both actions and discussions on environmental issues must take into consideration the promotion of economical and technological growth in order to appear more realistic and feasible.

The current transportation and energy systems both still rely mainly on fossil fuels with a massive impact on the environment. Measures are needed to reduce burning fossil fuel (coal, oil, gas) for electricity generation since it is much more difficult to replace it in transportation applications. This is particularly true for the Italian energy system that depends for the 80% on oil and natural gas. For energy production the country relies on an energy mix that doesn't include nuclear power (contrary to all the other most industrialized countries) as a result of a popular referendum held in November 1987 on energy related matters. In order to decrease production costs the national electricity demand is met importing 18% of the electricity (from nuclear power) from abroad.

Climate change: a global problem

Climate change is a globally important issue and it is responsible for the higher intensity and frequency of extreme weather events (i.e. hurricanes, storms, flooding, etc), as well as for the increase in temperature, the rise of sea level, desertification, the loss of biodiversity. The international scientific community have for a long time been debating the reasons and impacts of climate change and greenhouse gas effects. The United Nations Framework Convention on Climate Change, adopted in 1992, is the answer at international level for contrasting and reducing the negative effects of climate change to the minimum. The main objective of the Convention is stabilizing the greenhouse gas concentration in the atmosphere (caused by the use of fossil fuels) to a level that does not cause any dangerous interferences to the climate system.

In order to face the challenges related to climate change a joint effort from all contracting Parties is needed. This effort has to be in balance with the different abilities and responsibilities, and in line with the promotion of national economies. Within the United Nations Framework Convention on Climate Change, the Kyoto Protocol was signed in 1997 as an implementing instrument of the Convention. The Kyoto Protocol requires industrialized countries, responsible for more than 70% of
the total emissions, to reduce their greenhouse gas emissions by 5.2% from 1990 levels by 2008-2012 period.

**Environment and human activities**

Supply of Electricity is a key factor in economic and technological development of a country. In advanced industrialised regions like Italy and the EU, electricity demand tends to increase over time 3%/year. Also for developing countries, electricity supply is particularly important for economic growth and improvements in living standards. World electricity demand is likely to triple by 2050, with a major component from developing countries.

World-wide fossil fuels currently meet more than 85% of energy needs and will continue to dominate for the next few decades with an increase in atmospheric CO$_2$. In order to reduce future CO$_2$ emissions it is of paramount importance to shift our energy mix to increase the share of non-carbon emitting sources, including renewables and nuclear energy. Since this is a global problem every country, especially industrialised regions like Italy, should have an appropriate energy mix without delegating other regions to mitigate their effects.

In Italy 7.1 tons of CO$_2$ /person were emitted (1997 data from EFN) compared to 5.8 of France. France’s low emissions are due to the fact that its electricity is produced by nuclear (80%) and hydraulic energy (15%) with a final small contribution to CO$_2$ emissions for electricity applications. France without nuclear energy would be obliged to burn coal or gas to produce its electricity, which would then increase its emissions to about 10 tons per year and per person of CO$_2$.

The only large-scale renewable source today is hydro-electricity, providing about 18% of the world’s electric power but unfortunately with a limited capability of expansion without strong environmental issues. In Italy this source is very well employed.

Solar and wind generation, together with other renewable source, cannot meet the base-load demand for continuous reliable power while they can be very well suited for decentralised generation and certain applications. Research and development (R&D) must continue to grow to increase the efficiency of this source and to evaluate their environmental issues.

**Fission for present energy supply**

Nuclear fission currently provides 17% of global electricity. In Western Europe, where 35% of electricity is produced by nuclear power plants, safety records are excellent and internationally monitored. The realisation of long term solutions for existing waste products and expanded deployment of nuclear fission energy has been addressed. Some countries already have definite programmes for site selection and the investigation of final repositories is in progress everywhere. Nuclear non-proliferation and weapons capability is also a high priority and internationally monitored. Site approval is also a problem that can be overcome only with vigorous political and technical decisions and evaluations. For new Nuclear Power Plants (NPP), capital costs are a major factor, with fuel and other operational costs being relatively small and almost independent of fuel price fluctuations. Nuclear energy is economically competitive with other sources of energy in many countries and it could be everywhere if a smaller carbon emission tax would be considered.
Nuclear power can provide energy and heat without greenhouse emitting air pollutants or greenhouse gases. Although the discussions on reducing fossil fuel emissions, fission and all nuclear technologies have a very poor public and political acceptance and the subject is often avoided, especially in Italy. The discussion on nuclear fission could be addressed particularly in this moment after the recent blackouts that pointed out the dependence of our electricity system and stressed out the need for a more balanced energy mix. For the future use of hydrogen, both as a clean fuel for transportation and as a clean means of energy storage, high-temperature nuclear reactors can be used both to produce hydrogen and electricity without carbon emissions.

**Fusion for research and long term future applications**

Nuclear magnetic confinement fusion (MCF), as a nuclear alternative has the potential for very promising operational safety and environmental properties and sustainability. The fusion fuels - lithium and deuterium - are readily available and with almost unlimited supplies. The waste produced will consist of neutron activated part of the reactor structure with the absence of actinides. The absence of high-level radioactive waste make fusion particularly attractive although it produce a considerable amount of low/medium-level radioactive waste with much reduced toxicity (half lives of several hundreds years). Also inertial confinement fusion (ICF) and cold fusion have the same potential but research in these fields is not very well pursued in Italy and in Europe in general.

Successful R&D in recent decades, particularly in Europe, has made it possible to design an experimental MCF reactor (ITER) as part of the world fusion programme with the goal to achieve the proof-of-principle for nuclear fusion as a viable energy source. The path to a fusion reactor and economically convenient electricity by fusion is still very long. R&D must be vigorously addressed for future generations but unfortunately for a short-medium time scale fusion cannot be considered as an energy option.

**Italian waste repository and nuclear public information issues**

Nuclear waste is a major issue for the acceptability of nuclear power energy and nuclear technologies in general. Public information and communication is very important and much action is necessary together with deeper technical investigations. This issue needs to be addressed and solved before starting any discussion on nuclear power as the recent case of the proposed site (Scanzano Jonico) demonstrates. The Italian Government decided to find a solution to the disposal of nuclear waste from the past operation of four Nuclear Power Plants and of all the other nuclear waste from hospitals, medical facilities, industries and research centres but a very strong opposition arose against the installation of the proposed site.

A nuclear-waste storage facilities located in one secured place is a national priority, given the increased risks of possible terrorist attacks, accidents or natural disasters. The Italian decision needs to follow the guidelines and paths decided at the international and European level without delegating to future generations the problems and waste connected to previous use of nuclear technologies. On the other hand the inhabitants of the region of the proposed sites are extremely concerned and lot of actions are going on against this site selection. For this reason it is essential to
analyze and address not only the technical, economical and environmental aspects but also the social-communication issues in order to be more effective in the discussion for a nuclear waste storage facility and for the future employment of nuclear power.

**Nuclear Association and Young Generation in Italy**

The AIN (Associazione Italiana Nucleare or Italian Nuclear Association) has always been involved in energetics and nuclear issues considering all the possible aspects and elements with particular attention to communication issues. Recently a “fresh” perspective was added with the YG (Young Generation) network in Italy which is supported and is a part of AIN.

The YG network is still under development and to be completed. The main purpose of the YG network in Italy is to establish a national network within the "younger generation" of professionals and students that are willing to make efforts to raise the interest in nuclear fields as a whole and learn from the experiences and knowledge of mature established professionals. The YG network in Italy was re-born with the purpose to gather Young Nuclear Engineers (age below 35) throughout the country with a mailing list. Later it included Italian Young Nuclear Engineers that are studying and working abroad. Also few Italian Nuclear Engineers of age above 35 joined the mailing list during the year although it is meant primarily for discussion and information of the young generations. The purpose is to include people working or studying in the field of nuclear sciences and technologies interested in the further development of the field, especially for energy production applications in the country. For this reason the name: INN (Italian Nuclear Network) was chosen.

The YG main idea is modelled on the concept created by the European Nuclear Society (ENS) where the aim is to establish links between people new to the field and more experienced individuals. In Italy there is a big generation gap between the pioneers of the nuclear era in the country and the new generations. The aims and objectives of INN in agreement with ENS and other network of the same kind in Europe and worldwide can be summarized as follows:

1) organize a network as a base for information and discussion;
2) improve communication between experts, members of the list, public;
3) promote knowledge transfer between generations within the nuclear industry;
4) encourage young people to stay within the nuclear field and provide a resource for the future;
5) provide career opportunities and development;
6) improve the development of nuclear technology.

The main activity of the YG network in Italy is so far related to the maintenance of a mailing list and to get more people involved and enrolled in this free newsletter that spread via E-MAIL once or twice a month. Other actions and activities are planned and can become effective when a strong and motivated group arise.

**Conclusions**

Nuclear energy is beneficial not only when discussing about CO₂ emissions, climate change and energy supply but important for an overall economical and technological growth. In this COP9 occasion we focused on these subjects hoping that the media, the public opinion and the politicians in Italy could start considering
also the other positive aspects not simply depicting nuclear technology as a negative one. This is particularly true evaluating also the enormous progress in western countries to enhance reliability and safety, waste disposal issues, time and money investments, and nuclear proliferation issues.

Nuclear technology is still relatively young and it has a large potential for improvements and breakthroughs for power and non-power applications and for this reason it cannot be abandoned as our country seems to have done in the past few years.

Finally we believe that a reconsideration of the nuclear option in Italy can be beneficial together with an effective technical discussion supported by politicians in order to have a more balanced energy mix and to decrease the energy dependence for the welfare of the country.

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Acronyms used

UNFCCC (United Nations Framework Convention on Climate Change)  
COP (Conference of the Parties to the UNFCCC)  
IEA (International Energy Agency)  
WNA (World Nuclear Association)  
EFN (Environmentalists For Nuclear Energy)  
EU (European Union)  
ENS (European Nuclear Society)  
AIN (Italian Nuclear Association)  
R&D (Research and Development)  
NPP (fission Nuclear Power Plants)  
ITER (International Thermonuclear Experimental Reactor)  
MCF (magnetic confinement fusion)
IS NUCLEAR ENERGY SUITABLE FOR GLOBAL WORLD?

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Opponents of the nuclear energy in Russia have already agreed that its simple denial has no prospects, in view of the fact that new NPP construction now is a strategic policy of the Russian government. The tactics of pricking in the “painful spots” – especially in case of rightly choosing them – is now considered to be more efficient.

Recently the Russian anti-nuclear movements declared the most prospective the opposition to:

- nuclear material flows across the borders;
- use of plutonium in power reactors
- operating nuclear units’ life extension.

Choice of these subjects is successful, because life extension is critical for present-day nuclear energy viability, and both the plutonium fuel use and the transportation of nuclear fuel (fresh and irradiated) across the borders are the necessary links in the chain of technical and political issues, which, if not duly answered, would prevent the large-scale development of nuclear energy.

The arguments in support of such development’s realization, as well as that the “Second Nuclear Era” announced by many specialists will come, are well known:

- resource constraints and growing competition for non-renewable resources;
- crisis factors related to highly uneven distribution of fossil fuels and dependence on unstable energy exporting regions;
- global and regional environmental limitations;
- nuclear energy’s ability to become a factor of stability for economic development, as well as an environmentally acceptable part of the energy option.

However, the vision of the future nuclear power and the level of its internationalization today seem to be unclear even for the specialists, saying nothing about the general public.
Even some experts deny the globalization of nuclear energy. There is still a model, when each country stays alone with its nuclear problems, “from cradle to grave”.

Economic laws and the growing proliferation-resistance problem are gradually, but inevitably, destroying this model.

Even today only 6 companies control 80% of the world uranium production; there are four main suppliers on the enriched uranium market; six countries provide (or are going to provide) nuclear fuel processing services. In the same time, nuclear fuel and equipment manufacturers are actively consolidating themselves.

The calculations, quantitatively analyzing the vision of the future nuclear energy and estimating the demand of innovative technologies, both for the world in general and for its separate regions in the time frames of 50-100 years from now, have been carried out in the Russian Research Centre “Kurchatov Institute” within the framework of the IAEA’s INPRO Project.

The initial conditions included, first of all, the world energy development scenarios. In accordance with the INPRO recommendations, we have used the known SRES scenarios, prepared by the Intergovernmental Panel on Climate Change (IPCC) – 40 scenarios grouped in the 4 main types.

Scenarios, which could be called “medium”, were selected as basic ones. Under these scenarios, the world nuclear energy capacity should reach 2000 GW by 2050 (and 5000 GW by 2100).

The analysis included also more “strict” world nuclear energy development scenarios (up to about 10 000 GWe by the end of the century), which allowed using its considerable capacities for hydrogen production; as well as more moderate scenarios of nuclear energy development. The results show that even under the “medium” scenarios of the world energy development in the XXI century, the future nuclear power should contain many innovations. These are: fast neutron reactors, which are still rare today; and considerably advanced light-water reactors using plutonium; and nuclear fuel reprocessing plants based on new technologies.

“Low” scenarios create no typical “innovative” problems. In the field of reactor technology development, these are - advancement of light water reactors (and extension of their capacity range to small and medium capacities), as well as the development of hydrogen-production high-temperature reactor technology up to the commercial scale.

It’s hard to suppose that the bulk of the world countries will independently start realizing these innovations and creating the nuclear fuel cycle of their own, because this would be economically senseless, and the mankind cannot afford uncontrolled proliferation of weapon-grade materials.

The ideas to internationalize these most complex industries, as well as to create, reprocess and store nuclear materials on a limited number of sites under strict international control, have long been in the air.
In particular, our calculations show that the idea of creating large international fuel cycle centers may be very useful for solving the issues related even to a very fast rate of nuclear energy development. For example, Russia could, to a considerable extent, take upon itself many industries (enrichment, fuel fabrication, reprocessing).

Not only the calculations, but also the accumulated practical experience show that it is quite possible to create the reactor facilities (not containing weapon-grade materials), which would be suitable for various countries in terms of capacity range, conveniently transportable (by sea), and supplied (and then returned back to supplier, for example, on the base of leasing) to the countries with insufficiently developed nuclear or other infrastructure, but with equal rights for nuclear energy use compared to other countries. That is, it is quite possible, according to Dr. M. El Baradei, to “provide access to the benefits of nuclear technology for more people in more countries”. In this connection, the countries with accumulated nuclear and industrial experience should take upon themselves all the necessary services and further management of these facilities.

Finally, the multinational approaches to radioactive waste management, which have long been discussed in the IAEA, should be understood; and the NIMBY complex should be overcome, or, as it was said at PIME, we must “ensure the balance of national interests, with fair distribution of environmental burdens and compensations”.

It seems that such an approach to nuclear energy in the globalizing world, which makes the maximum use of the international cooperation, has not only the right to be considered, but also represents many obvious advantages. Certainly, on the way towards such nuclear power it will be necessary to solve many technical, political and institutional problems. But this “Second Nuclear Era” has all the reasons to pretend to the public confidence.
NUCLEAR POWER AND THE HYDROGEN ECONOMY

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1 A popular subject
As far as innovative energy systems go, hydrogen raises very high expectations. Using Google® as a yardstick for interest, one finds out that the phrase “hydrogen economy” generates around 212,000 references. This is less than nuclear fusion (330,000) but much more than “clean coal” (less than 44,000). This very abundance of information does not help communicators to shape their own opinion with respect to the role of hydrogen in future energy systems. This paper attempts to provide a summary of the most important facts to be borne into mind.

2 Basic facts about hydrogen and its potential role in power generation
2.1 Hydrogen’s advantages
Hydrogen looks attractive because of its abundance, benign environmental impact and potential versatility. The most abundant source of hydrogen is water, which covers three quarters of the surface of the globe. When it recombines with oxygen to generate heat or electricity, it only gives rise to water steam instead of the infamous carbon dioxide. Thanks to the existence of various types of fuel cells, it can fulfil all types of energy needs: stationary uses, transport and electricity generation.

2.2 Hydrogen Is not an energy source
This most basic fact would not even be mentioned here if it was not overlooked with remarkable consistency by the media, including their most distinguished representatives [1]. Natural hydrogen is found only in chemical compounds, the most familiar ones being water and methane, the main constituent of natural gas. Whatever the means utilised, setting it free absorbs more energy than can be recovered from it through further combustion. Chemistry textbooks indicate that for each and every unit of energy produced by pure hydrogen, one must have spent at least 135% of this energy to produce the corresponding quantity of hydrogen in the first place. This should be compared to oil that consumes only 20% of its energy from well to wheel and uranium that requires about 5% of its energy content to be processed into a usable form. In the case of transport, this adverse situation can be more than compensated by the better efficiency of fuel cells. However, whether hydrogen production will act as an energy drain or not will depend on the interaction of several factors and is not yet clear. The fact that it can be stored pending further use while not being an energy source justifies its naming of energy carrier.

2.3 The challenges ahead
The hydrogen atom is the smallest of all elements, making hydrogen gas the lightest substance in the universe. This particularity of hydrogen impacts significantly the economics of transport and storage. Furthermore, production and utilisation as an
energy carrier also need to be improved in terms of cost-efficiency. This accounts for the technical challenges. Before describing them briefly, one additional challenge must be mentioned: managing the transition between the current situation and a future hydrogen society. Massive investments will be required to replace the existing infrastructures if hydrogen is to become the fuel of the future. This is especially true for transport. With demand and supply waiting for each other to grow, one cannot avoid thinking of a “chicken and egg” situation.

2.3.1 Production
From an environmental point of view, hydrogen is, roughly speaking, only as good the primary energy source used to produce it. So far, hydrogen is mainly obtained through chemical processes using fossil fuels as source material. As a result, sizeable quantities of carbon dioxide arise as a by-product and the environmental problem might be reduced\(^1\), but certainly not removed. This is not satisfactory for large-scale utilisation beyond the restricted uses currently made of it. This is why renewables and nuclear power can play a role. Interruptible renewables such as solar and wind would see their main shortcoming actually vanish in the context of a hydrogen economy. They could be used to produce the energy carrier by electrolysis without any serious concern for interruptions because the output can be stored pending further use. This scheme would however remain expensive even in the long run [2]. Existing and currently planned nuclear power plants can also be considered as production sources by way of water electrolysis. They could in particular do so when the overall demand is low to ensure continuous base-load operation. It must however be admitted that the use of thermal energy generated in the core of a light water reactor would be far from optimal. The High Temperature Reactor (HTR) is expected to provide a better answer. This type of reactor can be tailored to the needs of hydrogen production and achieve an efficiency close to the theoretical limit of 70%. The HTR is part of the Generation IV programme initiated by the US DOE aiming at putting six innovative reactors into commercial operation as from 2020.

2.3.2 Hydrogen storage
It has been mentioned earlier that hydrogen can be stored pending further use. Storing it efficiently is probably the biggest obstacle to be overcome. Hydrogen’s low density means that a given volume of hydrogen contains less matter than the same volume of any other substance. It must therefore be compressed to high pressures to be stored economically but then, the hydrogen atoms could easily react with the material of the container and make it brittle. Special design measures are needed to avoid this danger. Furthermore, compression does eat up about 10% of the energy of the gas. The energy imparted under the form of high pressure can be recovered in principle but to what extent this will be practical remains to be seen.

2.3.3 Hydrogen transport
Contrary to what many believe, there is already a large body of experience concerning hydrogen transport: 1500 km of pipelines are operated in Western Europe and 900 in the US. Normal steel pipes can be utilised and few, if any, operational problems have been experienced. Networks designed for natural gas cannot however be used for hydrogen without adjustments. Leakage from pipelines –

\(^1\) providing fuel cells display sufficiently higher efficiencies as mentioned in paragraph 2.2
difficult to assess at this stage – might pose an additional problem by further
decreasing the efficiency of the production process.
Road and sea transport on the other hand do not seem to be a proposition because
the amount of energy used to transport hydrogen would represent too high a
proportion of the energy transported.

2.3.4 Hydrogen utilisation
This is the province of fuel cells. Numerous models based on various technologies
allow addressing different needs in the most appropriate way. The cost of fuel cells
has been significantly decreased, sometimes tenfold, over the last decades. Further
progress remains to be done for transport applications in particular in terms of
autonomy, reliability and cost.

3 Current status of hydrogen initiatives in the world
All the big industrialised countries have stated their interest in moving to the so-called
hydrogen economy, the main reasons being lower pollution, cleaner air, higher
energy independence and keeping abreast of technological developments. They
have all established deployment strategies backed by timetables and expressed
willingness to enter international cooperation agreements in order to reduce R&D
expenditures. The plans of the EU, the USA and Japan are briefly reviewed below.

3.1 The EU
The European Commission has devoted increasing attention and resources to
hydrogen (H) and fuel cells (FC) since many years due to concern over meeting
increased energy demand, especially in the transport sector. As an illustration, the 5th
Framework Programme (1999 – 2002) devoted 120 million euros to fuel cell and
hydrogen projects. It is envisaged that the budget for research on fuel cells, including
their applications and hydrogen technologies, will be increased substantially
compared with FP5.

The High Level Group (HLG) on Hydrogen and Fuel Cells was formally launched in
Brussels on 10th October 2002 by the Vice President of the European Commission
Loyola de Palacio, responsible for Energy and Transport, and Research
Commissioner Philippe Busquin, with the support of President Romano Prodi. It
brings together top-level stakeholders from across Europe, with the aim of
formulating an integrated EU vision on the possible role that hydrogen and fuel cells
could play in achieving sustainable energy. It has provided recommendations to
policy makers addressing what would be required to achieve global leadership in this
field in the next 20 to 30 years [3].

The European Commission is now establishing a European Hydrogen and Fuel
Technology Platform (HFCTP) aimed at accelerating the development and
deployment of these key technologies in Europe. This platform is expected
accomplish the bulk of its work starting in 2004 and beyond.

The deployment plans are still under development. They can be sketched as follows:
− until 2020: R&D, demonstration (lighthouse projects) and niche fleets leading to a
mix of energy sources,
− between 2020 and 2030: local H2 distribution grids, low cost and reliable fuel cell systems and vehicles available,
− from 2020 to 2050: increasing market penetration leading to the hydrogen society where H2 is produced from renewables and fission/fusion energy.

In-depth discussions with high-level Commission officials from DG RTD and TREN indicated that the nuclear industry would be wise to adopt a low profile when involving itself publicly in the hydrogen debate. If the nuclear industry comes on too strong, the idea of a hydrogen economy initiative might attract strong opposition from the Greens. Taking this view into consideration, the European nuclear industry should consolidate its position. First, it should define a common approach regarding further actions and strategies concerning the hydrogen initiative. Second, the level of visibility the nuclear industry wants in the hydrogen debate needs to be determined.

3.2 Japan
Japan established in 1999 a Policy Study Group for Fuel Cell Commercialisation and a Fuel Cell Commercialisation conference in 2001. Its expenses on fuel cells have been stepped to about 9 billion JPY (close to 68 million euros under January 2004’s exchange rates) in 2003. This figure does not do justice to the Japanese effort: it is reckoned that Japan is spending twice as much as the EU on hydrogen-related R&D. Their deployment plans can be summarised as follows:
− until 2005: basic work and technology demonstration stage
− from 2005 to 2010: introduction stage (50,000 vehicles equipped and 2.1 GW in stationary applications)
− in 2020: 5,000,000 vehicles equipped and 10 GW in stationary applications

3.3 United States of America
The USA’s plans regarding hydrogen are described in “A National Vision of America’s Transition to Hydrogen Economy – to 2030 and Beyond”. This document, published by the US Department of Energy is the outcome of a National Hydrogen Vision Meeting held in November 2001.
The following deployment dates are provided:
− until 2010: portable power
− from 2010 to 2020: stationary distributed power, bus fleets, mature technologies permitting mass production of fuel cells and storage devices,
− from 2020 to 2030: commercial fleets, distributed Combined Heat and Power, market introduction of personal vehicles,
− from 2030 to 2040: utility systems
The American plans make no mention of nuclear energy as a production source. The US R&D budget is assessed to be three times as high as the EU one.

In November 2003, an 'International Partnership for the Hydrogen Economy (IPHE)' was launched by the US at a ministerial meeting in Washington DC. The aim of the IPHE was to sign an agreement to share research & development on hydrogen and boost the hydrogen economy.

In January 2004, Japan and the United States agreed in principle to cooperate in developing hydrogen-based fuel cells.
4 Hydrogen and the Kyoto protocol

The current Kyoto protocol stipulates that by 2012, carbon dioxide emissions must be limited to 92% of the 1990 levels. This is however only a first step aimed at initiating the mechanisms needed to achieve much more substantial reductions. In the long run, but as soon as possible, it is estimated that a 60 to 70% reduction will need to be achieved to stem climate change. Another way of stating the same is to say that the yearly share of fossil fuel should not exceed 25% of world consumption by 2030.

What will the interactions between hydrogen and the Kyoto protocol be at the global level? Much will depend on whether hydrogen proves to be an energy drain or not. In fact, so stringent are the long-term objectives of the Kyoto Protocol that one must sincerely hope that the hydrogen economy will permit at least some energy savings. Should this not be the case, hydrogen will eventually appear as a luxury the world cannot afford.

Another factor introduced by hydrogen is much the more limited scope for imports. While it is possible to contemplate a European hydrogen transport network, intercontinental transport of the oil and gas types does not seem to be practical. The procurement of fuels would therefore become more “local” than it is today. This change can only strengthen the need for nuclear energy in Europe, but the specific contribution of hydrogen to this need will not be felt until there is a substantial demand for it, i.e. in the long run.

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NEW CHALLENGES ON NUCLEAR POWER

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Summary

The electricity demands know a rapidly growing in each region. Taking into account the scrapping of ageing power plants and the reduction of currently large excesses of generation plant capacity over-peak demand in some regions, new generating capacity will be necessary.

In many countries, electricity authorities recognize the nuclear power as a sustainable, clean, safe and economic solution to meet the world's rising demand of electricity relative to coal and oil.

Since the first nuclear commercial power reactor, some 11,000 reactor-year operating experiences have been acquired with commercial.

At the end of 2002, 441 nuclear power reactors with a capacity of over 359 GWe operating in 31 countries, generated 2544 billion kilowatt, more then all electricity generated worldwide in 1961.

New reactors type, the improving of the capacity or load factors, the lifetime extension are some of the ways through the nuclear power can bring its contribution in covering the rising demand of electricity and mankind progress.

But these are not the single solution and the specialists are looking for new options.

Nations develop new projects: Small Nuclear Power Reactors & Advanced Reactors will represent the future of nuclear power hope.

The paper presents new tendencies related to the new power sources, especially nuclear power.
TECHNOLOGICAL ROAD-MAPPING FOR THE IMPROVEMENT OF FUTURE NUCLEAR POWER INNOVATIONS

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Summary

This paper represents a practical method of Nuclear Technology Road-Mapping (NuTRM) for effective nuclear power innovations in the future. Through national nuclear R&D programmes in Korea, the object of NuTRM is to explore the strategic products as economic goods to cope with the future needs of the nuclear energy and to enhance the global competitiveness of the domestic nuclear industry, which in turn improves the contribution of the nuclear investment to the nation’s economic growth. Technology road-mapping starts with identifying the future needs and opportunities for the technology or industry concerned through the so-called SWOT analysis. Then a strategic planning is systematically undertaken to establish the future vision of the nuclear energy development by the year 2030. Finally strategic products are explored in order to cope effectively with the strategic environment and achieve the vision, which will lead the technological trajectories and the progress for the development of the technological capabilities and the competitiveness of the domestic innovation system.

1. Introduction

Through improvements in capital and labour productivity, the creation of new products, services and systems (Mitchell, 1999), technological progress has been acknowledged to be the major determinant of industrial development (OECD, 1996; Kim, 1999) and national economic growth (Nelson and Winter, 1982; Patel, 1995) in both the developed and developing countries. With the inauguration of the World Trade Organization (WTO) in January 1996, the global economy and trade environments have become fully competitive. Technological innovation to enhance industrial competitiveness has come to be viewed as one of the most critical issues in a national R&D policy. In this regard, it has been emphasized that national R&D should contribute more directly to the economic growth of the nation although it carries out creative scientific researches which hold potential payoffs from a long-term perspective.
Korea has attached great importance to the peaceful use of nuclear energy as an alternative energy source in order to overcome its vulnerability of energy security due to a lack of natural energy resources. Korean efforts in nuclear development started in the late 1950s when the major field of research was radioisotope application. Since the 1970s, Korea has carried out a very ambitious nuclear power programme with successful and continuous efforts for self-reliance in nuclear technology. In order to efficiently catch-up with the conventional technology and move effectively to the innovation stage, the government established the ‘National Nuclear Long-term R&D Plan’ in 1992 extending to the year 2001. The plan was revised to the year 2006 with the establishment of the ‘National Comprehensive Plan (NCP) for promoting the development and utilization of nuclear energy.’ in 1997.

Taking notice of the role of technological innovation to the nation’s economic development in the early 2000s, the Korean nuclear R&D programs were asked to link more directly with the nuclear energy industry and national economy. Likewise, as a primary mission of the national nuclear R&D, it was increasingly emphasized to promote technological innovation and to strengthen the competitiveness of the domestic industry in view of the peaceful uses of nuclear energy. This change of the technological environment surrounding the national nuclear R&D led to the creation of the Nuclear Technology Road-Mapping (NuTRM) project in 2003. At the macro level, the object of the NuTRM is to explore the strategic products as economic goods to cope with the future needs of the nuclear energy and to enhance the global competitiveness of domestic nuclear industry, which in turn improves the contribution of the nuclear investment to the nation’s economic growth by the year 2030.

This paper represents the procedure of the macro-NuTRM as follows: Forecasting the strategic technological environment of nuclear energy in the future society; Identifying future needs and technological requirements of the nuclear energy system; Searching for a national vision with a long-term direction and the policy goals of nuclear energy development for the year 2030; Finally, extracting the strategic products to meet the vision.

2. Evolution of the technological learning for the nuclear power industry in Korea

Technological learning for nuclear power development, with particular respect to a PWR, has been cumulatively performed. In the beginning, three units, Kori-1&2 and Wolsong 1, were constructed based on a turnkey contract with the foreign companies as prime contractors. Due to the lack of domestic technological capabilities, these units were entirely reliant upon foreign contractors for the whole range of plant constructions. The involvement of domestic industries as subcontractors was limited to the civil and architectural work for the service facilities. Major goals for technology learning in this period were to find the items available to be localised and to imitate the foreign suppliers.

Kori-3&4, Yonggwang 1&2 and Ulchin 1&2 units were constructed based on the component basis contract with foreign contractors. In this period, a domestic utility, KEPCO carried out the project management with the assistance of foreign Architect/Engineering (A/E) companies. Foreign companies supplied the primary system of the plant by the component approach. Domestic firms expanded their roles in the engineering and equipment supply areas.

In 1985, Korean government adopted the so-called national self-reliance policy which began to be applied to the implementation of the Yonggwang 3 & 4 projects.
With the support of a technology license from the foreign subcontractors, a domestic industrial firm, Hanjung, became the prime contractor under KEPCO's responsibility for the total project management. KAERI was responsible for absorbing the foreign technology of the NSSS system design and engineering. Combustion Engineering (CE) was selected to supply the NSSS hardware and nuclear fuel as a subcontractor.

In May 1992, the construction of the first KSNPs (Korean Standard Nuclear Power Plant), Ulchin units 3 and 4, commenced and most of the technologies for this conventional NPP were achieved with an overall self-reliance level of 95 % by the end of 1995. Since the Ulchin 3&4 units with Korea's indigenous design and construction, Korean organisations took overall responsibility in all aspects of the NPP project while the role of the foreign suppliers was reduced to mainly consulting.

As of December 2003, a total of 18 nuclear power units consisting of 14 PWRs and 4 CANDUs are in commercial operation. Two units are under construction. Eight units are to be constructed by 2015. Accounting for 29.0 % of the nation's electric power capacity, 15.7 GWe of the nuclear power plants produced 119 TWh of electricity which represented 38.9 % of Korea's power generation in 2002. Korea also has a high availability ratio for its nuclear units which were 90.4% in 2000, and 93.2% in 2001.

(Table 1). Nuclear Power Plants in Operation and under Construction in Korea

<table>
<thead>
<tr>
<th>No</th>
<th>Plant Name</th>
<th>Type</th>
<th>Gross Capacity (MWe)</th>
<th>Reactor Supplier</th>
<th>Commercial Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kori 1</td>
<td>PWR</td>
<td>587</td>
<td>WH</td>
<td>1978</td>
</tr>
<tr>
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<td>Kori 2</td>
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<td>650</td>
<td>WH</td>
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<td>3</td>
<td>Wolsung 1</td>
<td>PHWR</td>
<td>679</td>
<td>AECL</td>
<td>1983</td>
</tr>
<tr>
<td>4</td>
<td>Kori 3</td>
<td>PWR</td>
<td>950</td>
<td>WH</td>
<td>1985</td>
</tr>
<tr>
<td>5</td>
<td>Kori 4</td>
<td>PWR</td>
<td>950</td>
<td>WH</td>
<td>1986</td>
</tr>
<tr>
<td>6</td>
<td>Yonggwang 1</td>
<td>PWR</td>
<td>950</td>
<td>WH</td>
<td>1986</td>
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<tr>
<td>7</td>
<td>Yonggwang 2</td>
<td>PWR</td>
<td>950</td>
<td>WH</td>
<td>1986</td>
</tr>
<tr>
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<td>PWR</td>
<td>950</td>
<td>Framatome</td>
<td>1988</td>
</tr>
<tr>
<td>9</td>
<td>Ulchin 2</td>
<td>PWR</td>
<td>950</td>
<td>Framatome</td>
<td>1989</td>
</tr>
<tr>
<td>10</td>
<td>Yonggwang 3</td>
<td>PWR</td>
<td>1,000</td>
<td>Hanjung/KAERI/CE</td>
<td>1995</td>
</tr>
<tr>
<td>11</td>
<td>Yonggwang 4</td>
<td>PWR</td>
<td>1,000</td>
<td>Hanjung/KAERI/CE</td>
<td>1996</td>
</tr>
<tr>
<td>12</td>
<td>Wolsong 2</td>
<td>PHWR</td>
<td>700</td>
<td>AECL/Hanjung/KAERI</td>
<td>1997</td>
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<tr>
<td>13</td>
<td>Wolsong 3</td>
<td>PHWR</td>
<td>700</td>
<td>AECL/Hanjung/KAERI</td>
<td>1998</td>
</tr>
<tr>
<td>14</td>
<td>Wolsong 4</td>
<td>PHWR</td>
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<td>AECL/Hanjung/KAERI</td>
<td>1999</td>
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<td>PWR</td>
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<td>Hanjung/KAERI/CE</td>
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<td>16</td>
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<td>PWR</td>
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<td>1999</td>
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<td>17</td>
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<td>Hanjung/KAERI/CE</td>
<td>2001</td>
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<td>18</td>
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<td>PWR</td>
<td>1,000</td>
<td>Hanjung/KAERI/CE</td>
<td>2002</td>
</tr>
<tr>
<td>19</td>
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<td>PWR</td>
<td>1,000</td>
<td>Hanjung/KAERI/CE</td>
<td>(2004)²</td>
</tr>
<tr>
<td>20</td>
<td>Ulchin 6</td>
<td>PWR</td>
<td>1,000</td>
<td>Hanjung/KAERI/CE</td>
<td>(2005)³</td>
</tr>
</tbody>
</table>


³ These plants are currently under construction.
3. Template of the macro-NuTRM in Korea

In developing a nuclear technology road-mapping (NuTRM), at first, this paper assembled some relevant techniques concerned with the strategic management of technological innovations and designed the procedure to illuminate the dynamic relationship between the socio-economic demands and the relevant technological supplies. The resultant template of the macro-NuTRM is as follows:

I. Name of the vision discipline (commercial NPP)

I-1. Definition of technological and industrial characteristics

The system architecture of the vision technology (e.g., commercial NPP) is explained including the socio-economic uses and the market. Here it is also required to identify the unique features of the technological system which are likely to impact upon the R&D and industrial activities in the course of the technological development and diffusion including the following; Common characteristics involve technical complexity, technical novelty and science intensity. Technology-specific characteristics, in the case of a nuclear power plant are examined by the safety, radioactivity and proliferation risk. Vision (e.g., commercial NPP) industry in which technological goods are used and/or transacted is defined with its scope. Industrial and economic characteristics are also examined including the determinants of industrial competitiveness.

I-2. Future scenario of sub-vision (commercial NPP) development and diffusion

This section examines the influential factors such as political, economic, social, technical and ecological aspects which lead the present (the year 2003) and which are expected to lead the future society until the target year (the year 2030 in case of NuTRM), at home and abroad, respectively. Then it investigates how these factors have impacted on the development and the diffusion of the vision (e.g., commercial NPP) technology up to the present and forecasts how they are likely to influence the changes in technology supply and the market demand in the future society. Finally, the most likely scenario is forecasted with a major breakthrough of technology development and diffusion until the target year.

I-3. Analysis of the strategic environments of the vision (commercial NPP) technology

The most likely changes of the current and future competitors of the vision (e.g., commercial NPP) technology and industry are forecasted, and the way to cope with the changes is provided from a national and global sense, respectively. Based on the prospect of the change of the competition, the so-called SWOT (Strength, Weakness, Opportunity and Threat) analysis is undertaken with respect to the changes of the strategic environments of the vision (e.g., commercial NPP) technology and industry concerned. Taking into account the current and future competitors, external factors which play the role of an advantage, i.e. opportunities, and that of a disadvantage, i.e. threats, are assessed. Then the appropriate way to cope with the changes of the external environments is provided. In other words, the way to use effectively the opportunities and to reduce the threats are analysed.

With respect to the internal capabilities, based on the market and needs, in the first place, the determinants of the competitiveness in the market or demand are
identified. Then the competitive strengths and weaknesses of the vision (commercial NPP) technology/industry should be compared with its competitors. Finally an effective and efficient way should be explored to enhance the strengths and to improve the weaknesses.

I-4. Visioning (of commercial NPP)

Vision is defined as ‘the ultimate goal of the technology development until the target year.’ Therefore the title of vision should involve concisely the realization of the socio-economic value which results from the technological development and the future status of the organisation which is accompanied by the organisation’s contribution to society by the target year. The title should be followed by the establishment of the vision objectives. In order to understand the road map from R&D activities to the accomplishment of the vision, the objective is clearly identified with proxy measures to check how well the industrial product and technology contributes to the goal in terms of both the market/demand and technology/supply. These indicators are the basis to measure the efficacy, i.e. the validity of the strategic product and technology for the vision objectives. So far as technological competitiveness is concerned, the competitive position of the organisation and industry should be established in the local and global market. With regard to the objective of the technology/supply side whether or not the technology is incrementally or radically innovated, technological performance should be aimed at achieving a competitive market position. And this target position of the market and the performance of the technology should be analysed while assessing how much they are improved in comparison with those of the present time.

I-5. Exploitation of strategic products

At first, strategic products should be exploited by assessing the efficacy, i.e. validity of the strategic product for the achievement of the vision objectives in terms of both the market/demand and technology/supply. The technological concept and the requirements of the product are articulated to satisfy the efficacy. At the same time, the product should be evaluated by the effectiveness of the R&D investment, i.e. how likely it is to produce an industrial and economic value as a result of R&D activities. In doing this, it is required to forecast ‘By what time the strategic product should be industrially developed and how long the product is likely to produce a socio-economic value in a competitive manner.’ Then the return on investment (ROI) is evaluated.

After assessing the efficacy and effectiveness of the product, the efficiency in developing the product should be analysed. Based on the technological requirements of the strategic product with the target year, the efficiency is concerned with the internal capability in technical and organizational terms. At first the functional technical capabilities such as the design, manufacturing, installing or construction, commissioning and testing, etc., are evaluated to see if they will be able to cope with the technological requirements ranging from R&D, commercialisation and commercial production.

Based on the forecast of the functional technical capabilities, the efficient way for technological learning and innovation is designed in view of the national and global innovation system. Next, it is necessary to evaluate the cost of the investment including money, manpower and other infrastructure, etc., for the
development of the strategic product and to find an efficient way to secure the resources required.

4. Conclusion

Technology road-mapping is evaluated as a strategic management tool, which is expected to improve the performance of technological innovations, especially for the needs-driven technological changes under the ever-changing external environments as well as the internal conditions (Teece & Pisano, 1994; Garcia & Bray, 1997). By employing this technique for the strategic planning of future nuclear power innovations, it is very likely that it will improve the public perception regarding the socio-economic return of the nuclear energy investment by proving the systematic chains from R&D activities, through innovation and industrial performance to the eventual contribution to the development of the national and global society.

As of the end of 2003, NuTRM is still under development in Korea for the improvement of the industrial and economic effectiveness of the nuclear national R&D program which accounts for a large amount of money. From the point of view of the strategic management of the national R&D activities, the macro-NuTRM is to explore the strategic products as economic goods to cope with the future needs of the nuclear energy and to enhance the global competitiveness of the domestic nuclear industry. As a result, it is eventually expected to improve the contribution of the nuclear investment to the nation's economic growth by the year 2030. To this end, it is important to understand the efficacy and effectiveness as well as efficiency with regard to managing the national nuclear R&D performance.

After NuTRM is completed in June 2004, the way to implement NuTRM successfully will be prepared. In doing this, the existing R&D projects under the NCP (Nation Comprehensive Plan) will be reorganized in needs-driven terms with the development of the appropriate performance measures.

References

DO WE NEED NEW REACTOR TYPES FOR PUBLIC ACCEPTANCE OR NEW NPPs?

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Framatome ANP GmbH
Germany

Summary

As the installed fleet of nuclear power plants in Western Europe and North America is getting older, the future of nuclear energy will depend on a timely revival of new plant construction. For this to happen, competitiveness in a liberalized electricity market is, by itself, not enough: the second condition sine qua non is public acceptance for which the question of safety is one of the key factors (another being waste management). Some people believe that public acceptance for new NPPs can be won only by switching to new reactor types like those being considered under the “Generation IV” program and which are often labelled as “risk-free” or “inherently safe”. Others demand that the safety systems and their physical principles must be so simple that every layman can understand them. The paper will discuss why this is not a way to secure the future of nuclear energy and how Public Relations of the nuclear industry should handle the topic of nuclear safety.

Background

For base-load electricity generation in large units, water-cooled reactors, especially light water reactors, are well-established technology and are subject to continuous improvement. Know-how accumulated within industry and science, expert organizations and licensing authorities are a reliable basis for the future. Nuclear technology also offers additional potential, particularly for new fields of application of nuclear energy, outside base-load electricity generation. This potential is being studied in the framework of “Generation IV International Forum” (GIF) and INPRO. The aim is to have one or more new reactor types (“Generation IV reactors”) available for commercial deployment around 2030. Before 2010, construction of new NPPs will return to the agenda. In the absence of new types ready at this date, the market belongs to water-cooled reactors, in particular light water reactors. In preparation, vendors propose advanced designs (“Generation III reactors”) to meet economic needs and to attain higher acceptance due to further increased safety.

Winning public acceptance

TVO has won public acceptance for the Finland 5 project by showing the benefits from the plant for the general public in terms of satisfying growing electricity demand at low and predictable cost, reducing dependence from imported energy, and combating climate change. Safety was no major topic; the government left the choice of the reactor type (PWR, BWR, or VVER) to TVO. Both communities of the two
existing NPP sites competed for the new unit. This shows that public acceptance can be won with today’s reactor types provided there is a need for a new plant. The Finnish case also indicates the fundamental role of waste management for public acceptance: Finland has chosen the location for the final repository for high-level waste shortly before deciding on the fifth plant.

LWRs should not be abandoned for new and as yet not available reactor types:

- No new reactor line is ready for near-term construction. The market is coming back, and
- Advanced PWR and BWR models can meet the latest safety requirements, including postulated core-melt accidents. Additionally, switching to a new reactor type would only undermine the public trust in the existing reactor models.
- The popularity bonus of a futuristic concept in the media and the public is gone as soon as it leaves the drawing board, as experienced in Germany with the modular pebble-bed HTR.

The safety issue in public acceptance cannot be successfully addressed by technology alone, because zero-risk technology is not possible. Our task is to convince the public that new plants to be decided upon are in the common interest of society and justify the residual risk. We do not need new designs in which the safety concept is so simple that it can be explained to everybody. What counts is that safety authorities are satisfied by the safety and that the safety authorities enjoy credibility within the public.

Finally, the nuclear industry should play a more active role in the public, explaining the contribution of nuclear energy for sustainable development.
IN THE QUEST FOR NUCLEAR-FRIENDLY MEDIA
(POLISH CASE)

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Summary

In Poland 95% of electric energy is produced by coal combustion, but electricity consumption per capita is one of the lowest in Europe.

Poland is a non-nuclear country, although the possibility of building some nuclear power plants in the future is not excluded. The majority of Poles are afraid of the atom, mostly because of the Chernobyl accident. Only one in three Poles approves of nuclear power plant construction and nearly half is against it.

Two years ago a serious radiation accident occurred in Bialystok Oncology Center. One of five overexposed patients recently died. The cause of death is not yet clear: was it the overexposure or the cancer. The reaction of Polish press was very emotional, with headlines as “Worse than the impact of Chernobyl” and “As in the Chernobyl”. Media seek all possible sensations. Recently one of the tabloids wrote about “the contamination concealed by the authorities” in the context of well known increased radon concentration in one of Polish mountain region.

Such is the panorama of nuclear issues in Poland and in Polish media.

In this situation - how to influence the media? In what way the nuclear debates may be made more “rational” rather than “emotional”?

This contribution gives many examples of the initiatives and actions undertaken in Poland to familiarize the public and the media with nuclear issues. Although no evidence for a significant change in public attitudes was yet observed, one can show that - especially in Polish media - nuclear debates become quieter and more rational. Rational arguments begin to break through, despite the battle for readers, despite the pursuit of sensation, despite the “blood and tears” reporting.
Long-time cooperation of the nuclear community with the media (e.g. inviting media representatives to scientific conferences, conducting press briefings, organizing the visits in nuclear power plants and nuclear centers, permanent readiness to answer various questions, access to appropriate materials, commenting the events, initiating and creating situations and events attractive to the media: Science Festival, Radio Picnic, Physics on the Stage, etc.) brought about a significant change in the attitude of many journalists and in the overall tone of their publications.

This contribution shows a number of examples of a positive media attitude toward the nuclear issues. This change in media attitude results not only from the cooperation offered by pro-nuclear community, but also from the very condition of the nuclear industry. Recent signals from the USA, France, Finland and Czech Republic indicate a growing belief in the oncoming nuclear industry revival. Thus one may hope for a positive media reaction also (or perhaps first of all) in the countries with no nuclear power program.
MASS MEDIA COMMUNICATION

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Moscow Scientific and Industrial Association «Radon» carries out work on collection, transportation, decontamination and disposing radioactive waste. It controls Moscow, Moscow Region as well as the nearest bordering regions.

«Radon» began working in 1961. For a long period of time – till the late 1980s – its activity had been kept in secret. The first information on the «Radon»’s activity appeared in the central press on March 21, 1986 in «Pravda». But the article didn’t point on the place, where the enterprise was situated. The authors were allowed just to name the Moscow Region.

The residents of Sergiev Posad of course knew that the enterprise was situated in 25 km from the town in the forest area of Moscow region. But local Press hardly dared to turn to such a risky topic.

Only in 1989 the first article was published in the main local newspaper «Vpered». During that year leading specialists of enterprise: Sergei Dmitriev, Alexander Barinov, Euvgeniy Timofeev and others prepared a number of publications.

At the same period the information on the «Radon»’s activity appeared in central Press. Part of the materials was positive or neutral. But there were also publications, which contained wrong and sometimes absurd information.


We often had to face incompetent approach of Mass Media to the question of «Radon». But the enterprise was not an exception among of other plants with potentially dangerous technology.

It was the early 1990s, when Russian Mass Media changed. The basic feature of TV and Press of the USSR was careful approach to the facts, but new so-called «independent» Press more and more concentrated on finding sensational materials.

News editors preferred to inform on catastrophes, floods, fires, blows, murders, mafia and radiation and nuclear accidents.
Many new editions and TV channels appeared, some could be considered «Yellow» Press.

At the same time Russian Mass Media paid more attention to ecology, but often overcame professional ethic borders. Nuclear industry became the favourite target of those, who work in «sensational journalism».

But the «Radon»’s specialists continued communicating to Mass Media. It took much effort to make this communication efficient. Soon the strategy of Mass Media Communication was worked out. The directors of «Radon» did their best to help the journalists.

Mass media representatives regularly visit «Radon» since 1989. The leading specialists of enterprise found time for detailed conversation with journalists. It is necessary because some correspondents have no deep knowledge in the sphere of radiation and radwaste treatment. After such conversations the journalists have an excursion to the facilities to see the plant and the special transport in action and to be sure the system is under reliable control.

Such approach had certain results. We can see that those journalists, who visited «Radon», made less mistakes than those who never came to the plant, but prepared publications on its activity. Theirs negative opinion of «Radon» changed for the better. We managed understanding, to improve the terminology, to light up the problems professionally. Press and Television representatives visit «Radon» and develop the topic in their articles.

Besides Russian journalists the representatives of foreign Mass Media began to visit «Radon» in the middle 1990s. BBC, Associated Press, Reuters agency, Asahi, El Mundo, TV of Germany, France, Finland, Norway, Radio of Berlin are among them.

Moreover, the Radon’s specialists themselves prepared articles and reports for publication in the central and regional Press.

We considered the sad experience of disproving attempts and decided to prevent negative publications by giving real information on the enterprise’s activity. In PR business such approach is called «The principle preventive information». Such principle proved to have effective influence on communication to Mass Media in Moscow and Moscow Region. That was the region where a number of legislator nominees agitated to close the plant.

Negative opinion of «Radon» among native people was caused by lack of information on its activity and superficial knowledge in the sphere of radiation (many people considered that any level of radiation is dangerous, no matter was not it higher than the background level).

To clear up the situation a series of articles was published in the local paper «Vpered» in 1993. These articles, being edited once a month during the year, explained the basic concepts of radio-ecology, natural radiation level, limits and doses, the system of radiation monitoring, methods of localization of RAW, etc. Each
article cited data of radiation level in the region monitored by «Radon».

Such activity allowed reducing the radiophobia level and change people’s opinion of «Radon». Later the Radon’s officials continued to provide the people with transparent information.

Such strategy was of benefit for the enterprise. By the middle of 1990s all the main editions had received reliable information. During the negotiations the agreement to consult the Radon’s specialists before publishing article was concluded. This practice is traditional nowadays. Besides PR officials of «Radon» are on friendly terms with many journalists.

It allowed the enterprise surviving the 3 main crises in public relations.

The first crisis happened during the first democratic elections in late 1980s – early 1990s. Nominees to different authority branches tried to gain popularity by speculating on the problems of ecology. Some of them promised their voters to close «Radon».

But the appearance of different information on Radon’s activity in Russian press helped us very much. First of all we made publications on technology, but also the articles on culture, art, education, social life were published. By the 40th anniversary of «Radon» a series of articles about the best people of enterprise (workers, drivers, technologists, directors) was published.

The aim of the project was to make average citizens consider «Radon» not an extraordinary and more than dangerous enterprise, but a common plant with complicated but controllable technology; to show that its collaborators are not mythical villains but the people which have interesting and respectable job, just like any of their neighbors.

Such approach helped surviving the second crisis, which burst out in the middle of 1990s because of Military Ministry to place the American plant processing extratoxic component of rocket fuel – heptyl – in neighbor settlement Remmash. It’s natural that local ecologists made a resolute protest. The «Green» couldn’t miss the opportunity to attack «Radon» again. But the support of local authorities and regional press helped repel the attack.

The third was in the XXI century. It was caused by debating and passing the bill connected with the importation of spent nuclear fuel in Russia. Many citizens supposed that the fuel would be placed in «Radon». «Yellow» press only poured oil on the flame informing about the disposing the fuel in the repository near Sergiev Posad. Letters of angry residents were delivered to the editions of local papers. So we had to clear up the situation and stop the panic by publishing a series of articles with the last one under the headline «Nuclear fuel waste won’t be placed in «Radon» («Vpered», Feb. 20, 2001).

Nowadays «Radon»’s specialists communicate to Mass Media using experience being gained for many years. Of course, there can be mistakes caused by the lack of understanding, but the main trend is the following: to communicate to the society regularly and to inform the people about our work.
MEDIA RELATIONS: BRIDGING THE AWARENESS GAP

JOSEPH FITCHETT
World Nuclear Association

Summary

At major news organizations, the gatekeepers -- the star reporters, columnists and TV producers who frame the daily output -- shy from suggestions of nuclear energy as “good news.” The reasons for this resistance no longer stem so much from any alignment between journalists and ideologically anti-nuclear groups. Nowadays, newsrooms have a structural problem with energy stories, particularly concerning nuclear power, because these gatekeepers are generalists who know, at best, that they don’t know much about nuclear questions. They may be the best in the business, but they have a professional insecurity that breeds a journalistic reflex to err on the side of the conventional wisdom when it comes to nuclear energy. As a result, coverage is timid, less because of prejudice than out of ignorance. Indeed, I can think of no other major subject that gets so much media coverage with so little real knowledge.

Of course, crass mistakes are still caught by best-practice journalism. But the overall effect of this insecurity is timidity about nuclear energy in news judgment – about what stories to assign, how much play to give them. Since energy is generally considered to be “unsexy” outside crises, wrong mental assumptions persist, usually unconsciously. If you could read journalists’ minds, you would regularly find the notion that power reactors are basically atom bombs that are being burned slowly and carefully, so that they make electricity instead of exploding. With this unexamined image in their heads, many journalists never shake their mistaken instinct that nuclear energy is unnatural and therefore defies human management. This false image – of reactors as bombs – nurtures media’s kneejerk readiness to amplify alarmist notions about nuclear power plants feeding proliferation and terrorists.

Theoretically, the media’s poor performance on nuclear energy should be self-correcting. It isn’t, mainly because mainstream media doesn’t develop energy specialists with confidence in their knowledge and judgment. This basic media shortage is easy to explain. Energy is just too difficult a subject. It involves three overlapping fields, each difficult – science, economics and political sense. A mainstream journalist who masters any one of these three fields ends up moving on to specialize in a popular aspect such as covering new consumer technologies, or business and the stock-market, or politics in national capitals.

My talk will then explore the impact of this lack of expertise on media attitudes. I will conclude by suggesting ways to promote greater receptivity.
INTRODUCTION

SANTIAGO SAN ANTONIO
Spanish Nuclear Forum

In Spain there are nine nuclear power plants and these plants produced in year 2003 one fourth of the total electricity in the country. The electricity market is fully liberalized as regard to the option of the utilities for building or not new generating plants, and to choose the technology. In this sense there is not any kind of moratoria for the construction of new nuclear power plants since 1998.

Public opinion is not all in favour of nuclear plants. Communication at national level is a big issue in the country reason why the nuclear sector established a so-called Nuclear Communication Committee where utilities, plants and related organizations are represented. The aim of this Committee is to coordinate the public relations activities at local (nuclear sites) and national level.

One of the main issues in the recent times has been the possible location of ITER in Spain and specifically in the Community of Catalonia. Nuclear fusion was in the headlines of newspapers, radio and TV with the support of the full country, including local and national politicians, among them the President of the National Government. This support has not been found lately for nuclear fission.
Highlights presentation:

1.- Spanish power sector:
   - Who is who in the sector: main players
   - Power assets
   - Generation -Transport-Distribution

2.- Current energy issues in Spain:
   - Power sector liberalization process
   - The importance of the increase in demand
   - Investments plans
   - New tariff's methodology
   - The energy efficiency

3.- Power sector and the nuclear issue:
   - Importance of the nuclear power generation for power companies
   - Regulatory aspects
   - Security measures and commitments
   - Future outlook
In Spain we have 9 nuclear power plants in 7 sites with a percentage of 14 % of the total power installed (7,871 eMW). The electrical production is approximately 26 % of total Spanish consumption. We will talk about the good operating experience of our NPP’s versus society’s perception.

In Spain, nuclear power plants are an important contribution to the grid's stability, as they are always on the grid, (18 and 24 months between refuelling outages), and have a high Load Factor. There are no significant operational transients. Instead of considering these results and our efforts to convince the public, society has the stigma of the nuclear military use, maintaining the concept of danger.

In order to improve nuclear safety and the concept of safety for the public, the NPP’s, through their respective communications managers and in agreement with a “Foro Nuclear” Spanish organisation, work constantly and strongly analysing the Communications Media treatment, and focusing their work on different activities: National, local, society, economy, media. Educational courses for college teachers and journalists, etc are given.

The NPP’s have included, in their Mission & Vision, a voluntary submission to external independent assessments performed by prestigious organisations as a manner of continuous improvement. These assessments include a “Wano Peer Review”, “OSART” “ ISO-9000 Spanish Quality Certification, etc. This high level of quality permits our nuclear electrical power generation to transmit such contrasted confidence to the society.

With reference to the impact of September 11th, prior to that date all Spanish NPP’s had a visitors program including a short walk-down through our installations, with the idea to offer the public a close up view of our plants. Currently, we only receive these visitors in a visitor’s centre outside the security double fence.

José Cabrera NPP actual situation. Construction began in July 1965. The first kilowatt-hours of electricity produced by nuclear means were injected into the Spanish national grid on 14th July 1968. On 14th October 2002, the Ministry of Economy, following a favourable report from the Nuclear Safety Council, granted the last operating license until the 30th April 2006. Until that date, Zorita NPP would have been in operation for 38 years, instead of the 40 years requested in its demand of year 2001. Also, even it was not decisive for the decision, on 25th April 2002, six Greenpeace activists climb up the dome at the Zorita nuclear power plant containment building.
NUCLEAR FUEL ACTIVITIES IN SPAIN

ANA DÁVILA
Enusa Industrias Avanzadas
Madrid, Spain

Because of the special characteristics of the sector in which the company conducts its business, where the most demanding process quality, safety and control requirements prevail, ENUSA is one of the leading companies in the world both in items of reliability and quality of its final product and its ongoing attention to worker training.

Activities developed in Spain related to the nuclear fuel cycle:

Management of enriched uranium procurement for Spanish Nuclear Power Plants: To obtain the enriched uranium it supplies to the Spanish Nuclear power plants, Enusa engages different European and North American sources to perform the conversion and enrichment operations. This is done by Enusa on a diversified basis in order to ensure the highest quality and best market price at all times.

Engineering and manufacturing of PWR and BWR fuel assemblies: Fuel Assembly Engineering and Manufacturing is performed by Enusa through the license agreements signed with Westinghouse for Pressurized Water Reactors (PWR) and with GNF (General Electric) for boiling Water Reactors (BWR). With these agreements and its technological development programs, Enusa is able to offer to its customers the most reliable, advanced products and services. The fuel assemblies are manufactured by Enusa in its factory in Juzbado (Salamanca). Its production capacity is equivalent to 300 tons of enriched uranium, and it is equipped with four assembly lines – two for PWR products, one for BWR products and one for gadolinium rod production.

The mine closing down: On the 1st of January, 2001, production activity at the mining centre in Saelices-Ciudad Rodrigo (Salamanca) came to an end, and work on closing down and restoring its facilities began. This measure was adopted as a consequence of exhaustion, at present market prices, of the economically recoverable mining resources.

The factory running: The Juzbado fuel elements factory went into operation in 1985 and at present has annual fuel element production capacity equivalent to 300 tonnes of enriched uranium oxide. It has four production lines, three for PWR- and BWR-type products, and the fourth for the manufacture of gadolinium oxide rods. The base material with which the first three of these work is enriched uranium dioxide, from a number of foreign suppliers. After a long manipulation process, pellets are produced, and these are placed in metal rods, which in turn are assembled into bundles, which comprise the fuel elements supplied to the client. All these industrial operations are carried out to rigorous specifications and complying with strict quality control requirements. The gadolinium oxide line, which went into operation in 1995, has manufacturing capacity of 14,000 rods p/a, equivalent to 40 tonnes of enriched uranium oxide.
**Diversification:** In 1994, ENUSA decided to engage in a process of diversification, and enter other fields related to its traditional industrial activity at ENUSA:

**Environmental management service provision:** Created as a part of Enusa, *ENUSA-MEDIOAMBIENTE* combines all the material resources, qualified personnel and technical experience gained over 27 years of activity in the areas of mining, mineral processing and associated engineering. *ENUSA-MEDIOAMBIENTE* is thus qualified to undertake all kinds of environmental projects involving land reclamation and integration into the landscape. Since 2001, this activity has been complemented by services provided by *TECONMA, S.A.*, which is 60% owned by *ENUSA Industrias Avanzadas* and specializing in the reclamation and integration of land affected by civil engineering works. And since 2003 it holds a majority share in the capital of *EMGRISA*, a company focusing on waste management and reclamation of contaminated soil, among other activities.

**Special materials logistics:** EXPRESS TRUCK, S.A. (ETSA) develops logistics activities of special materials, mainly nuclear and radioactive ones, explosives and hazardous waste.

**Sterilisation and hygienisation of products:** This activity is carried out by the ENUSA subsidiary *IONMED ESTERILIZACIÓN S.A.*, engaged in the industrial activity of sterilisation and hygienisation of different products, using the technology of accelerated electron ionisation.

**Innovation for nuclear medicine:** This area of activity is carried out by MOLYPHARMA, S.A. which is an innovative business project providing industrial capacity to nuclear medicine in Spain, something which had previously not existed.

**Advanced ceramics:** This activity is carried out by the ENUSA subsidiary, SHS CERAMICAS, S.A. which works on the production of raw materials essential for the manufacture of advanced ceramics, using production techniques which are innovative in the world on an industrial scale.
NUCLEAR WASTE

JORGE LANG LENTON
ENRESA
Madrid, Spain

In general terms it may be stated that, despite awareness of the difficulties existing as regards the achievement of certain of the objectives mapped out, fundamentally in areas relating to spent fuel and high level wastes (HLW), Spain possesses a significant infrastructure for the safe and efficient management of radioactive wastes, from the administrative, technical and economic-financial points of view.

From the administrative stand-point, there is an organisation, based on relatively far-reaching and developed legislative framework in keeping with the evolution of international regulatory requirements, that suitably contemplates and brings together the main responsibilities of the different parties involved in the process: the Government through the Ministry of Economy responsible for defining policies and awarding the corresponding permits and licenses; the Nuclear Safety Council (CSN), as the sole party responsible for nuclear safety and radiological protection, that reports to Parliament; ENRESA as the company responsible for radioactive waste management, and the waste producers, among which special mention may be made of 7 nuclear power plants (NPP’s) with 9 reactors, the Juzbado Fuel Manufacturing Facility and some 1,300 authorised radioactive installations (RI’s).

From the technical standpoint the strategies and actions to be implemented in the different areas relating to radioactive wastes are included in the General Radioactive Waste Management Plan revised annually by ENRESA and, where appropriate, approved by the Government through the Cabinet.

From the economic-financial point of view, there is a system that guarantees the financing of radioactive waste management costs, based on the principle of generating funds up front, throughout the operating lifetime of the NPP’s. These are collected by way of a fee, consisting of a percentage of total electricity billing.

Consequently, there is a consolidated system in place that has made it possible for Spain to develop an important capacity in waste management, with deployment of the necessary resources.

However it should be pointed out that, in view of the obvious sensitivity of society to matters relating to radioactivity, based among other things on a lack of public understanding of the true nature of the technical solutions proposed, it is necessary to carry out the widest possible information/educational campaigns, in order to facilitate better knowledge and understanding both of the problem to be solved and the technology to be implemented for the HLW management.

The drawing up of specific communication plants for each of the foreseen activities, such as the one developed for the Vandellos I NPP dismantling project, contributes
to a better understanding of the need for and suitability of the technical actions
proposed among the sectors of the populations living closest to the affected sites.

The fundamental goal is to improve the knowledge of the Spanish society towards
the work that needs to be done with regards to the radioactive waste management,
showing with openness and transparency which is the assurance and the control
offered by ENRESA.

The communication effort has seven major lines of action:

The media work, ENRESA Foundation, education, visitors centres and exhibitions in
Science Museums, audiovisuals and edited material, web site, local actions.

As main local actions, the following can be cited:

- Media seminars. Media information sessions.
- Information committees.
- Foundation agreements.
- University courses.
- Courses to school teachers.
- Courses for local stakeholders.
- Visits to the facilities in Spain.
- Press interviews with opinion leaders.
- Visits to foreign facilities.
- Meeting with local, provincial and regional authorities.
- Use of local labour.
- Decisions-making in the local sphere.
In Spain, as well as in other countries, there is a serious credibility problem on the part of the society toward the regulatory body, motivated by different aspects of the economic life, politic interests and other environments, in addition to a considerable lag on public information and transparency matters in the part of the regulator as in the companies of the nuclear sector. It is certain also that they have been undertaken initiatives that, even though they are not having an immediate effect because movements of the public opinion are always slow, it is generating a new panorama in public information matter in a new stage that the Spanish nuclear sector will start in the next years.

The information policy of the CSN is centered in the attention to the citizen, locating the problems on the energetic future and the preferences of the different political and social organizations to other discussion forums. It is intended to avoid that no rigorous arguments about nuclear safety and radiological protection are used as negotiation tools in energetic discussions, and to center the informative interest in objective information on the priority of the regulatory body: safety. These intentions are developed in a constant information strategy and training as well the nuclear environment as the informers, to reduce the distance between the real state of the safety in the nuclear power plants and the public perception of about it.

It is considered necessary to approach, on the other hand, within this renovation of the informative strategies, new problems that they have appeared in the last years, such as the application of the new security measures from September 11th, the appropriateness of the renovations of the regulation and laws to the speed of the advances of the technology, and the flexibility that requires to approach it the daily or sporadic events within a planning with a farther horizon.
The poster shows the Czech Nuclear Society (CNS) web page which was started in March 2003. The web page has been visited by thousands of people not only in the Czech Republic (news in Czech and English is available). More than 300 people visited the web page during the first ten months. This kind of communication appears to be a strong tool for public information because the visit rate shows that more than 60% of visitors are people other than nuclear professionals (students, journalists, greens etc.). The CNS web page brings fresh news from nuclear field every day. It was created also to enable CNS members to provide information about the activities of the society.
Korea Institute of Nuclear Safety (KINS) is the regulatory expert organization that technically supports the government in the area of nuclear energy. KINS surveyed public opinion on nuclear safety and regulations several times in order to generate basic information for the build-up of nuclear safety policies, safety policies and public relations strategies. The surveys were conducted through Gallup Korea, a specialized research company.

The survey's main contents are as follows:
- General understanding of nuclear energy
- Opinions on environmental radioactivity
- Opinions about accidents at nuclear power plants
- Perception of the regulatory body
- Opinions about nuclear safety index

The surveys provided KINS with many important findings, and I will present the main findings of the surveys at the poster session.
ARAO is the Slovenian government institution responsible for the management of radioactive waste. The main activities of ARAO are: providing the conditions and implementing the necessary projects for the final disposal of LILW, performing the public service for the management of LILW from small producers and informing the public on waste management and its current activities.

For the quality management of these activities, ARAO needed to have a survey done on Slovenian public opinion. Therefore, ARAO started regular public opinion surveys in 1995. Abstracts from these yearly surveys have provided ARAO with a review of current information and opinion (social and political) on the nuclear issue and its changes over the years. Through gathered data, ARAO prepares, performs and supervises and adjusts its communications activities, as its work largely depends on the goodwill and the preparedness of societal and political audiences to accept its proposals and solutions.

Some of the questions in the survey change slightly over the years, but most remain the same all the time. The questions reflect changes in trends in public opinion through the years. Public opinion surveys are performed among the general public and also among environmentalists, journalists and people in the political field. Each year, the number of those surveyed is more or less the same, i.e. around 700 members of the general public, 70 politicians, 20 environmentalists and about 50 journalists. Although this is not such a large sample, it is possible to perceive the trends in public opinion. This PIME contribution presents results of public opinion surveys which are aimed at perceiving trends in public opinion and changes through the years. The survey are also aimed at finding out which were the most influential factors contributing to changes in public opinion.
In this study, 1) the formation process for public opinion on nuclear energy, in a society with a unique nuclear energy climate, is defined as being composed of cognition, exchange and propagation by the social constituents of information obtained via the mass media etc., from government, businesses and communities; 2) a multi-agent model (artificial society model) is formulated for the process in which macroscopic acceptance of nuclear energy is formed with nuclear energy information cognized by each individual's acceptance of nuclear energy; 3) numerical simulation was performed to study the characteristics of public opinion formation on nuclear energy, cognitive psychological factors, characteristics of the media, and the influence of social climate.

In addition to the explanation about the model itself, simulation results relating to social network structure, cognitive psychological factors and the influence of media are given. So far, no examples of numerical analysis of public acceptance of nuclear energy are available. In addition, this study successfully reproduced the cognitive psychological effect pointed out by P. Slovic et al. A numerical model like the one used in this study, which simultaneously deals with various effects, can put existing findings into perspective and is effective in explaining the meaning and effect in easy-to-understand terms. Especially, in a multi-agent model it is easy to introduce the versatility of agents, social structure, and various interactions between agents, and one can analyze quantitatively the influences of each factor. Such an approach is effective in "systematically understanding" the formation mechanism of public opinion on nuclear energy and its characteristics.
The OECD Nuclear Energy Agency (NEA) has a wide-ranging publications and information programme designed to inform technical specialists and interested generalists alike. It prints roughly 70 titles a year and is currently providing over 2400 reports free of charge on its website at www.nea.fr.

One of its latest publication endeavours, which aims to provide authoritative and factual replies to the major questions the public and policy makers are asking about nuclear energy, is called Nuclear Energy Today.

Journalists, policy researchers and the nuclear community at large will be particularly interested in the Agency’s well-stocked website. They are especially encouraged to visit “Policy-oriented papers” in the publications section and the “Press kits” in the press room.

The Agency’s scientific and technical publications are at the forefront of knowledge, representing the international state of the art, and are known for their in-depth analyses. The full NEA Catalogue of Publications is updated daily at www.nea.fr.

The Agency seeks to provide an excellent source of third-party information. We are very interested in obtaining your feedback and learning what specific information needs “PIMERs” have.
WWW RESOURCES ON NUCLEAR: ADAPTING TO RUSSIAN AUDIENCE

MIKHAIL POZDEEV
"ATOMINFORM" of Minatom of Russia
Moscow, Russia

The websites of the IAEA, ENS, WNA and many other nuclear organizations use English as a main language. The Russian nuclear experts and other Web visitors from Russia, who are also interested in nuclear, face a very serious obstacle when visiting nuclear websites – language barrier. Only 20% or so of Russians understand English enough to visit English-language websites and find very useful nuclear data for their work, studies and learning about nuclear. The problem is huge. The volume of www.minatom.ru (the website of Minatom of Russia) has been rather modest for the past two years, but the situation has changed and now it's being converted into an Internet Portal, which will comprise 10 websites. These sites will provide enough space for placing Russian versions of data provided by major international nuclear websites: www.iaea.org, www.world-nuclear.org, www.euronuclear.org, and others. One of Minatom’s websites will be devoted to nuclear education and will have in place a Russian version of www.world-nuclear-university.org (the website of the World Nuclear University). Minatom’s Internet Portal will open the door to the world of nuclear knowledge and expertise for the Russian audience.
Established in August 2001, the Immobilisation Science Laboratory (ISL) has developed research projects in the immobilisation of radioactive wastes through the use of vitrification, cement and ceramics. Working closely with BNFL to identify and immobilise waste systems, the ISL intends to build further collaborations through the United Kingdom's radioactive waste immobilisation network, RWIN.
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