

## **Experience in nuclear power plant operation: WANO's view**

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‘Good morning. It is an honour for me to represent the World Association of Nuclear Operators before this distinguished audience.

I want to start this talk with three words that illustrate the world's experience of nuclear energy over the last 20 years. Those words are:

- Zarnowiec
- Chernobyl, and
- WANO

The first of these, Zarnowiec, was the proposed site of Poland's first nuclear power station.

It was the early 1970s and in Poland, as in many other countries, nuclear power was believed to hold great promise for the future and to provide a worry-free solution to the country's growing energy needs.

Zarnowiec Lake near the Baltic Sea was chosen as the site of Poland's first nuclear power plant and, following the signing of a cooperation agreement with the Soviet Union, construction work started in 1984.

Nuclear's promising evolution came to a sudden halt 20 years ago. The disaster at Chernobyl on 26 April 1986 shattered public confidence in nuclear power around the world. The effect was disastrous. Public opinion turned completely against nuclear energy.

In Poland, Chernobyl underlined misgivings about the safety of the chosen Soviet-designed reactors. The country's independence in 1989 brought these concerns to a head and so, in 1990, construction on Zarnowiec power plant was halted.

Elsewhere, the shock waves of Chernobyl saw many countries introduce nuclear moratoria and phase-out laws.

I certainly remember Chernobyl vividly. I was working at the time as head of Systems Design at Tractebel in Belgium, working on the design of the fifth reactor at Doel nuclear power station. We had the systems descriptions and most of the equipment specifications ready, the safety analysis report was well advanced, and all of a sudden the project was cancelled after the Belgian government declared a moratorium on new construction. It was a very frustrating experience.

For the nuclear industry, Chernobyl was both an end and a beginning. The accident sent shockwaves through the industry and marked the end of the old ways – the ways of isolation. It began a new focus on safety and international cooperation. This brings me to the third of the words that I introduced at the start of this talk – WANO.

As a direct result of Chernobyl, the world's nuclear operators gathered together in Moscow in 1989 to form WANO – the World Association of Nuclear Operators. WANO was Chernobyl's child, the nuclear industry's effort to prevent another Chernobyl from happening again. Through WANO the worldwide nuclear industry has succeeded in working together to improve safety and reliability in nuclear power plant operation.

I will begin the next section of my talk by giving you an overview of WANO and the work that we do to improve nuclear safety worldwide.

This will provide the context for a look at how, against a background of continual improvement in nuclear safety, nuclear power is coming back into favour around the world.

I will then move on to look at some of the key challenges that face nuclear operators today.

I will finish by looking at the ways WANO is tackling these challenges.

Turning first to look at WANO.

From the outset, WANO has had a very clear mission.

That mission is: 'To maximise the safety and reliability of the operation of nuclear power plants by exchanging information and encouraging communication, comparison and emulation amongst its members.'

WANO recognises that an adequate level of nuclear safety can only be attained by striving for excellence, not by just satisfying norms and inspecting. We believe that nuclear safety must be an integral part of the business, not just an add-on. There is no sustained nuclear business without nuclear safety. It is the strong foundation on which the industry has to build.

Every plant in the world needs to be in contact with the international nuclear community to get a clear vision of what excellence in nuclear safety looks like. An individual plant cannot develop this in isolation. One plant, or even one utility – however large – cannot realise this striving for excellence on its own. A corporate culture sets in; blind spots develop. If you are inside the bottle, you cannot read the label.

There is no alternative: we have to work together – Chernobyl has taught us that the cost of isolation is enormous.

From the beginning, the operator of every nuclear electricity generating station in the world has been a member of WANO. Our membership today consists of a total of 443 nuclear reactors in more than 30 countries. This unanimity is the key to WANO's strength and its value.

WANO is organised around four regional centres – in Atlanta, Moscow, Paris and Tokyo – with an overall coordinating centre in London.

The five centres are staffed by experienced professionals, both managers and engineers from WANO member organisations and permanent support staff.

Our aim, as you can see, is to maximise safety and reliability in plant operation. But how does WANO achieve this aim?

WANO's work is achieved through four complementary programmes:

- firstly, peer reviews
- secondly, operating experience
- thirdly, professional and technical development
- lastly, technical support and exchange

Let me first talk about peer reviews. A peer review brings a dedicated team of professionals from outside the host utility to examine a plant's daily operation. The result is a frank but confidential report containing strengths and areas for improvement. Since their inception in 1992, there have been over 275 peer reviews. We are now running between 30 and 40 peer reviews a year.

Secondly there is operating experience. Up to 900 event reports a year are collected and, according to their significance, they are analysed by WANO. The lessons learned are passed on to every nuclear plant in a series of reports and an on-line operating experience database.

Next there is our professional and technical development programme. This programme provides an information exchange forum, for example improving the decision-making in plant operations. Specific activities include workshops, seminars, expert meetings and training courses. WANO regional centres conduct over 80 such courses and workshops each year.

Lastly comes our technical support and exchange programme. This programme enables members to resolve problems and improve plant safety and reliability by disseminating data, providing supporting documents or lending hands-on assistance. For instance, we currently collect, check and collate quarterly data from every nuclear plant worldwide and produce nine performance indicators. These provide a quantitative guide to nuclear plant safety and reliability, plant efficiency and personnel safety. All of these are available to our members. We also run over 120 Technical Support Missions each year, where a group of highly qualified peers visits a plant to find a solution to a specific issue.

The nuclear industry has successfully worked together to achieve these results, which have left the worldwide nuclear industry in much better shape than it was at the time of Chernobyl.

We now find the wheel of public opinion turning back in favour of nuclear power. As the memory of Chernobyl fades in the public's mind and nuclear's credentials as a safe, affordable and clean-air energy are appreciated, there is increasing talk in many countries of a nuclear renaissance. Poland is among the countries that is reconsidering its position on nuclear power.

Our world certainly needs nuclear energy. There will be a 60% increase in world primary energy demand by 2030 and it will be disastrous for the earth's climate if this need is fulfilled solely by carbon dioxide producing fossil fuels. Renewable forms of energy, such as wind and solar power, cannot cope with this huge increase in demand and the development of nuclear fusion is too far away.

James Lovelock, an independent scientist and environmentalist, sums up this viewpoint in his latest book, 'The Revenge of Gaia'.

He says: ‘My insistence on the need for nuclear energy comes because there is no other safe and reliable alternative for the large-scale production of electricity.’ He goes on to state: ‘We must conquer our fears and accept nuclear energy as the one safe and proven energy source that has minimal global consequences.’

Nuclear energy certainly has a vital and unique contribution to make to the world’s energy needs. The numbers speak for themselves. Mohamed ElBaradei, the director general of the International Atomic Energy Agency, has declared that, even by the Agency’s most conservative estimates, there will be 427 gigawatts of global nuclear capacity in 2020. This compares to today’s total of 367 gigawatts. China alone plans to increase its total nuclear electricity generating capacity from 6.5 to 36 gigawatts by 2020.

Poland stands on the threshold of deciding once again to join the world nuclear community. It is a very different community from the one that existed the last time Poland undertook to build a nuclear power station. Back then there was a lack of worldwide cooperation; today there has been an enormous improvement in safety performance and there is unprecedented sharing of information.

But the Polish people and decision-makers would be right to ask hard questions of the nuclear industry and to investigate fully the case for nuclear power. WANO’s achievements and its position as an organisation that encompasses every single nuclear power plant from Argentina to Armenia and from the Ukraine to the United States put it in a unique position to answer those questions and to comment authoritatively on the nuclear industry.

So what is it that we see when we look through the WANO window?

For a start, we are aware that our greatest challenge is complacency. One single accident can again tip the scales against nuclear power. We also recognise that excellence is a task that is never complete, a race without a finish line. In fact the more the memory of Chernobyl slips from people’s minds, the more we see the need to redouble our efforts and ensure that the importance of safety is not forgotten.

This is why WANO’s role is as important today as it was when it was founded. Our industry is facing many important challenges and WANO’s mission is more relevant than ever. I am not going to stand before you today and tell you that everything is fine. I am not going to deny that we have challenges ahead. The important thing is that we are ready to meet those challenges and that we have a strategy in place to continue improving upon the already substantial improvements made in nuclear safety.

So what are some of the key challenges that face the nuclear industry?

- Firstly, there is still a variation in plant performance that is too large
- Next, overall performance indicators are tending to level off
- We also see recurring issues during peer reviews
- Finally, important events continue to take place

The first of these challenges is a variation in plant performance that is still too large. Our analysis of operational experience exchange and peer review results shows us that there is a spread in all four regions between best and worst performers that is too large. Plants have to learn from each other.

Next there is the issue of the levelling off of performance.

When we look back at our worldwide performance indicators we see that there were rapid improvements in the decade after Chernobyl. Such improvements have started to slacken off – and in some cases have even started to decline somewhat. Plant availability has levelled off since 2000, unplanned unavailability has increased slightly and the number of unplanned automatic reactor trips is stagnating. Although these trends are not alarming in themselves, they show clearly that the battle to improve safety in nuclear plant operation is never won.

Our peer review programme gives us a very good indication of what is actually happening in nuclear power plants. From this we observe a number of recurring issues. They include poor on-site communication, complacency and an insufficiently questioning attitude, and insufficient links with or control of contractors.

Another challenge is that important events continue to happen at nuclear power stations. If there was no chance of another safety lapse at a nuclear power station, I would happily retire tomorrow. Instead there are constant reminders that we need to be forever vigilant. Here are just a few recent examples.

Fuel assemblies were severely damaged during cleaning at Paks nuclear power station in Hungary; boric acid at Davis-Besse nuclear power plant in the US seriously damaged the reactor vessel head; a hydrogen explosion in a pipe connected to the reactor cooling system at Brunsbüttel in Germany left the reactor isolated from the containment atmosphere by only one checkvalve. These events are just the most recent reminders that we cannot afford to become smug with our success.

The nuclear industry has to face up to these challenges. I believe that our industry can only thrive by striving for excellence and continuous improvement.

We therefore have a three-fold strategy for improvement.

- Firstly, keeping in regular contact with all plants, including the ‘good performers’.
- Secondly, reporting events.
- Thirdly, using operating experience.

The first of these keys to improvement is keeping in contact. We are making continual efforts to keep in regular contact with every plant and utility, including the ‘good performers’. Excellence starts with good communication and for us to be cut off from any of our members is unacceptable.

This communication with our members is not a passive undertaking. We are actively involved in learning more about each plant and ensuring that they become involved in the WANO process of continual improvement. This includes the following:

- conducting a WANO peer review at every plant at least once every six years
- encouraging an outside review every three years
- undertaking a prestart-up peer review at every new plant before it comes on line. This would apply in the case of any nuclear power plant built in Poland
- sending technical support missions to plants to help them solve difficult issues between peer reviews

- arranging corporate reviews so that, at corporate level, utilities are also part of the improvement cycle

Secondly, we are striving to ensure that plants report events promptly.

Throughout the nuclear industry, events triggered by everything from equipment failures and human performance errors to procedure problems and design deficiencies threaten plant safety and reliability.

However, lessons from these events cannot be shared if they are not reported. We are aware that there is sometimes a reluctance at plants to admit their mistakes or difficulties. However, the confidential nature of WANO is the key to breaking down this barrier. Whereas plants report only what they must to the regulator, WANO provides an environment of mutual support, bolstered by peer pressure, that allows them to report what they want to. The result is the impressive total of about 900 event reports that WANO receives each year. We have also set a goal for every reactor unit to report at least one significant event per year.

The last part of our strategy for improvement is to ensure that plants use operating experience in a timely and effective manner. It is not sufficient simply to provide a mass of data and lessons learnt. These are only of value if plants use them.

We are tackling this issue in two key ways.

- Firstly, by ensuring that there is access to the WANO website and operational experience database by plant staff at all levels.
- Secondly, by ensuring that plants implement the major lessons learned from events worldwide

I hope that this speech has given you a good insight into WANO and the work that we do. I hope also that it has given you a better understanding of what is happening in the world of nuclear power operations, a world where we strive for excellence, where much has been achieved to ensure safety, but where we will not rest in continuing to pursue our goal of excellence.

Taking the decision to build a nuclear power station is not one to be taken lightly. It is a major undertaking and one where many factors have to be weighed together. Much of the fear associated with nuclear power comes from a lack of knowledge, while many people's belief that nuclear power is unsafe comes from the experience of Chernobyl. WANO's existence is the antidote to concerns about safety.

I hope this talk will have given each of you plenty of food for thought. I also hope it will have opened a little bit wider the door to a safe, nuclear future in Poland. WANO welcomes new member countries. Together we can strive to put safety first .