

## A NEW MILLENIUM, A NEW DESIRE: THE NUCLEAR DREAM OF THE YOUNG GENERATION

"Y-Notes" sessions were held each evening following the formal sessions to give participants a unique opportunity for international discussions about the challenges facing the nuclear industry. A representative sample of participants drawn from multiple viewpoints met in "Y-Notes" sessions to develop a statement summarizing the common theme of the discussion following each technical session. The session summary statements, along with proposed actions to address the challenges, were presented at a final plenary session to all participants for discussion, modification, and adoption by the Congress. All statements adopted by the Congress were combined into a final report and distributed to the media and interested individuals to demonstrate the young generation's commitment to the future of nuclear technology.



["Y-note" session](#)

## FUEL CYCLE CHALLENGES

*How can the process be improved?*

In this last session of the congress there was a wide diversity of topics presented for discussion. Together with the limitations on time, this meant that the audience had very little time to respond to the majority of the presentations. The audience expressed an interest in the use of new fuel types and the new possibilities for recycling in the future. The most significant topic discussed was that of waste management, particularly, did the hesitancy on the part of the decision makers to identify and permit a permanent disposal site for High Level Waste affect the public perception of the nuclear fuel cycle? The viewpoint was that public perception and clear communication with them was, as with many nuclear issues, the key to possible success.

The discussion of the Y-Notes group focused on the fact that waste management has improved as technology has developed. This has enabled the nuclear industry to enhance its waste management strategy and to minimize waste volumes and discharges. It was felt that perhaps as the industry is now able to deal with waste in a more comprehensive manner then this progress should be reported more fully to the public in order to gain their understanding that this is an issue that is constantly evolving.

There was broad agreement that the issue required resolution as soon as possible in order to encourage confidence in the industry as a whole. The public remains to be convinced that permanent disposal of high level waste is safe and the conclusions of the Young Generation during this Y Notes session were that:

- We have an important role to play in improving the communication between the nuclear industry and the general public
- We need to encourage policy decision makers by utilizing our enthusiasm and drive within and for the industry to accelerate the decisions associated with the placing of high level waste stores to demonstrate to the public that we have an effective and safe solution available for the long term storage of high level waste
- It should also be communicated that as young people in the industry, we will see the results of our efforts as we work towards resolving people's concerns regarding nuclear waste, this demonstrates to the public that we have a real motivation in ensuring a brighter future.

These conclusions can be seen to be key to the resolution of the whole waste management issue.

## ECONOMICS

### *What economic targets must nuclear meet for the future?*

In order to make nuclear power an economically viable alternative for the future, we must continue to improve the economic metrics of nuclear power in three main categories:

- Remove barriers to new construction. Reduce the time to grid connection by standardizing the design, licensing, and construction of new facilities.
- Continue to reduce fuel cycle costs. Total fuel cycle costs make up only 25% of the total plant cost, but are easiest to impact in operating reactors.
- Quantify and solidify decommissioning costs. Until decommissioning costs are fully understood, companies will be unable to create an accurate and total economic forecast for a nuclear facility.

It was noted that the first and third categories make up over 50% of the total cost of a nuclear power plant. Thus, any action taken to decrease these components of the cost can have a large and measurable impact on the overall cost of nuclear power.

When evaluating the economics associated with nuclear power, it was quickly demonstrated that there is a large variance between countries. For example, the availability of resources within a country impact the economics as the needs for self-sustainability, security of supply, and dependable resource availability are considered. Also, each country faces a unique environmental situation and level of urgency to meet certain environmental targets. Only when these country-specific factors are considered can a complete economic picture be developed.

There were a couple of concerns raised over improvements to existing technology and the development of future technologies, and any negative impact due to an increased focus on economic sustainability. Sample improvements to existing technology include the implementation of new workflow and information management systems, but the economic merits of any such upgrades must be evaluated before pursuing a new option.

Additionally, it remains to be demonstrated where the responsibility for the development of future technologies will fall: on utility companies, service providers or governmental organizations.

In an economic world, all investments must have an expected rate of return. At this point in time, any private investment into future nuclear technologies is based on speculation.

## COMMUNICATION & PUBLIC PERCEPTION

*How can we improve public communication efforts about the benefits of nuclear power?*

### Comments

The communication and public perception sessions consisted of a number of interesting papers on different subjects, and sometimes surprising ways of presenting them. A paper from Hungary was given by a high school science teacher and his pupil in a question and answer style, and demonstrated the importance of experiment as opposed to simulation through a school project on in-house radon levels.

Some papers covered a quite new and/or unexpected subject. To most participants, the topic of improving public acceptance through memetic engineering, presented in a Canadian paper, was a completely new approach. The French approach to transparency by creating an internet site with webcams was also considered an unexpected way to say "we have nothing to hide". In the question and answer session afterwards, some members in the audience had some new information to share, especially on the Tokaimura accident. However, the most controversial and to the audience certainly most surprising presentation was given by a journalist, who created quite a stir by stating that "*journalists don't need education, communication is ok, but information is better*". She added to that the importance of trust. It should be no surprise that most audience questions were addressed to her.

Even though different cultures have to deal with slightly different types of problems in nuclear technology, the cause of the public perception problem and the approach to solve it through communication seems to be the same everywhere. The importance of clear and honest information was mentioned more than once. The Y notes session group suggests however that a new and better approach would be to use the 'tricks' of Greenpeace, without copying their style. This means making a bigger effort to be seen and heard, develop and follow a clear strategy, and being more creative. A group like the IYNC is the ideal organization to do this, especially since company-related activities often don't allow young generation professionals to "do their thing".

### Suggestions

Based on a question asked by the IYNC General Chair, during the Y notes session, the group considered the possibility of having a session with anti-nuclear opponents (e.g Greenpeace) in future IYNC meetings. The group agreed to this in general, but with conditions. The following suggestions were made to meet these conditions:

- as a regular panel session organized with a representative from anti-nuclear organizations, politician(s), journalist(s),...
- as an evening debate with representatives from anti-nuclear organizations and young generation representatives, moderated by an independent moderator (journalist, rock star?)

Some concern was uttered regarding the potential negative (media) impact such an event/session might cause. However, most participants agreed that with the necessary preparation and strategic planning, such an event might be an educational experience for a lot of young generation professionals.

## ENVIRONMENT & SAFETY

*What must be done to address the safety and environmental concerns for the future?*

- Safety is continuously improved, which is supported by many of ongoing activities.
- Nuclear energy contributes significantly to cleaner environment. Millions of tons of CO<sub>2</sub> and SO<sub>2</sub> are prevented by operation of nuclear power plants each year. Kyoto protocol cannot be reached without nuclear power plants.
- The issues on radioactive waste have been solved scientifically and technologically.

A few activities are going on at the moment to mitigate the consequences of past mistakes on radioactive waste disposal. Political reasons for reducing the number of nuclear power plants are not always supported by technical arguments, e.g. Barseback closure. The human factor is a dominant contributor to risk.

Better communication with the public and education of incoming generations at very early stages is essential in the future as much as the transfer of knowledge between generations.

The audience questions touched software reliability improvement by application of methods from nuclear safety and methods on radiological consequence analysis. The discussion showed that knowledge gained in nuclear safety is being increasingly used in other fields, e.g. safety analyses in chemical industry, e.g. improvement of safety software reliability.

## POLITICAL ASPECTS

### *Is nuclear politically correct in an international environment?*

Although there are a number of political aspects to nuclear technology, the session became focused on nonproliferation of nuclear weapons issues. It was noted that the Young Generation is united in opposition to nuclear weapons, however there are big differences in the attitudes of different countries towards related issues. For example, excess weapons grade plutonium is viewed as a resource by Russia, but as a waste by the U.S. Also, compare the attitude toward reprocessing and recycling between France and the U.S.

A common viewpoint on nonproliferation is the implementation of nuclear "Safeguard" systems and the importance of verification. It was pointed out that international safeguard systems of the IAEA have succeeded without fail for over 10 years of large-scale production and use of MOX fuels in Europe. Similar institutional safeguards will automatically be part of any major program dealing with special nuclear material such as the disposition of weapons-grade U and Pu to bring about political confidence and trust.

The Young Generation in the nuclear industry should be aware that they are impacted by nonproliferation treaties and disarmament. The nature of nuclear energy demands an environment of trust and transparency and therefore the trust of nonproliferation is achieved only through institutional means. However, these safeguards do not need to interfere with a country's ability to benefit from nuclear technology. The Young Generation should try to understand the relationship between their occupation and the reality of nonproliferation treaties and disarmament.

In the audience of about 100, there appeared to be a lack of reaction in general. The Y Notes Group felt this could be due to: (1) lack of knowledge or expertise on the part of the audience on the nuclear weapons nonproliferation treaty and related issues, (2) the lack of comfort with the English language may have caused people to be timid, and (3) the topic was one of opinion and not a field of technical curiosity for this audience.

Three papers were cancelled entitled *Present and Future Role of Nuclear Power in the Energy Mix From the Point of Safety, Competitiveness and Climate Protection* by O. Studenec, Ministry of Economy, Slovakia; *EU Nuclear Policy in the Wider European Context: Future Perspectives* by M. Deffrenes, European Commission, Belgium; and *The Plutonium Challenge for the Future* by L. Gray, Lawrence Livermore National Laboratory, USA.

The Y Notes Group makes the following observation and recommendation: Often nuclear scientists and engineers are not educated on political nonproliferation issues, therefore, a focused session set apart from other political aspects should be held that includes a more diversified representation. In particular, it is essential to get the viewpoints of other nuclear weapons countries such as China and India, as well as non-nuclear countries.

## NUCLEAR PROGRAMS & TECHNICAL COOPERATION

At third day of Conference there were held the session called "Nuclear Programs & Technical Cooperation". The session was opened by a IAEA presentation on Technical Cooperation. It followed by reports about national nuclear programs from India, Russia, Romania, Armenia, Macedonia and Ukraine.

During this session was shown that the international technical cooperation in nuclear has become very important, and the future of the nuclear industry and nuclear applications should be more international. In this case, it will be a success.

The cooperation among young generation from nuclear industry in the world is really necessary now and will help to promote sustainable development of peaceful nuclear technologies.

## OTHER APPLICATIONS OF NUCLEAR TECHNOLOGY

As result of the meeting we realized that the main problems that affect the Nuclear Applications are the following:

- lack of interest and support in the same Nuclear Field which cause economic problems and diminish the number and quality of research.
- lack of communication about the benefits produced by the Nuclear Applications in Human Mankind
- lack of interest in the same Nuclear Applications, such as in Nuclear Medicine where physicians either by disregard or not enough knowledge do not profit from it. On the other hand Nuclear Space Applications suffer from the lack of government support caused by public rejection and the fear of having more "Challengers" accidents using nuclear reactors.

Conclusion:

The NUCLEAR FIELD should take more care about NUCLEAR APPLICATIONS because it is ITS more POSITIVE side because its benefits, like cancer struggle, food conservation, plug control, ... , are out of debate and are well accepted by the general public.

If we want to improve the public opinion about Nuclear Field, we should start to communicate the benefits we achieved in a better way.

## NUCLEAR TECHNOLOGY

### *What does the future hold?*

436 nuclear reactors are currently operating worldwide and 39 of them are under construction. Together they have accumulated nearly 10000 operating years. They produce approximately 16 % of world electricity generated. Research and development in nuclear field is on the highest level and significant portion of knowledge gained in nuclear field is successfully applied in other fields. The issues on radioactive waste have been solved scientifically and technologically.

The problems that nuclear technology is currently facing seems to be the following:

- no new reactors are built in Europe and in North America which can result in losing of expertise and know-how; this might be the most significant concern of today and the question is whether the current generation of young experts is able to build new nuclear power plants,
- public acceptance of nuclear power - high level radioactive waste is of more concern than the safety issues.

The session on nuclear technology showed that various advanced designs of new reactors are being developed. To become a reality they should have the following features:

- competitiveness – especially with the gas power plants,
- inherent safety features
- simpler design than current NPPs – safety has to be easy to demonstrate,

It is believed that this could stimulate construction of new nuclear power plants, which is necessary for keeping the current level of know-how in the industry.

Audience agreed that political and financial support is necessary for development and construction of new reactors. As the political acceptance of the industry may be driven by public opinion, better communication towards the public may be the key to the solution of the current not very promising situation.

## NUCLEAR EDUCATION & TRANSFER OF KNOW-HOW

Can nuclear science offer a promising career?

Will tomorrow scientists have the knowledge needed for the future?

An education and knowledge transfer panel session was organized in response to general observance of an aging workforce, lack of student interest in nuclear programs (evidenced by declining enrollment in university programs worldwide), and declining job opportunities for nuclear professionals as a result of budget cuts and a lack of new project development in nuclear fields.

Participants in this session discussed the decline of University engineering enrollment and suggested that one responsibility of the Young Generation is to build up the structures for knowledge transfer for the next generation entering a nuclear profession. Panelists were asked what caused them to take up nuclear studies, followed by a question on why they believed others did not go into studies of nuclear science. Overall, we learned that most entered the subject area due to an excitement for the subject and the challenge that the field offers. On the contrary, people may choose not to enter nuclear technologies due to the lack of job prospects, a fear of radiation, lack of positive role models, no early experiences with nuclear, or poor public perception. A fundamental cultural difference was noted with respect to job selection. For many Europeans, vicinity to family was an important component to job selection, whereas this is a minor issue for Americans. One panelist was quite honest in his answer, indicating that, in his country, many young people go where the money is, despite a potential desire to work in some other career area.

It was the general feeling of the Y-notes discussion group that know-how transfer is best accomplished by mentoring and on-the-job training, but that this cannot be effective without an active, inquisitive mind. Each generation should take on the responsibility of mentoring the next. It is never too early to begin communicating a positive image of the nuclear sciences to children. Young children need to see and to touch to learn about science. In the younger age groups, we must consider hands-on methods of communicating. At all stages of development, it is important for children to have positive role models who will help to guide them to scientific and technical paths.

To assist in providing solutions to the problems related to education and knowledge transfer in the nuclear field, we hope to foster knowledge transfer between generations as well as across international boundaries. One mechanism may be to establish an International Nuclear University to organize a world network of nuclear professionals, encouraging international collaboration.

During this session, new ways of communicating information were presented. In one instance, two authors presented a paper together as a discussion that was intended to continue with the audience. It is recommended by this review group that paper presenters seek new and innovative methods of communication. New, different presentation methods are memorable to members of the audience, providing a fresher view of the subject matter. Another method may be to "question the questioner" to assure that the appropriate message was communicated. This can be a useful technique to improve transfer of information to the public, ensuring that the information that is conveyed is correctly understood.

## YOUNG GENERATION OPENING SESSION

The main question that came out from the session as well as from the Y Notes session was actually a very simple one: why do those young generation movements exist in the nuclear field? Why is there such a need? And to such an obvious question, the answer is not that easy. And it seems to be very different from one country to another. Following this conference, the first action that we should probably conduct all together is to answer it as well as we can. The outside world needs to understand our motivations. Some first answers came out from the meeting, on which everybody agreed:

- We need to create an international network because the past generations did not have the means to do it (political situation, communication tools, globalization status) and because the future nuclear technology will be developed internationally for a lot of obvious reasons.
- The problem of retirement (and transfer of know-how induced) is not solved by natural means in our industry, so we need to handle it differently.
- More and more young people are involved in other applications of nuclear technology than nuclear power, and they have to be somehow connected to each other, at least to talk to the outside world.
- The world we are living in is an open one, so we want to open the nuclear world to the outside, starting with students then the whole public, our opponents ...
- One of the most important targets which whom we have to discuss is the young public in order to build together the energy mix of the future and to attract more students to nuclear education, and since we share the same languages, the same sense of humor, we as YG should be responsible for that in the nuclear world.
- In the communication field also, we can easily use the efficiency of the surprise effect (of being young and in nuclear) to get messages through.
- We all know that this energy will be needed for the future and we feel responsible for maintaining and promoting the related know-how, even if those are quite hard times.

The nuclear industry as a whole probably needs us then, for all these reasons, but what was surprising was that we did not find an answer to the other questions: why do we as young people in the nuclear industry feel so strongly and personally the need for gathering? Let us think about it ...

Auto-criticism: among the main goals defined for the YG activities, one of them seems not to be really treated, probably because this is the harder part of the job, even if we talk a lot about it during most of the young generation presentations. Did anybody once present a real and concrete example of a successful transfer of know-how initiated by the young generation? A first solution suggested could be the one of long-term mentoring.

During the session, great news came out with the creation of the Japanese young generation group, which will probably also induce the start of a movement in the whole Asia after the creation of the national networks. In any case, a statement was made that national activities should always have the priority.

And, finally, is this name 'Young Generation' really correct? One strong statement made was that we don't want to stay as a separate standing organization. And the fact is that our name is sometimes misleading. This is how the Y notes session group agreed to propose a change towards Future

Generation. Let us think about it also.