



WANO

GLOBAL LEADERSHIP IN **NUCLEAR SAFETY**

FIRST CHAIRMAN



THE LORD WAS RIGHT

Distinguished colleagues! Dear readers!

The 15th of May 2024 is the 35th anniversary of the World Association of Nuclear Operators (WANO). One of the outcomes of a project sponsored by the World Nuclear Power Museum and supported by WANO is this book featuring recollections about Lord Marshall who was a wonderful person and professional, and an advocate for wide international cooperation for the sake of strengthening the safety and reliability of the nuclear power industry.

The creation of the World Association of Nuclear Operators was an extraordinary event. Its initiators including Lord Marshall, Lee and Lukonin, were able to unite, in a short time, all the world's plant operators to work jointly on safety provision for the nuclear power plants of all the continents. The Association was established in an environment of deep mistrust of the global public towards the 'peaceful atoms' after the Chernobyl accident.

The organisation, which still has no comparable equivalent anywhere, was set up thanks to Lord Marshall's social friendliness, high professionalism, and ebullient energy. This was the reason why the WANO Inaugural Meeting elected him the first WANO Chair. He and his colleagues could ensure that WANO started as a rapid and efficient entity of the international nuclear cooperation.

35 years of WANO were guided by a fundamental principle proposed by Lord Marshall – a principle of partnership and close collaboration. Chair Marshall focused on human factors and the safety culture aspects of nuclear technology. He recognized that striving for strong safety is a continuous process: that industry success is in the power of operator-to-operator interaction rather than isolation.

Lord Marshall was right: today, in these challenging times, we see how relevant it is again. When the nuclear safety is affected by not only man, machine and nature but also by geopolitics. It is the legacy of the founders that we still follow the same principles. WANO's core strengths come from operator trust, transparency, respect, and professionalism. We must act in unity as ONE WANO.

When reading the book on Lord Marshall, you will see that his colleagues have the warmest memories of him. Lord Marshall was quite humble and very courageous. He communicated with people in an equitable manner, and he was kind and benevolent and had a good sense of humour. At the same time, his powerful appearance emitted strength and confidence; and his enthusiasm for chess and go demonstrated he had a philosophical bent of mind. He was frequently accompanied and supported by Lady Marshall. From early childhood, after his father's death, Walter shouldered a responsibility for family care. Similarly, after many years he took upon himself a responsibility for the nuclear family, and to the end he, an ill man, gave all of himself to our common cause.

To ensure a bright future for our industry, we continue to learn lessons from the past. We need to transfer the valuable knowledge and experience, industrial traditions, and history from previous and current leaders by developing the spirit of unity and cooperation among our young engineers. We believe this book and the examples from Lord Marshall's life are worthy examples for our next generation of leaders to learn from and apply.

Tom Mitchell
WANO Chairman

Nikolay Sorokin
19th WANO President

EQUAL AMONG EQUALS

One of the joint projects of WANO, Nuclear Society of Russia and Obninsk Municipal Administration is a project named World Nuclear Power Museum (WNPM). WANO is ready to further support its promotion among the members.

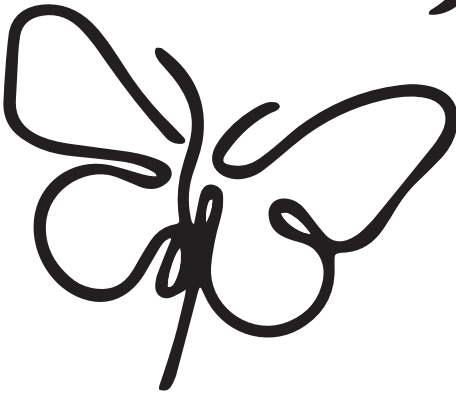
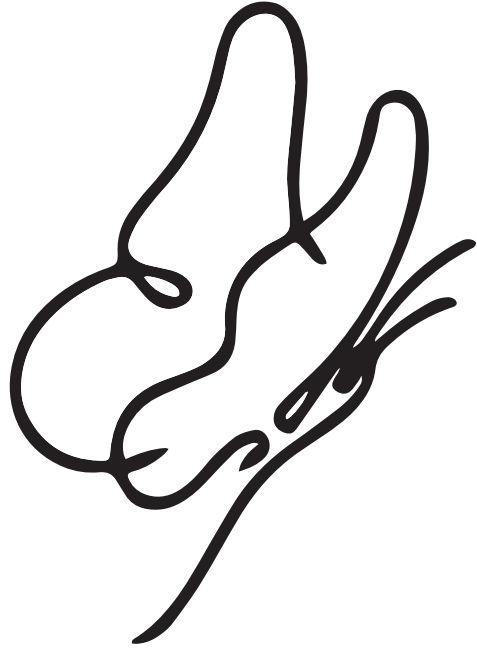
In 2020, WNPM launched the issue of a series of books dedicated to the prominent nuclear power persons (scientists, technologists, designers, operators, administrators or site managers) who made a significant contribution to the industry development but already left us. The first book was published in August 2020 and devoted to Evgeny Ignatenko, a person who created Rosenergoatom and was its first Director General. Today, the preparation of 10 new books is in progress.

This Lord Marshall issue supported by WANO is a continuation of the said fruitful work for the good of the industry development and for the purpose of upbringing of a new generation of the nuclear engineers. The WANO London Office and Regional Centres supported this activity and helped in collecting information and archival materials, and a consent was given to use pages relating to Lord Marshall, from a book on WANO's history. We look forward to engaging our young experts in a glorious history of the nuclear power and WANO. Memories of colleagues, and documents and photographs presented in the book will allow the reader to paint a bright image of the respected Lord Marshall.

Vasily Aksenov
Director
WANO Moscow Centre

Sergey Kushnarev
Chief Coordinator
National Nuclear Society





IN LIEU OF A PREFACE

*To mark 35 years of Report of the President's Commission
on the Accident at Three Mile Island*

To mark 30 years of the Normal Accident Theory

To mark 25 years of the World Association of Nuclear Operators

BUTTERFLY WINGS

/article by Vera Lukyanova, Rosenergoatom Magazine, 2014/

We are all connected with one another with invisible threads in time and space.

Incredibly, a pre-war Budapest was connected with the nuclear accident in oversea Pennsylvania in the seventies, and an English Lord – with Soviet reactors. A common person's decision to leave a pro-fascist country becomes a decision of twenty-nine post-industrial countries to create a world association. This interaction of all things is sometimes beautifully called the Butterfly Effect: they say that a butterfly wing beat in Indonesia could cause a hurricane in North Carolina. A small creature flapping its wings is the tiniest change to the initial system condition that causes a chain reaction of events triggering large-scale events. The system could have caused the other trajectory in its development if the butterfly had not flown up.

Budapest. The town slept lightly during one morning of 1940 listening to the sound of down at heel steps in the streets and hardly audible buzzing of Danube flowing lazily through the entire Danube town.

A mother cautiously touched Janos's arm: "Wake up, son."

A thirteen-year-old boy reluctantly opened his eyes and covered himself with a thin blanket:

– "Did something happen, mom?"

– "Yes, we are leaving."

Janos quickly sat up on the bed.

– "Where?"

– "Far away."

Mother sighed.

– "To the USA."

– “What about grandfather?”

Mum shook her head sadly.

– “But why? Why should we leave?”

The woman sadly looked at her son. Should I tell the boy about Horthy? The Arrow Cross Party? The first and second Jewish laws and pogroms? The pain she and father feel leaving their native Hungary and going to New York without any knowledge of English.

Someone knocked on the window on the second floor. The woman and the boy turned quickly. It was an old woman lowering a basket on a rope. A two pengé note gently covered by a small stone for the street vendor selling poppyseed rolls. The woman dropped her arms wearily and started to cry calmly. A year later, all relatives of the Kemen family who remained in Hungary died in the Auschwitz concentration camp. A Hungarian boy Janos Kemen became John Kemeny, assistant of Albert Einstein, and the inventor of the BASIC computer language, President of Dartmouth University and the forefather of the internet. Today's sociologists remember his name each time they use such tools of mathematical techniques of expert value analysis methods as the Kemeny median and the Kemeny distance.

It was John Kemeny who later became a chairman of the President's Commission on the Accident at Three Mile Island.

In 1979, he would write the following in the report specifying the accident causes: “After many years of operation of nuclear power plants, with no evidence that any member of the general public has been hurt, the belief that nuclear power plants are sufficiently safe grew into a conviction. One must recognize this to understand why many key steps that could have prevented the accident at Three Mile Island were not taken. The Commission is convinced that this attitude must be changed to one that says nuclear power is, by its very nature, potentially dangerous, and, therefore, one must continually question whether the safeguards already in place are sufficient to prevent major accidents. A comprehensive system is required in which equipment and human beings are treated with equal importance...

To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, and practices – and above all – in the attitudes ... of the nuclear industry.

The lessons from previous accidents did not result in new, clear instructions being passed on to the operators. This is illustrated in the following

case history. A senior engineer of the Babcock & Wilcox Company (suppliers of the nuclear steam system) noted in an earlier accident, bearing strong similarities to the one at Three Mile Island, that operators had mistakenly turned off the emergency cooling system. He pointed out that we were lucky that the circumstances under which this error was committed did not lead to a serious accident and warned that under other circumstances (like those that would later exist at Three Mile Island); a very serious accident could result. He urged, in the strongest terms, that clear instructions be passed on to the operators. This memorandum was written 13 months before the accident at Three Mile Island, but no new instructions resulted from it.”

Here was the first consequence of the Butterfly Effect, i.e. the final recommendation to the industry companies: “The nuclear industry must dramatically change its attitudes toward safety... There must be a systematic gathering, review, and analysis of operating experience at all nuclear power plants coupled with an industry-wide international communications network to facilitate the speedy flow of this information to affected parties. If such experiences indicate the need for modifications in design or operation, such changes should be implemented according to realistic deadlines... Operator training must be continuously integrated with operating experience”.



John Kemeny

New Haven, Yale University. On that spring morning of 1981, canaries and other songbirds kept by the citizens in small cages on the balconies were devotedly chirping over the noise made by coffee machines and spoons rattling in glasses. Someone was tapping indecisively on the IBM Selectric typewriter as if trying not to stifle the morning sounds from open windows.

The Kemeny Commission's report was in front of Professor Perrow and his student Abalofia.

– “Professor, this term *Normal Accident* somehow seems strange to me. Some kind of oxymoron... Heavy lightness, misshapen chaos of well-seeming forms, feather of lead, bright smoke, cold fire, and sick health.”

– Mitchell, said Professor laughing. You know Shakespeare and literary devices quite well. However, an accident for the world of modern technology is, surprisingly, quite normal. The more we conquer nature, the more complex are the systems created by mankind, which increases the risks for users, innocent bystanders and future generations. Modern technologies are prone to risk. There is no escape. I dare say that despite more effective equipment and (sometimes because of them) an accident in a complex system is inevitable.

– Due to its complexity?

– Unfortunately, yes. What is a nuclear power plant? An inherent complexity and close component interaction. And nobody – you hear me, nobody! – could predict how thousands of components would interact with one another. Here is Kemeny's report. It is an excellent example of how minor and banal failures cause a severe accident. Could a clogged filter alone or a failed sensor alone or a warning light obscured by a repair tag have caused the reactor core melting?

– I see. We have been describing the first thirteen seconds of this accident on five pages.

– Moreover, nobody will ever be able to estimate all these minor – frequently trivial – events in non-trivial systems. A worker in the North Anna Number 1 plant was cleaning the floor in an auxiliary building. His shirt caught on a handle of a circuit breaker. He pulled it free, and apparently was unaware that in doing so he activated the breaker. This shut off the current to the control rod mechanism, and the reactor scrammed automatically. This trivial event caused a four-day shutdown. Even changing light bulbs has its dangers in these highly engineered, complex systems. A worker changing a light bulb in a control panel at the Rancho Secco 1 reactor dropped the bulb. It created a short circuit in some sensors and controls. Fortunately, the reactor

scram controls were not among those affected, and the reactor automatically scrammed. The loss of some sensors meant the operators could not determine the condition of the plant. The rapid cooling did not, in this case, damage the core. But this is probably only because the plant had been operating at full power for less than three years.

– Professor, don't you think that to make matters worse some mystical forces begin to work in complicated systems? For example, the Kemeny Commission spent a lot of time trying to find out just who was responsible for leaving the emergency pump valves closed. They were unsuccessful. Operators testified that it was a mystery to them how the valves had gotten closed, because they distinctly remembered opening them immediately after the testing.

– Complicated system accidents often involve such mysteries. Do you remember the landing capsule's hatch opened? Gus Grissom who miraculously survived later stated that he had not fired it prematurely or hit it accidentally. The hatch just blew by itself. This is the old war between operators and the equipment others have designed and built.

In 1984, the book *Normal Accidents* by Charles Perrow was published and became legendary. The Normal Accident Theory was the most important step in risk assessment and... a notable result of the Butterfly Effect.

Perrow made three key conclusions. 1. A system fault in complicated technical systems is inevitable and unpredictable. It is impossible to estimate the likelihood thereof as it is always there due to a non-linear combination of components. 2. Accidents occur both in old well-regulated industries and new insufficiently controlled ones. 3. A quantitative risk assessment ignores complicated interactions between the system elements, which cause a chain of system failures.

As to ineffective exchange of operating experience, when analysing 13 seconds of the transient he wrote that these short seconds included an earlier accident with condensate pump failures at an Ohio plant, memos from a TVA engineer, memos in the files of Babcock and Wilcox (the firm that built the reactor), and an accident in Belgium in a Westinghouse reactor. The President's Commission turned up at least eleven instances of it failing in other nuclear plants (to the surprise of the Nuclear Regulatory Commission

and the builder of the reactor, Babcock and Wilcox, who only knew of four) and there had been two earlier failures in the short life of TMI-Unit 2.

“We must journey into the heart of industry experience, taking a close look at some serious accidents, some trivial ones, problems of reliability and management, and above all, the special characteristics of the nuclear power system. This will give us the necessary tools, in the form of ideas or concepts, to enter, in later chapters, the world of other high-risk systems that someone has decided we cannot live without.”

On page 32 of the book, the next chapter’s title was the following: *Nuclear Power as a High-Risk System: Why We Have Not Had More TMIs-But Will Soon*.



Charles Perrow

London. On this spring morning in 1986, it was drizzling a dull rain. The cold silver Thames twisted like a dropped wedding ribbon, and the melted ice mush breathed like chocolate dissipating in a water bath. It was cold in Lord Marshall’s study; in Britain, Lord Marshall was called Mr. Nuclear. He himself and Peter Walker, Secretary of State for Energy, were in the study.

- So, will you also let the Soviets join this international organisation? Are you willing to negotiate with them?
- They will be the first. We will also include them in the peer review team, Marshall said quietly. INPO and EDF support me.
- Their Chernobyl undermined public confidence in nuclear power!
- Lord Marshall nodded towards the paper-cluttered desk, on which the *Kemeny Commission Report* and Perrow’s *Normal Accident* laid.
- The Kemeny Commission’s recommendation about the global industry-wide operating experience network and Perrow’s unexpected

prophecy about the Chernobyl accident is priceless for me. Accidents will always happen in the world of high technology at nuclear and petrochemical sites, aircraft, railroads, spaceships. Only a better understanding of the nature of this risky world can help us. Perhaps, together we can reduce or eliminate the hazards.

– They did not print enough cartoons on you! – Secretary said in his heart.

– All nuclear licensees are eternal hostages of each other, – Lord said sadly.

This was the most significant butterfly effect: 1989 saw the creation of the World Association of Nuclear Operators. Speaking at the Inaugural Meeting in Moscow in May, Lord Marshall, one of the founders of this organization, said that every operator must learn from one another so that they emulate the best practices, which are available throughout the world. All operating companies are responsible for joint efforts and help to enhance the safety and reliability of nuclear power plants in operation. He then warned: “Public confidence in nuclear power will not survive another accident as severe as Chernobyl”.

Moscow 2014. As any of us understand that the past has an impact on the present things and sometimes tries to understand whether we should have had to change “the yesterday” to improve a situation of today, it would be interesting to mull over the following question: “What would the global nuclear power look like today if there was no accident in its history?” We need to note that Three Mile Island, Chernobyl and Fukushima certainly contributed to a huge analytical effort taken and a creation of innovative



Lord Marshall

approaches towards plant safety issues. One such approach is mutual assistance of all nuclear power plants using the operating experience of one another including even minor events at the plant sites.

Today, we clearly see visionaryism of the people whose efforts resulted in the industry's building. It is never a bad idea to refer to this experience. One wise man said: "If you need new ideas, re-read the old book." The philosopher Eric Hoffer added as follows: "In a world of change, the learners shall inherit the earth, while the learned shall find themselves perfectly suited for a world that no longer exists."





W Marshall

I. FELLOWS OF THE ROYAL SOCIETY SPEAKING

WALTER CHARLES MARSHALL, C.B.E. LORD MARSHALL OF GORING

5 March 1932–20 February 1996

Elected F.R.S. 1971

By D. Fishlock, O.B.E. and L.E.J. Roberts, C.B.E., ER.S.†

Walter Marshall was recognized by the scientific community at an early age as one of the outstanding theoretical physicists of his generation. But he is more likely to be remembered for his distinguished career in public service, which led to a knighthood in 1981 and a life peerage in 1985, and for his forthright public advocacy of nuclear power.

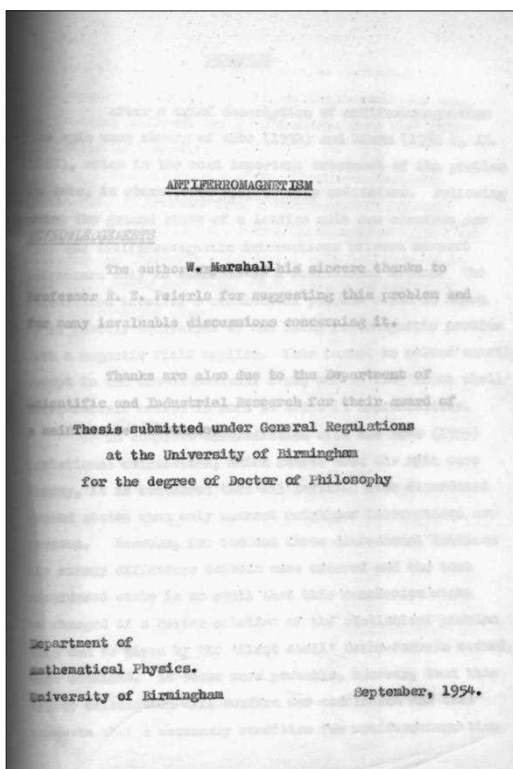
EARLY YEARS: PURE, THEN APPLIED SCIENTIST

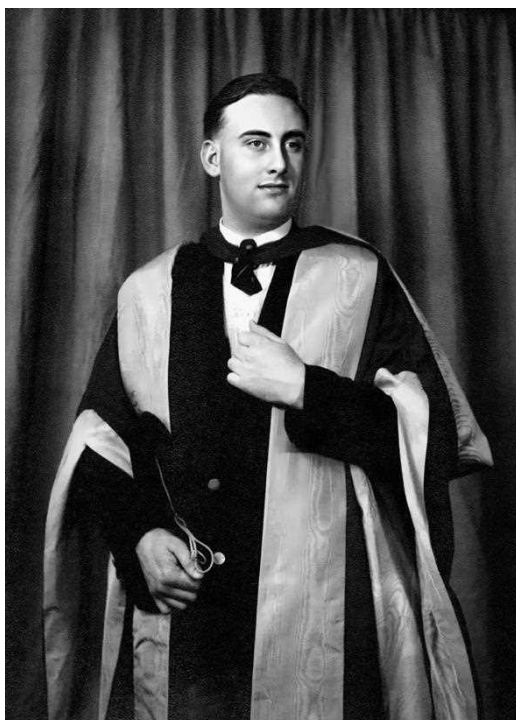
Walter Charles Marshall was born on 5 March 1932 in Rumney, near Cardiff, the youngest child in a family of three. In later years, he delighted to recall that he had insisted on ‘doing sums’ on his first day in primary school. His mathematical promise was recognized by his mathematics teacher, Mr Wustenholme, in his grammar school, St Illtyd’s College in Cardiff. He also developed a serious interest in chess at the age of 11 and became Welsh Junior Chess Champion at 15.

He left school with a Major County Scholarship in 1949 to study mathematical physics at the University of Birmingham where, after taking his first degree, he remained to write a thesis on ‘Antiferromagnetism and neutron scattering from ferromagnets’, for which he was awarded a Ph.D at the early



*University of Birmingham
Chess Club 1952-53
Midland University Champions 1952-3
Birmingham League Champions 1952-3
Terrill Trophy Holders
Back in the center W Marshall*





*PhD graduation portrait
University of Birmingham, 1954*

age of 22. He acknowledged that the guidance of his supervisor, Professor (later Sir Rudolf) R.E. Peierls, F.R.S., was the major influence on his career.

Walter Marshall was recruited to the Theoretical Physics Division at AERE Harwell by Dr B.H. Flowers (now Lord Flowers, F.R.S.) in 1954. His first assignment was to the Plasma Physics Group, where his research on the difficult problems posed by shock waves in magnetically confined plasma discharges confirmed his powers as a theoretician. But he soon returned to his initial interest in condensed matter physics, which was developed by two periods of study leave in the USA, visiting Berkeley, Livermore and Harvard, where he made a profound impression.

On his return to Harwell, Marshall became Leader of the Solid State Theory Group and, in 1960, at the age of 28, the Head of Theoretical Physics Division, which included a number of outstanding theoreticians from across a range of subjects. Under his leadership, the Division attracted a large number of visiting scientists, particularly from the USA, and maintained good collaboration with the theoretical physicists in Oxford, including Peierls,

who had moved from Birmingham, and Roger Elliott (later Sir Roger Elliott, F.R.S.). Marshall's intellectual strengths and forceful personality also made him a prominent participant at international conferences.

Marshall's main personal contributions to the theory of the solid state related to magnetic properties, ranging from the very mathematical in discussing the statistical mechanics of magnetic phase transitions, and in particular their critical properties, to much more phenomenological treatments of the molecular orbitals in magnetic salts, and to the theory of magnetism in transition metals, in particular in alloys. He became convinced of the value of the applications of neutron scattering. Here again, his main but not exclusive interest was in magnetic substances, where he encouraged experiments on the inelastic scattering from spin waves, on the magnetic structure factors around impurities, and many other studies, including an early interest in the Mossbauer effect.

Walter Marshall's main impact arose from his strong interaction with experimentalists and the driving through of programmes to test and expand the theoretical understanding of real materials. His outstanding abilities as a manager of research were later to transfer successfully to the commercial sector. He had published over 60 papers, with many collaborators, by 1969 and lectured extensively and lucidly on the applications of neutron scattering. His book *The theory of thermal neutron scattering*, which he wrote with Stephen Lovesey, remained the definitive text on the subject for 20 years. He gave the Kelvin Lecture in 1964 on thermal neutron research, showing his characteristic delight in explaining scientific concepts to a non-specialist or non-scientific audience. He was the second recipient of the Maxwell Medal for outstanding contributions to theoretical physics from the Institute of Physics in 1964, the first having been Abdus Salam in 1962. He was elected to the Royal Society in 1971—the youngest Fellow at that time.

Walter Marshall continued to work on problems in superconductivity and magnetism after 1970 as mental relaxation, during periods of leave in the USA, at home, and in airport lounges and other unlikely places. He recorded it all in his neat handwriting in a number of notebooks.

One for 21 July 1985 records a resolution to work on these problems for half an hour a night, although by that date he was immersed in the politics and management of nuclear power.

Diversification and industrial research

The success and international reputation of the Theoretical Physics Division under his leadership confirmed Marshall's ability to lead scientific programmes and to motivate the work of others. This led to a significant switch in his career, from pure science to the administration of applied science and technology, with his promotion to Deputy-Director of AERE Harwell in 1966 and to Director in 1968.

The 1960s were a time of profound change in the Harwell Laboratory. Many of the urgent scientific objectives that had led to its establishment in 1946 had been met. Much of the pioneering nuclear work was moving away to other nuclear establishments and enterprises.

Less than 20 years after it was founded, Harwell had to find a major new additional mission or face considerable reduction. The chance of expanding its programme beyond the terms allowed under the 1954 Atomic Energy Act was provided, in principle, by the Science and Technology Act of 1965. However, the first new proposals in which Marshall was involved, at the invitation of Dr F.A. Vick, followed from his own research interests—to establish at Harwell a high magnetic field laboratory (HMFL) and a high flux neutron beam reactor (HFBR).

Marshall saw these proposals as an opportunity for further collaboration with university laboratories, which would establish Harwell as a national centre for materials research. But there were problems both of finance and of remit. The HMFL could be built at Harwell only under a broad Requirement under the 1965 Act for materials science and this the Ministry of Technology was unwilling to provide. The HFBR could have been built under the 1954 Act, since neutron beam research was well supported at Harwell, but the Ministry could provide funds only for research aimed at industrial development and was not convinced that industrial applications of neutron beam research would arise for many years.

Marshall was undoubtedly disappointed but he accepted the general position that a laboratory spending much public money had to be seen to be contributing to the national welfare at a time when the UK economy was perceived to be falling behind those of other industrialized nations. So he directed his formidable energies towards transforming Harwell into a laboratory aimed at improving industrial performance generally and meeting defined government needs. For this, he had the authority of Dr (later Sir)

John Hill, F.R.S. Chairman of the UK Atomic Energy Authority, and his Board. Marshall wrote:

My plans are founded on the belief that the future of one of the world's great multidisciplinary laboratories is largely dependent on the extent to which we are able to exploit the technological spin off from our nuclear research and development.

Marshall realized that this change amounted to a revolutionary shift in the aims and objectives of many of the scientists at Harwell, and that it would involve administrative as well as technical changes. He later listed the difficulties in the way of creating an industrial programme large enough to employ about a third of the laboratory—more than any contract research organization in Europe at that time. Harwell seemed too expensive, lacking in commercial expertise and organization, and unused to marketing its research. Furthermore, there was little external support for the idea: 'Industry simply did not want us and most people sought strongly to discourage us'.

There were also strengths to exploit, however. Close involvement with the technology of nuclear power had accustomed many at Harwell to the need to meet technological problems on a tight timescale. And there had been some interaction with industry from the early days.

Typically, it involved the use of radiation or radioactive isotopes and a small commercial office existed to draw up the necessary contracts. This 'applied nuclear' work was expanded and given sharper objectives, transformed from 'missionary' to 'mission-oriented' work and pursued with industrial partners.

The expertise of the laboratory was much broader. Nuclear energy technology had demanded development at the cutting edge of many disciplines—in metallurgy, ceramics, heat transfer, non-destructive testing and atmospheric pollution, for example. Such skills could not be exploited without a Requirement under the 1965 Act. By 1969, 16 such Requirements had been granted. Authority to spend public money had to be won from the Requirements Boards set up by the Ministry. Marshall saw that the most pressing need was to establish good communications with a large number of potential industrial customers, and placed the responsibility of doing so on the project leaders themselves, insisting that the ultimate criterion of success would be financial. These were key decisions, which forced a large number of

Harwell scientists to acquire first-hand knowledge of industry and liberated unsuspected entrepreneurial talents in many of them. Industrial opposition fell away as more firms became involved.

The industrial programme grew rapidly after 1967. By 1973, it accounted for 39% of the Harwell programme, and for 51% by 1976. The income came about equally from industry and government agencies. The new sources of funds allowed Marshall to stabilize the size of the laboratory after 1975, though the professional staff had been reduced by about 25% over 10 years. By far the greatest reduction had been in the areas of basic science connected with nuclear technology. Nevertheless, Marshall believed that a significant programme of this type was necessary to maintain the scientific standards of the laboratory.

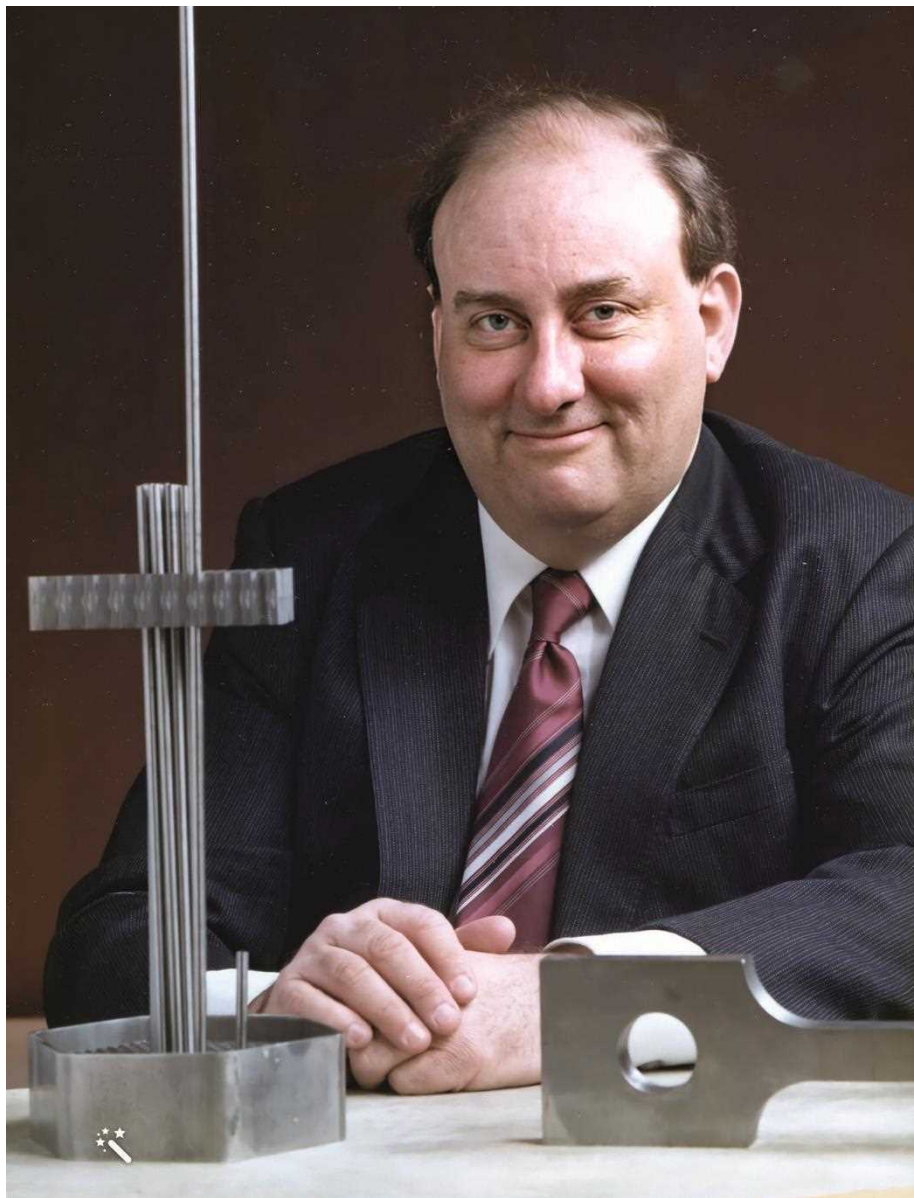
Diversification gave the laboratory a new lease of life. It excited considerable national and international interest, though Marshall was always careful to say that the precise structure followed at Harwell arose from the circumstances and strengths of that laboratory and might not be applicable generally. His 'outstanding contribution to the organization, utilization and application of science' was marked by the award of the Glazebrook Medal of the Institute of Physics in 1975. In a retrospective lecture to the National Academy of Sciences in Washington, Marshall claimed that the Harwell experience had proved that a multidisciplinary national laboratory was 'an asset which should fully interact with the life of a country to help solve its most serious problems'. But it was important to consider the proper mission of such a laboratory at regular intervals to anticipate the need for change. Altering the orientation of the laboratory had been very difficult but 'it can be done if sufficient determination and will is applied to the task'.

Marshall could claim by the early 1970s that the discipline of having to earn money had improved the general morale of the laboratory. It is a well-deserved tribute that the headquarters of the reorganized UKAEA at Harwell has been named the Marshall Building.

Energy policy and nuclear power

During the 1970s, Walter Marshall became increasingly concerned with questions of energy policy and by 1980 he was well known as an enthusiastic advocate of nuclear power. He became Head of the Research Group of the UKAEA in 1969, responsible for the Culham and Harwell laboratories.

He was appointed to the Board of the UKAEA in 1972 and became Deputy-Chairman in 1975 and Chairman in 1981.



Dr Walter Marshall Chairman of the UKAEA, 1981

Marshall shared the general optimism about the future of nuclear power that was current in the UKAEA at that time. Nuclear power was

expected to provide a major part of the electricity generated in the UK by the end of the century, with a substantial input from fast reactors.

Fusion was seen as a bright hope for the longer term. Marshall took part in the reviews of the prospects for fusion during the 1970s and in the negotiations that ended with the siting of JET, the Joint European Torus, at Culham. He was convinced that 'the incredibly complex technical problems associated with fusion are capable of solution on a reasonable timescale', but remained doubtful whether fusion reactors would be economic.

In 1974, Marshall was appointed Chief Scientist to the Department of Energy on a part-time basis. He worked extremely hard at this additional remit, chairing the Advisory Committee on the Energy Industries and the new Offshore Energy Technology Board. He organized a series of exercises designed to rank energy technologies against scenarios of supply projections and fuel mix. He inaugurated the Energy Technology Support Unit at Harwell to encourage energy conservation in industry and to evaluate the potential of the 'renewable' sources of energy. This organization (ETSU) still exists.

Marshall also chaired a Study Group looking at the role that combined heat and power (CHP) linked to district heating schemes might play in the UK, following the example of proven CHP schemes in several European countries. This study was organized because energy efficiency and conservation were seen as key objectives in the aftermath of the 'oil shocks' of the early 1970s and the prospect that the UK would become a net importer of hydrocarbon fuels around the turn of the century. The Study Group comprised leading academics and senior members of the Electricity Supply Industry. Their final report in 1979 concluded that there was no immediate economic argument for CHP and district heating in the UK, but that there would be opportunities for CHP in the longer term if gas prices increased substantially.

Marshall and the majority of the Group were in favour of starting one lead scheme in a city centre as soon as was practicable, and encouraging smaller schemes in industry. But, in the event, gas remains cheap and supplies are perceived to be secure.

In 1977, for reasons discussed later, Marshall was abruptly asked to return to full-time duties in the UKAEA, although he continued to chair the CHP Group. Marshall was deeply hurt but there was much to do. Marshall

saw a growing nuclear component with a strong industrial base as essential for a stable energy policy in the UK. He became involved in the debate about thermal reactor choice—whether the next round of civil stations should be pressurized water reactors (PWRs), steam-generating heavy water reactors (SGHWRs), or more advanced gas-cooled reactors (AGRs). He became convinced that the right choice would be PWRs. He had been impressed by the amount of PWR fabrication that could be accomplished in a factory rather than on-site during one of his visits to Westinghouse facilities in the USA, and he thought that the UK nuclear industry would do better in foreign markets if it too were building the most popular reactor in the world.

The CEBG also favoured PWRs, but there were wider concerns about their safety, and Marshall gave increasing attention to questions of safety and large-scale accidents. In particular, the Government's Chief Scientific Adviser (Sir Alan Cottrell, F.R.S.) drew attention to the possibility of rapid fracture of the steel pressure vessels under operational or accident conditions. The Chairman of the UKAEA, Sir John Hill, had invited Marshall to set up a study group to review the integrity of PWR pressure vessels and draw conclusions about the mathematical probability of vessel failure and about the factors that affected that probability. Marshall saw that this concern could be addressed only by a rigorous analysis of all relevant features of design, fabrication, fracture analysis, non-destructive test analysis and quality assurance. The probabilities of failure under operational fault and emergency conditions were estimated by taking into account the probable distribution of crack sizes in vessels entering service, the distribution of materials properties and possible crack growth rates in service. A report was submitted to extensive external review and published in 1976.

The Study Group was reconstituted and strengthened with more academic members in 1980, after a government decision that the next nuclear station to be built would be a PWR, if safety requirements could be met. The whole study was reviewed, using the latest evidence on materials properties. The work included a fracture assessment of the pressure vessel of a generic four-loop PWR of modern design, reviewing and comparing different methods of fracture analysis. The final Report, published in 1982, ended with 57 'essential' recommendations and listed a further 26 topics that should be pursued to improve understanding. Sir Alan Cottrell accepted the general conclusion that a PWR pressure vessel subject to all these conditions would

have a high integrity and reliability in service and welcomed particularly the emphasis given in the Report to the need for rigorous ultrasonic inspection, backed by independent validation of the techniques used. This recommendation was later implemented in the arrangements made for the non-destructive testing of the Sizewell PWR. The general influence of the Study Group has since been extended by the formation of a Technical Advisory Group, currently chaired by Sir Peter Hirsch, F.R.S., which provides a peer review body on structural integrity issues (TAGSI) across all nuclear plant in the UK.

Walter Marshall also played a vigorous part in the debates about the safety of the nuclear fuel cycle that took place in the 1970s. These debates were initiated by worries about the safety of fast reactors—then the major project of the UKAEA—and of the dangers of the theft or diversion of plutonium if it became a common article of nuclear trade. But broader questions of the future need for nuclear power and for fast reactors as a means of extending uranium supplies were also raised, as in the Sixth Report of the Royal Commission on Environmental Pollution in 1976. Most significantly, official opinion in the USA turned against reprocessing nuclear fuel and even against the worldwide growth of nuclear power.

President Carter postponed indefinitely the reprocessing of civilian spent fuel in 1977 and deferred the development of fast reactors. He launched the International Nuclear Fuel Cycle Evaluation Exercise (INFCE) to assess and reduce the danger of the proliferation of nuclear weapons arising from civilian nuclear power installations. Marshall became involved, as co-chairman with a Japanese delegate, of Working Group 4 of INFCE, dealing with reprocessing, plutonium handling and recycling.

Marshall made his own personal position very clear in a series of lectures, during and after the conclusion of INFCE in early 1980. He was convinced that an increasing nuclear power programme was essential—‘a moral imperative’—to meet the energy requirements of an expanding world population. To achieve this, a gradual change to fast reactors and an efficient, closed fuel cycle would be necessary. He thought that the fears that had been expressed about fast reactors had been exaggerated. He saw fast reactors as a means of controlling the total stocks of plutonium in the world, since they could be designed to consume plutonium or to ‘breed’ plutonium slowly, but never to produce as much plutonium as thermal reactors for the same energy output. He disliked the regime of storing spent fuel indefinitely,

as advocated by the USA, fearing that the stores could become plutonium sources of increasing accessibility, which would be a target for diversion or theft.

Marshall's alternative vision was an international regime of interdependence in which a few countries with large enough numbers of thermal reactors would set up reprocessing plants and use the separated plutonium to fuel fast reactors. Marshall recognized that such an international regime could be realized only if many governments saw the advantages and were willing to support it. In any case, it could be only one item in an international regime aimed at preventing the proliferation of nuclear weapons—a broader objective than the control of plutonium, and essentially a political objective, which might be assisted, but not solved, by technical means. Much depended on the political leadership of the USA, and Marshall gave several lectures in the USA to explain his views.

The INFCE ended without making any universal policy recommendations, though the need for international cooperation in strengthening safeguards against proliferation was emphasized.

It was seen as a satisfactory result for the UK. Marshall was thanked for his contribution by the Department of Energy. Since the early 1980s, however, the economics of fast reactors have seemed less favourable. Marshall could not offer funds for fast reactor development when he moved to the CEGB, and government support has also been withdrawn. More countries have turned to recycling plutonium in thermal reactors—as Marshall predicted would happen.

YEARS OF TECHNICAL MANAGEMENT

Walter Marshall's life changed dramatically when, in 1983, Mr Nigel Lawson, Energy Secretary, summoned him to say: 'The Prime Minister and I have decided that in the national interest you should be the next Chairman of the CEGB'. Privatization of the electricity industry was not an issue at this stage. The big challenges were to get nuclear power relaunched and to reorganize a business whose generating capacity had changed dramatically since it was unified in the 1940s. An inventory of 278 power stations had shrunk to 70. But a paramount factor, Lawson made it plain privately, was

that Marshall was seen by the Government as 'Mr Nuclear'. It was the start of some of the happiest years of Marshall's life.

His abilities as an inspirational manager and natural leader who 'made things happen' emerged early in his career. At 30 he spent a sabbatical year at the Oak Ridge National Laboratory in Tennessee. The director, Alvin Weinberg, was later to reflect to one of the authors: 'I think if Walter had stayed any longer, he would have taken over this laboratory'.

The task that brought him to ministerial attention as a potential chairman of the CEBG was one thrust upon him as the new Chairman of UKAEA in 1981. Britain's nuclear design and construction industry was in disarray. This was most evident in attempts to get ready for public inquiry a design for a 'British PWR'. The CEBG and the nuclear companies asked the Energy Secretary for Marshall to lead a Task Force to sort out an agreed design. For 18 months Marshall led this Task Force, which settled the design for Sizewell B, seen as Britain's lead PWR station. This design had to meet Britain's nuclear safety requirements, founded on gas-cooled reactors, without compromising the integrity of the Westinghouse nuclear steam supply system (NSSS) required for the PWR. Marshall demonstrated well that he could lead a divided and quarrelsome industry.

But in so doing inevitably he made himself the prime target of groups opposed to nuclear energy. He met criticism with a disconcerting mixture of jolly good humour and abrupt dismissal. When a group called SCRAM—the Scottish Committee for Resisting the Atomic Menace—published a postcard featuring a sketch of a PWR with Marshall's features drawn on the containment dome, he considered it to be good fun and ordered a batch. But in public debate, when opponents abandoned logic or dismissed his science, he could lose patience.

While he was leading the PWR Task Force there was a turning point in Britain's relations with the US nuclear industry. The earlier disarray had convinced the industry that Britain was not serious about adopting the PWR. Marshall invited two senior engineers from Westinghouse and Bechtel to audit progress by his task force for themselves; especially the tricky business of accommodating British safety requirements. Marshall also promised his guests a meeting with the Energy Secretary. The visit coincided with rumours of a Cabinet reshuffle in which Mr David Howell, Energy Secretary, would be replaced by Mr Nigel Lawson. Anticipating the

change, Marshall sent a note to the Prime Minister's office to register how important it was to the PWR programme that his guests should meet the Energy Secretary. As a result, the American engineers found themselves at 10 Downing Street meeting not only Lawson, the new Energy Secretary, but also the Prime Minister, Margaret Thatcher. The 30-minute interview began with the Prime Minister stating that she understood the critical issue was detecting cracks only an inch long in the pressure vessel. Finally, the Americans were convinced Britain was serious about the PWR.

The long coalminers strike, in 1985-86 was an unscheduled interruption to Marshall's tenure at the CEBG. As he saw it, the electricity supply industry had a professional obligation to keep the lights burning, regardless of the miners' arguments. He did not take sides publicly.

Nuclear energy was not an issue during the strike, since the CEBG ran its reactors at base load and there was no extra power available from that source.

In what Marshall called a personal footnote to a book by CEBG executives about its management of the miners' attempt to deprive them of their principal fuel (Ledger & Sallis 1995), he recounts how at his first board meeting in mid-1982 he asked about plans to combat a strike, and was not satisfied with the answers. He called for a 'simple, straightforward statement of policy'. His director of operations responded with a £70 million plan to build coal stocks to unprecedented levels, to prepare power stations against siege picketing, and to bum oil in both oil- and coal-fired stations.

The strike began in March 1984, and two days later he met his executive directors to decide what the utility's response should be. It was a difficult decision, for they could not ask for government advice lest this give the dispute a political flavour and alienate its own workforce.

The decision his board had to take was whether to bum the coal stocks it had accumulated and paid for, or bum oil. If it burned coal and the strike outlasted stocks, the miners would win.

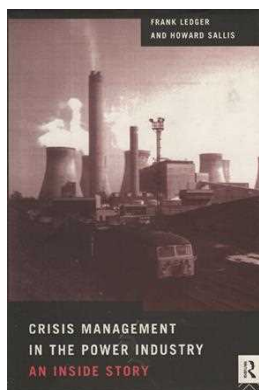
On the other hand, if they burned oil and the strike proved short-lived it would have to pay a big extra fuel bill. 'I decided to burn oil ... a unilateral decision taken in view of the legal responsibility of the CEBG "to maintain a secure electricity supply to England and Wales".'

The next three months were miserable, Marshall records. Then colleagues in the industry and Whitehall began to talk of the wisdom of

burning oil. As winter approached there was need to keep the Prime Minister informed. The Energy Secretary—by then Peter Walker—arranged for them both to see her. They promised her they would keep the lights on. ‘Of course I did not actually know that we could, but it was quite clear that the Prime Minister’s role in this dispute was to sit quietly at No. 10 as an observer. It was not a role that Mrs Thatcher liked, but with some reluctance she agreed. Walker and I therefore hold the unique record of giving her unwelcome advice—and surviving’.

The strike lasted a year and the CEGB ran up a £2 billion oil bill, underwritten by the Government. For keeping the lights on, Marshall was rewarded with a peerage that elevated him to Lord Marshall of Goring—the Thames-side town where he lived for most of his career.

A courageous decision was needed to start increasing oil burn and on 26 March the Chairman, Sir Walter Marshall, made it, with the support of his executive director colleagues and later the full Board. It was a difficult decision. He felt personally at risk since he believed that if the strike collapsed after a short time everyone would then rationalise why a short strike was inevitable. It would therefore be difficult to justify in retrospect the high cost of burning oil. The same day he told Sir Philip Jones, chairman of the Electricity Council and the Secretary of State, Peter Walker. The urgency of the decision made it impracticable to consult formally with the Electricity Council and the area boards. The Prime Minister, Margaret Thatcher, was told almost immediately. No disagreement with the decision or advice to the contrary was communicated to Sir Walter Marshall and that was interpreted as endorsement of the action. Margaret Thatcher in her memories The Downing Street years, states that she made the decision to start oil burn. She actually did so by deciding not to intervene.



From the book “Crisis management in the power industry. An inside story”

Marshall also had a flair for public relations that was not characteristic of the industry he led. Shortly after he became Chairman, anti-nuclear critics charged that the CEGB's spent-fuel shipping casks would not survive a serious transportation accident. Marshall agreed to a dramatic public demonstration of a cask's integrity. A full-size, albeit empty, cask was placed on a railway siding and a locomotive driven into it at full speed. The event was well attended and accompanied by a racecourse-style commentary. The cask bounced up in the air and came down intact. The locomotive did not fare so well. The event generated enormous publicity and was a remarkably successful public relations exercise.

Another success was scored soon after the coal strike ended in 1986, when the headmaster of Westminster School, close to the Palace of Westminster in London, invited Marshall to talk to his pupils. Marshall saw it as an opportunity to get the perceived hazards of radioactive waste into better perspective. His address became known as 'the garden lecture' and was subsequently given by him throughout Britain. It involved bringing samples of nuclear waste, suitably contained, into the hall, within a few metres of his audience, and using a very audible signal from a Geiger counter to dramatize their presence. An enthusiastic gardener himself, he showed how a garden always contains substantial quantities of radioactive materials.



CEGB Nuclear Train Flask Collision Test - Operation Smash Hit (1984). Walter Marshall the CEGB's chairman summed it up for the press afterwards. "General public made the point, we're not going to believe, we want to see you actually do it, so well now we've done it."

<https://www.youtube.com/watch?v=hTshPr2TogE>

In his words, ‘we are surrounded by radioactivity, and most of us are hardly conscious of the fact’.



Lecture at Eton College “Electricity, nuclear power and nuclear waste”, 30 April 1986

Marshall’s consummate skill at putting across complex technical matters in simple terms, and often with very appropriate wit and humour, became greatly appreciated at all levels, from the schoolchildren who received his first garden lecture so enthusiastically, to the Prime Minister.

Where he had problems with boardroom colleagues at the CEBG was in recognizing that it was basically a coal-fueled generating company, and long would remain so, no matter how successful he proved in converting it to a nuclear utility. The immense magnitude of the nuclear problems took centre stage in his mind; not only problems in launching the PWR but also problems with seriously underperforming gas-cooled reactors which were expensive and were compromising the nuclear image.

In 1981, the year before he joined the CEBG and as Chairman of the UKAEA, he set down his thoughts on management for his senior executives. His experience at senior level had been in high technology and in areas where there was a high degree of public accountability, he said. He



*Lecture at Westminster School
"Electricity, nuclear power and
nuclear waste" 1986*

was convinced that the most senior people in an organization must strive constantly to see they had enough time to think about problems beyond today and this week. Another important task of management, he urged, was to avoid anonymity. Big organizations so easily became remote and impersonal. To some senior managers the task came more naturally than to others, but whether they liked it or not it was a task they had to do. Marshall's boundless enthusiasm and energy left no one in doubt that it came naturally to him, and that this forceful personality revelled in being seen as the leader.

A senior civil servant who had been closely associated with Marshall's career from the time when he was appointed Chief Scientist to the Department of Energy in 1974 recalls, 'the aura of a man who knew his worth and who could demand his own terms on such matters as living and travelling arrangements'. He wanted a car he could use as a travelling office for his frequent journeys between Harwell and Whitehall. He used Harwell, which he knew intimately, as a technical resource in strengthening the Department of Energy.

Where Marshall proved less robust as a manager was when, in 1977, he was abruptly sacked by Mr Anthony Wedgwood Benn, Secretary for Energy. Relations between them had grown increasingly strained through Marshall's enthusiasm for nuclear power and Mr Benn's growing suspicion of the nuclear industry. Benn's action was against the advice of his most senior officials. Marshall, clearly very shocked by the first major setback of his career, returned disconsolately to the UKAEA, where he had retained his position as Deputy-Chairman.

The Chernobyl explosion

On 26 April 1986, a Soviet-designed RBMK reactor exploded at Chernobyl in the Ukraine, releasing radioactivity that was to spread worldwide. Speaking to nuclear industry executives and MPs on 1 May, Marshall said the reactor had unsatisfactory safety characteristics, which ensured that the design could never be licenced in Britain. He called it a unique design with no counterpart in the West. Britain had no bilateral exchange agreement on nuclear accidents with the USSR of the kind it had with many other countries. By the end of May, Marshall was acknowledging that the accident had badly shaken public confidence in nuclear power and cast gloom over all nuclear activities.

Marshall led the British delegation to the special conference convened by the International Atomic Energy Agency in Vienna in August 1986, when the Soviet Government presented its analysis of the accident. In a dramatic presentation, which included colour film of the burning reactor core, Dr Valery Legasov, leading the large Soviet delegation, spoke of a 'tremendous psychological mistake on the part of the designers of this reactor'. He admitted several crucial design weaknesses. 'He's laying it all out', said an astonished Marshall. 'He's admitting faults in the design, in training, in Soviet safety philosophy' (Fishlock 1986).

Legasov also sought help from the West. Marshall accepted that what had occurred was a nuclear excursion. He was to play a leading role in helping the Soviet Government modify its RBMKs and its operating practices to ensure that such an accident could not happen again. He was later to liken the basic design flaw to a car with a design fault that required the driver to give constant attention to his brakes when driving below 20 miles per hour, to prevent the car from surging to 100 miles per hour if, for example, the fan belt should break.

In January 1987, the public inquiry into CEBG plans for a PWR at Sizewell – the so-called 'British PWR' – recommended the project. It was a personal triumph for Marshall as 'Mr Nuclear', although a fellow CEBG member, John Baker, had led its case before the inquiry.

The Government approved plans for the construction of Sizewell B as lead station of a £6 billion programme of PWRs in March 1987. Marshall hailed the decision as the best buy for the electricity consumer, and forecast

that the CEEB would make another PWR planning application that year. He rejected Treasury criticism of CEEB investment plans as too ambitious and too expensive as 'the kind of thing the Treasury always says'.

In February 1988, the Government published its White Paper on the future shape of the electricity supply industry. The CEEB was to be split into two generating companies, with a third to own the transmission grid. Marshall's efforts to persuade government that it should be kept whole because it had been conceived and designed as a single, integral system which could be destabilized by fragmentation had been unsuccessful. Political imperatives had prevailed. Marshall was disappointed but phlegmatic: he saw the decision to break up the utility as a purely political decision and not a criticism of the CEEB. 'I can accept that', he said. He was later appointed Chairman-Designate of National Power, the larger of the two generators and the one which was to run the nuclear reactors.

But in 1989, the Government made three basic decisions relating to the reactors that were to change the situation profoundly. One of them effectively eliminated the task for which Marshall had been recruited in 1983. The first decision, in July, was to withdraw the ageing Magnox reactors from privatization plans, on grounds that it was unrealistic to expect private investors to shoulder the high shut-down costs for plants then seen as relatively near the end of their economic life. The second decision, in November, was to abandon the PWR programme, in light of the financial criteria by which the City of London was weighing electricity investment. Sizewell B, the lead PWR, 2.5 years under construction, was to be completed but not replicated as replacements for Magnox reactors. The private sector simply refused to accept the economic case for a series of PWRs on its investment terms, and anyway wanted government to underwrite all financial risks.

The third decision was simply a consequence of the other two: namely, that there was little point in privatizing the advanced gas-cooled reactors when Magnox and the PWR would remain in the public sector. The Government invited John Collier, a long-time close associate and friend of Marshall, to head a new public-sector organization to run the CEEB reactors. John Wakeham (Lord Wakeham), announcing Marshall's resignation to Parliament in December, stressed that Marshall was in no way to blame for the difficulties that had led to those decisions.

Marshall's last act as Chairman was to sign the delayed CEGB accounts for the year, which provide some of the evidence underpinning the nuclear decisions. Provisions for the future nuclear liabilities had increased substantially, partly at least because of the protracted efforts the CEGB had made with its supplier, British Nuclear Fuels, to quantify the inherent uncertainties and hence the true costs of nuclear generation. Its estimates included a doubling of previous figures for the cost of decommissioning a Magnox station, for example, and a doubling of the costs of spent fuel reprocessing. The net result of the increased nuclear cost estimates for the year was to cut by two-thirds the CEGB's earlier estimate of profits for 1988-89, from £956 million to only £355 million.

In a valedictory address to the British Nuclear Energy Society, Marshall observed wryly: 'When at long last we embark upon an appropriate technology we are compelled to abandon it because of the nature of the privatization process which forces short-term commercial judgments on a project whose value is primarily long-term and strategic'. The CEGB had assumed an 8 per cent cost of capital over a 40-year life for its PWR programme. The banks wished to recover their capital in 20 or even in 10 years, he said.

THE ENTREPRENEURIAL YEARS

Several senior commercial friends rallied to the support of the deposed Chairman. Sir Richard Giordano, Chairman of British Oxygen and a non-executive CEGB member, helped sort out Marshall's financial terms with a Treasury that was disposed to be miserly. Bill Lee, President of the US electricity company Duke Power, proposed that Marshall should become Executive-Chairman of a new international nuclear organization called the World Association of Nuclear Operators (WANO) that the two of them had helped to found in the aftermath of Chernobyl.

The salary offered was larger than his CEGB salary. Having spent his life to the age of 57 in the public sector, Marshall embarked on a new phase, that of entrepreneur.

WANO was the industry's response to the Chernobyl explosion. At its inauguration in Moscow in 1989, Marshall, as Non-Executive Chairman, had warned its 139 signatories, representing every one of the world's nuclear electricity companies: 'All are agreed that public confidence in nuclear power will not survive another accident as severe as Chernobyl'. The secret

of WANO is peer group pressure; the kind of pressure that ensures no club member can risk being accused of failing to comply with the spirit of WANO. To kindle this spirit he spent much of the early 1990s visiting member companies worldwide, accompanied by his wife, Ann. He estimated that in 1994, the year the new Russian republics were created, he was away from home on WANO business 60 per cent of the time.

Marshall believed that WANO helped to give new status to the engineers who operate and manage nuclear stations in the former Comecon countries. Operators got the blame officially for Chernobyl (although an international study published in 1992 found the engineers and scientists who designed the stricken reactor equally guilty). WANO preached that nuclear operation was a professional discipline and reactor operators were a community of highly trained professionals, as aware of peer group pressures as, say, accountants or scientists.

Marshall also helped persuade the big state-owned research and engineering institutes which hitherto had dominated the international nuclear scene that they themselves had no place in WANO, and that in future they must share power and influence with operators (Fishlock 1996).

Marshall also believed that WANO taught the Russian nuclear establishment how nuclear safety was managed in the West, and why the West was so confident that, although nuclear accidents would continue to happen—just as railway and aircraft accidents continue to happen—a catastrophe like Chernobyl could not possibly happen in the West. When Marshall relinquished his position as WANO's Executive Chairman in 1993, it was persuaded by Eastern Bloc members to retain him as 'ambassador' for further negotiations, so great was the rapport he had built with these countries. In 1994, he set up a Users' Group specifically for operators of the 20 Chernobyl-type (RBMK) reactors.

In 1990, a young underwriter at Lloyd's of London insurance market set up a syndicate specializing exclusively in insuring nuclear risks—the first ever. Michael Dawson recognized that he needed two things to succeed: considerable expertise in assessing nuclear risk and credibility in the City (he was only 29). He phoned Marshall and immediately won his attention. Marshall became adviser to the new venture, and friend and mentor of the ambitious young underwriter. In 1995, Dawson floated his venture on the London Stock Exchange, with Marshall—now a Lloyd's Name—as Chairman.

From a market capitalization that year of £30 million, Cox Insurance Holdings grew to £400 million over the next three years.

In 1992, Mr Shiochiro Kobayashi, Chairman of Kansai Electric Power Company, a leading Japanese nuclear generator, made another personal approach to Marshall for help in setting up a new technical venture aimed at reinforcing public confidence in the inherent safeness of nuclear power. He sought an independent adviser of international standing. That year Marshall was appointed adviser to the new Institute of Nuclear Safety System Inc. headed by Professor Nobuaki Kumagai. The appointment took him to Japan several times a year. In 1997, the Institute dedicated the Marshall Conference Room. It has also named an eddy current flaw detector the **Marshall Probe**.*

Walter Marshall was a person of considerable and unforgettable presence, and of many parts, a polymath and much more. Even his tortured accent was unique, forged he said by consorting mostly with emigré European physicists in his late teens. He made considerable efforts to develop the UK's international nuclear relations in the 1970s, much of which came to nothing, but this was followed by building an unusually warm and productive relationship with the Japanese. Marshall was a self-confessed workaholic who enjoyed the exhilaration of power. Some found him overbearing, and his habit of working with a small number of trusted colleagues outside established lines of communication sometimes led to tension. He gave enormous attention to his public lectures and he was a popular and entertaining speaker. When it was discussed in the late 1980s that a book might be written about Walter Marshall, his first response was: 'I would want you to start with a long talk with Ann'. Ann Shepperd, who came from the same village, married Marshall when he took his first job and they remained together for 41 years, living beside the river at Goring from the mid-1960s. Bridleway House became famous for parties memorable for Ann's grace and elegance and Walter's boisterous good humour. Despite a crippling workload throughout his career he remained a family man to the end with a penchant for DIY and the garden. They had two children, a son who became a doctor and a daughter who became a scientist. For the last two decades Ann was his constant companion and aide on his travels, and finally also his nurse during a long terminal illness.

* For friendly political reasons, the agreement was that it would be known as "The Kansai-Marshall Probe" in Japan and by Kansai customers but "The Marshall-Kansai Probe" elsewhere. – Victoria Marshall

HONOURS AND PRIZES

- 1964 Fellow of the Institute of Physics.
Maxwell Medal, Institute of Physics.
- 1971 Fellow of the Royal Society.
- 1973 C.B.E.
- 1975 Glazebrook Medal, Institute of Physics.
- 1977 Foreign Associate, National Academy of Engineering, USA.
- 1977 Honorary D.Sc., Salford University.
- 1979 Fellow of the Royal Swedish Academy of
Engineering Sciences.
- 1982 Knighthood. Honorary D.Sc., City University.
- 1983 Honorary Fellow of St Hugh's College, Oxford.
- 1984 Freeman, City of London. Honorary D.Sc.,
Birmingham University.
- 1985 Life peer. Henry de Wolf Smythe Nuclear Statesman
Award, USA.
- 1987 Honorary Fellow of the Welding Institute.
- 1991 International Award, Canadian Nuclear Association.



*The Most Excellent Order of the British Empire
Knighthood, 1982*

The Institute of Mathematics
and its Applications



This is to certify that

Walter Charles Marshall

was elected a

Fellow of the Institute

on the 2nd day of April 1964.

Given under the Common Seal of the Institute
by resolution of the Council

M. J. L. Smith President

Bryan Thwaites

Members of Council

P. H. W. W. W.

Norman C. Smith

Secretary & Registrar



The Royal Society
of
London

18. March 1971

Sir,

We have the honour of acquainting you that
you were today elected a Fellow of the Royal Society
in consequence of which the Statute requires your
attendance for admission on or before the fourth
Meeting from the day of your election, or within
such further time as shall be granted by the
Society or Council, upon cause shown to either
of them, otherwise your election will be void.

You will therefore be pleased to attend at
half past four of the clock in the afternoon on
one of the following days, viz:-
Thursday 25 March Thursday 1 April
Thursday 22 April Thursday 29 April

We are,

Sir,

Your obedient Servants

Walter Marshall, F.R.S.

Secretaries

Printed by the Society



THE WELDING INSTITUTE
THIS IS TO CERTIFY THAT

The Lord Marshall of Goring

WAS ELECTED
Honorary Fellow
OF THE INSTITUTE ON

6 May 1987

IN TESTIMONY WHEREOF THE SEAL OF THE INSTITUTE
HAS BEEN HEREUNTO AFFIXED BY ORDER OF THE COUNCIL
AS WITNESS

CHAIRMAN OF THE PROFESSIONAL BOARD

MEMBER OF COUNCIL

SECRETARY FOR PROFESSIONAL AFFAIRS



PRIME MINISTER - PREMIER MINISTRE

November 5, 1991

Dear Lord Marshall,

I am delighted to convey my congratulations and best wishes to you on receiving the Canadian Nuclear Association's 1991 International Award.

This tribute reflects the high esteem in which you are held by the nuclear industry world-wide. Your efforts to promote nuclear safety together with your formidable business acumen are indeed worthy of recognition. You may take great pride in your accomplishments, and I am certain that your Canadian colleagues welcome this opportunity to honour you today.

I join all those gathered here in wishing you health, happiness and continued success in meeting the challenges ahead.

With every good wish,

Yours sincerely,

Lord Marshall of Goring



THE INSTITUTE OF PHYSICS AND
THE PHYSICAL SOCIETY

This is to Certify that at a meeting of the Council
held this day

Walter Charles Marshall

was elected a Fellow of The Institute of Physics

Given under our hand and Seal by Resolution of the Council

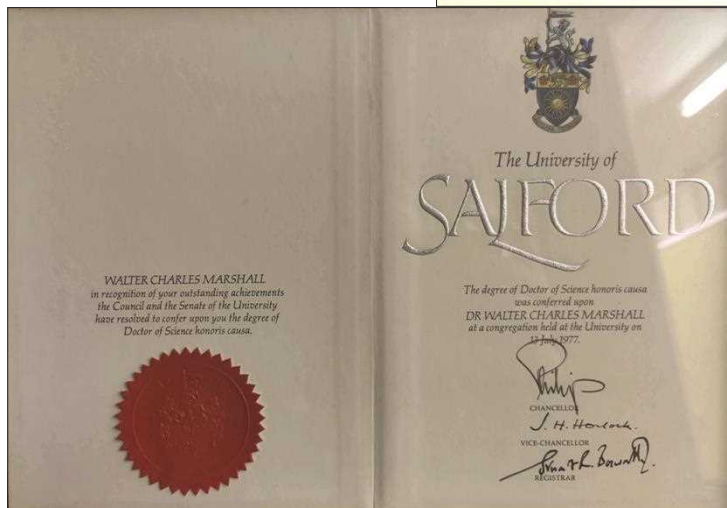
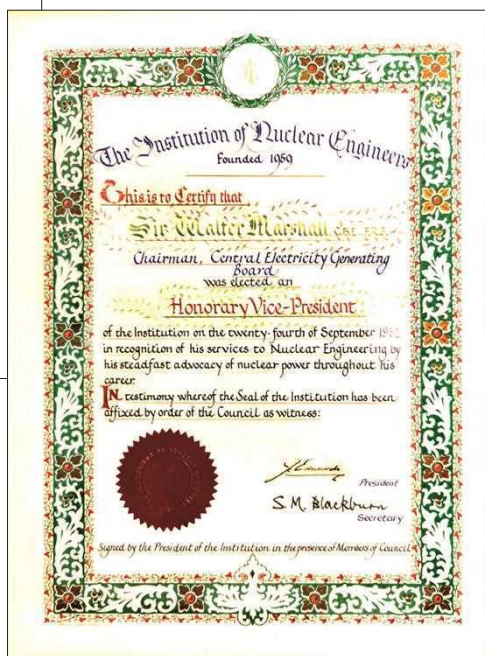
on the fifth day of May 1967

A. F. Wilson

PRESIDENT

C. J. Syme

HONORARY SECRETARY





*The Pen Sketch for "Harlequin"
by John Eggleton,
Engineering Support Division.*

**Personal profile from Harlequin, the internal magazine of the UKAEA,
dated May 1972**

**Answering the "Personal Questions" to start this new series
is the Director Dr. Walter Marshall**

Born 5 th March, 1932; educated Birmingham University;

came to Harwell 1954as Scientific Officer;

Research Physicist, University of California, 1957-58;

Harvard University 1958-59;

Group Leader Harwell's Solid State Theory, 1959-60;

Head of Theoretical Physics Division, 1960-66;

Deputy Director, 1966-68;

Director, 1968;

Director Research Group U.K.A.E.A., 1966-68;

Member National Research Development Corporation, 1969;

Elected Fellow of The Royal Society, 1971.

Married 1955, one son, one daughter.

Recreations listed in "Who's Who" are Croquet, Chess,
Gardening, Origami.

The Pen Sketch for "Harlequin" by John Eggleton,
Engineering Support Division.



1. If you could meet and talk to any person living today, whom would you choose?

Chou En Lai.

2. And if from the past, then whom?

Duke of Wellington.

3. What are your hobbies?

Physics.

4. What is your favourite saying?

Be reasonable! Do it my way!

5. What sort of holiday do you prefer?

A family holiday in a luxury hotel.

6. What type of person irritates you most?

*People who don't listen and, therefore,
cannot themselves communicate.*

7. What kind of entertainment do you enjoy most?

Opera.

8. What "little things" irritate you most?

Background music simultaneous with conversation.

9. If you could do any job in the world, what would you choose?

Director of Harwell.

10. What in your wife's opinion are your worst vices and greatest virtues?

*Worst vice: He always thinks he is right.
Greatest virtue: He is always right.*



II. YEARS OF WANO

ONE OF WANO FOUNDERS

/by Nikolay F. Lukonin, first WANO President/

... How was WANO founded?

The Chernobyl nuclear plant accident that had brought the nuclear industry to the brink of survival posed a question of how all nuclear professionals could pull together as a community to prevent a similar recurrence. In October 1988, the window of opportunity presented itself at a Paris meeting I participated in on behalf of the USSR. The meeting, aiming to work out operational safety improvements, deemed it expedient to found WANO with its mandate to serve as a cooperation platform for the extensive sharing of information, operating experience, etc. to drive operational safety enhancements.

The following individuals were among the first to play an active role in the foundation of the organisation whose inaugural meeting was held in Moscow on 15 May 1989:

- **Lord Walter Marshall of Goring**, Chairman of Great Britain's Central Electricity Generating Board (CEGB)
- **William S (Bill) Lee III**, Head of Duke Power Company (USA)
- **Pierre Delaporte**, Chairman of Électricité de France (EDF)
- **Shoh Nasu**, President of the Tokyo Electric Power Company (TEPCO)
- **Zack Pate**, Chairman and CEO of the Institute of Nuclear Power Operations (INPO)



Lord Marshall of Goring, Nikolay Lukonin and William S. Lee



Inaugural meeting, Lord Marshall of Goring, Nikolay Lukonin

MEANINGFUL MEETINGS

/by Anatoly M. Kirichenko, First Deputy Director, WANO Moscow Centre/

There was little to suggest that the turbulent, dramatic, watershed years of the 1990s-2000s would allow me and us to have the good fortune to meet and communicate with amazing people, people of beautiful culture, extraordinary mind and eminence. Many of them are representatives of the so-called West, far-away America, Japan and The Foggy Albion.

The creation of the World Association of Nuclear Operators in 1989 was not an ordinary event: only the “powers that be” were able to find a common interest and goal and unite for cooperation of all the utilities and nuclear power plants around the world, all without exception, to ensure the safety of nuclear power plants on all the continents.

Walter Charles Marshall was a well-known physicist, CEO of a large UK nuclear power company, a chairman of various scientific and technical unions and councils, and also Lord Marshall of Goring.

My first meeting with this man, with the Lord, took place at the Inaugural Meeting in Moscow in May 1989 where the Charter was signed on the establishment of a new international organization of WANO. I had the honour, along with the others, to sign that landmark document. Lord Marshall and Minister of the USSR Nikolay Lukonin shook hands with me, took pictures and captured this event with smiles on the stage of the International Trade Centre.



A. Kirichenko is signing the Charter at the Inaugural Meeting

Lord Marshall was the first WANO Chairman, and he would have to coordinate the establishment and development of our organization—under special circumstances and with regard to differences in cultures, positions, capabilities, technologies and designs. He would shape “aristocratic” culture of interaction and cooperation of nuclear operators.

He travelled the world a lot and often visited our country. In our company—Rosenergoatom—any of his visits was a master class on various everyday topics: how to negotiate, how to write letters, how and what to talk about, how to grasp complex things easily and how to be patient in addressing challenges. I was involved in many meetings and I learnt a lot. His requests to meet someone were quite unusual, for example: “...Please organize a meeting with the Peace hawk”—he meant Minister Victor Mikhailov, or “... I would like to listen to the opinion of the Kursk nightingale on RBMK”—this was about Mr Gusarov, Kursk plant director, or “I missed smart Armen”—this was, of course, about Armen Abagyan, director of VNIIAES, the nuclear scientific institute.

Sophisticated British humour, creative thinking, precise definitions, social graces have always defined his image for us, the image of the Lord!

Lord Marshall often invited our delegation to his estate in the suburbs of London, where we could see and hear this legendary man and talk to his neighbours in an informal setting. I will always remember these meetings.

WANO is a successful global project, and it is being successfully implemented. The basic foundations laid by Lord Marshall have become the values of our Mission and a guide for the future. These values are international: Partnership, Trust, Collective and Individual Responsibility, Professionalism and common Safety Culture.

BALL MOVING

/by Zack Pate, WANO Chairman Emeritus, to mark 30 years of WANO/

Tom Mitchell: I would first like to welcome to stage one of WANO's founders, Chairman Emeritus Zack Pate to the lectern, to share some of his thoughts and reminisces about the origins of WANO. So please join me in welcoming Zack Pate in this special session.

Zack Pate: I recall giving a speech several years ago in Toronto, Canada. And it was I think the conference sponsored by the Canadian regulator, I was giving the speech for the closing of the conference. My wife Betty was there with me. And so the guy that introduced me was an executive with what was then Ontario Hydro. And in the introduction, he referred to me as one of the great leaders of our industry. So my ego went up a couple of notches. I gave my speech, went to town, had dinner with my wife. Then when it is over, we're walking back to our hotel room, and when I get in a private place, I look at my wife and I say, "Honey, am I one of great leaders, do you think, there are in our industry?" With very little hesitation, she looks at me and says "One less, and you do". Now my ego came right back to size.

Now I was 43 years old when the Three Mile Island accident occurred 40 years ago, so if your math is pretty good, you can figure out how old I am now. And I gave many talks and speeches during my career, but I haven't done one in several years. And my vision has deteriorated greatly, so we got the speech prepared and it was on about three pages typed but I couldn't read it at all. And so with help from the stair, of the WANO stair we expanded the font to bigger and bigger font, and when I got to read it, it was 40 pages, so I'm going to bring 40 pages up here. I would drop a page or go to mixed up.

So I'm having to speak today from memory. So, please, forgive me if I pause for a minute to try to do a memory search. One thing I will not forget. As the names of the people that I will match on that were early founders of WANO. Speaking of my wife, Betty, our 27th wedding anniversary was on 26 April 1986, the day of the Chernobyl accident. I never got any credit for celebrating that anniversary. And the bad news that day got worse for many, many days.

Soon our team at INPO was seriously thinking about what should we do, if anything? At that point in time, we held a small international program, small in the sense of number of people, but 13 countries in Europe and Asia were members and we had an International Participant Advisory Committee with one person from each country. And we called that International Participant Advisory Committee IPAC for short. So we easily decided that we would form a committee from IPAC and a separate committee from a board of directors to independently think about what should we do in response to Chernobyl.

Well, the IPAC members were Thomas Eckered from Sweden, he was chairman, Pierre Tanguy from EDF and later Boris Saitcevsy from EDF, Juan Eibenschutz from Mexico, Andrew Clarke from the UK and Stan Anderson who was director of our international program. The board committee was Billy Bob Campbell and Stan Anderson. And they were tasked with studying and thinking about the whole worldwide situation. What should we do, as I said, if there're anything? But they would work independently, and they did and they really put their hearts into it. And they came to several conclusions that were virtually the same.

Those conclusions were as follows.

Number one. We should attempt to form some kind of international organization, nuclear safety organization.

Number two. It could not be an expanded INPO and actually it couldn't be in America. And the reasons for that were at that point in history, the performance of US nuclear utilities lag that of most other countries. And in addition, the Three Mile accident was fresh in everybody's memory. And then they added, furthermore, it can't be led by an American for the same reasons. And their final or important conclusion was that such an organization can't be set out in one place geographically. We talked a lot about Vienna, but they pushed that away and said we need to spread the signals of this organization around the globe to account for different cultures and different languages. They didn't go into further detail at that point.

So, the next big question was who could lead such an organization? We had already concluded it couldn't be an American. So these committees and my staff considered a number of names. And pretty soon and rather easily we settled on Sir Walter Marshall, later Lord Marshall. At that point, Marshall was the chairman of a giant utility that served virtually all over

the UK. Andrew Clarke worked for him and knew him well, and so Andrew was pleased to get the assignment to go, try and convince Marshall to take up the mantle and lead this new organization and this new idea. Several days later, he called me from London and said, "Zack, I gave it my best, but Marshall won't do it. Furthermore, he says, this idea is doomed to failure." So that on the phone, that really set me back. But after several weeks of discussion and persuasion, Marshall changed his mind and once he changed his mind, he undertook the challenge with huge enthusiasm.

Next, what do we do next? We got to hear of the backing of utilities around the world. So we came up with the idea of a planning meeting to invite leaders from around the world. And EDF readily agreed to host that meeting in Paris. So now you think about that planning meeting was 32 years ago. EDF was a host. Thirty-two years later, here we are, EDF is a host. Thank you, EDF.

Marshall led the planning meeting in Paris. Well, it turned out, I think, representatives from 28 countries. He did a splendid job of describing the need to the audience and the basic concept of what we were trying to do. By the time this meeting was over, every representative top leader from the 28 countries agreed on the concept. Then, soon after that, Russia agreed to host an inaugural meeting in Moscow.

And then, it took almost two years to plan the details of what became WANO, and to plan the details of the inaugural meeting in Moscow. You know, the Iron Curtain was just coming down. So, planning a meeting with details mostly concerning English and the West to be hosted in Moscow was no small challenge. But we held it on schedule. That was well attended. Once again, it was led by Lord Marshall. And it was a huge success. Near the end of the meeting the representatives from every country, 30 of them, came down to the stage of this conference room and signed on the WANO Charter.

I took the podium and promised the full support of INPO, which we surely needed in those early days and which was given, with a full support I stayed there full of enthusiasm. By the end of that inaugural meeting WANO was underway.

Now, I want to name the people that made this happen and that made WANO move forward and made it a success. And I'm talking about the earlier people now. Those of us on stage who are being honored today for

our contributions. There are quite a few other people who are gone now or who couldn't be here and there are a couple in the audience, that very much deserved merchant, the people of merchant early from the IPAC, Thomas Eckered and Pierre Tanguy and so on surely belong on any list of WANO founders. And what they recommended was actually carried out pretty much in keeping with their recommendations.

But now let's look at other people that I'm sure I remember better than most in the audience. So I'll go back for whole 30 years. First, the Moscow Centre. Armen Abagyan was the first chairman of the Moscow Centre and a longtime member of the main Governing Board. He was from Russia and Armenia. He ran a big, big technology company in Russia that supported the Russian nuclear industry. He couldn't be more helpful. He introduced me to key people in Russia that helped me convince the Russians that this Moscow Centre was important. I travelled to Armenia with him and spent three days there. We were friends. Our wives were friends. A few years later, Armen Abagyan received WANO Nuclear Excellence Award at the BGM in Budapest.

Next from the Moscow Centre is a gentleman named Jussi Helske. He was from Finland, he ran the Loviisa nuclear plant in Finland. He was a member of the original main Governing Board. Jussi challenged just about everything we did. We soon learned that it was wise to pay attention to his challenges, and he always meant well. He ran the Loviisa plant to high standards. Loviisa was doing outages on about 25 days. Utilities in the US were taking 60 days or more. So utilities sent small teams to Finland to learn how to do an efficient outage. Jussi Helske received a well-deserved WANO Nuclear Excellence Award at the BGM in Chicago.

Next, the Paris Centre. Remy Carle, our second chairman was totally committed to his job. He travelled extensively, and at his invitation, I often travel with him. His mission was to build and nourish relationships in every region. And believe me, he did, and that was an important foundation block for WANO. Remy put his heart into it, and he, in effect, was a training leader with his belief as chairman. So it's needless to say I have a lot of affection for him.

Pierre Tanguy. I'm sorry. Wrong name. My memory slipped. Pierre Carlier from France ran a nuclear program in EDF, and soon became WANO President. He helped us build positive relationships everywhere, just

as Remy had, and during an early part of my chairmanship, he was a special ambassador for WANO and really made my chairmanship much more successful than without his help.

Next. The Tokyo Centre. Ryo Ikegame from TEPCO was a member of the original governing board and led the Tokyo Centre Governing Board. Ikegame could be a contrarian, somewhat like Jussi Helske. But like in the case of Jussi, we figured out we better listen to his views. He was a long-time supporter of WANO.

Matsushita Mori was a senior officer in Kansai Electric. He was a chairman of the Tokyo Centre after Ikegame. He led the Tokyo Centre through some difficult years. And he was a member of the main governing board. Very constructive member. He and I became good friends, even though he virtually always beat me in tennis. He now has a lovely widow named Tomiko. She came with him to every board meeting. So my wife and I got to know Tomiko well. She came around somewhere and when I'm making the statement that I used to pay, and I could get they couldn't call me Zack, and I know Andrew remembers Tomiko, Tomiko Mori. She came around somewhere and was saying, "This guy, Mr. Pate, has a magic way of getting people to do what he asked them to do". So needless to say, I admired her. And believe it, believe it or not, we got an email from her this summer in which she said the same thing, and Ed Hux is here, and he saw that e-mail so he'll vouch for the validity. So they were good friends, and sadly, she is now Matsushita Mori's widow.

The Atlanta Centre. Bill Lee obviously belongs on this list. He became chairman of WANO at the inaugural meeting. And he and Lord Marshall made a powerful team, and they were good friends for WANO's first two years.

Next, Bob Franklin from Canada. Chairman of what was an Ontario Hydro, and I think most of you know, it's now Ontario Power Generation. He could not have been a better choice for the first chairman of the Atlanta Centre board. He was a thoughtful, persuasive member of the WANO main governing board, and he was actually a role model and a mentor for me. Bob's doing well, I'm sorry he is not here.

Last, but certainly not least, Lord Walter Marshall. His contributions to WANO are legendary. We all know that. His wife, now his widow and the Lady Marshall of Goring, epitomizes a well-known saying "Behind every

good man, there is a good woman". Lady Marshall travelled with him virtually everywhere; she went and went to many, probably most, meetings with him. And she attended virtually all main governing board meetings. She probably remembers more WANO's very early history than most of us in this room.



*Lord and Lady Marshall with
Prince Charles, 9 May 1984,
Dinorwig Power Station, Wales*



*Lord and Lady Marshall, N. Lukonin and G. Nefedov at
the WANO Inaugural meeting in Moscow on 15 May 1989*

For a close, I am on attempt to a bit of humour. It's a story about golf. To those of you who have been to South Africa. I've seen some of the giant anthills in that country. These are example, and that may be a record. But there are many thousands of anthills about this high. Two feet, four feet. So I had a golf tournament in South Africa some years ago. One of the top golfers drove his ball off the fairway and it did ride and landed on one of these anthills. So the audience quickly appointed him to the anthill. And he got up to it, he could see a big hole in it. And he looked carefully down in that hole. He could see something white. So being a determined golfer he takes several practices with his wedge. And he's going to knock that ball out of the anthill. And when he finally gets his aim right, he comes up to the anthill and slams into it. Dirt flies everywhere. Several ants are injured and the ball doesn't move. So he's determined. A couple more practice swings, back up to the anthill, slams into it, dirt flies everywhere again, several ants are killed, the ball doesn't move. Well, this guy's back the way like he's going to do it again. The ants can see him. So meanwhile, the chief ant says to all the other ants: "If we want to survive, we better get on the ball".

Thirty-two years ago. Planning meeting in Paris. And I remember well, Lord Marshall made some marvellous speeches. But the essence of what he said was, if we want to survive, we better get on the ball. And here we are 30 years later and we are on the ball, and I hope everybody knows what this expression means. It means: get with it, get moving. WANO has a bright, very bright future. 1986 was a bad year. 2019 so far for me has been a great year. We are celebrating WANO's 30th anniversary. We're celebrating INPO's 40th anniversary. And my wife Betty and I are celebrating our 60th anniversary. Let's keep the ball moving. Thank you so much.

Tom Mitchell: What a message, keep the ball moving. Thank you Zack, I can't tell you how much we appreciate you being here today. And thank you again for the continued commitment to WANO, it shines through everything you say. I just want you to know, you're an inspiration for all of us following your footsteps, thank you very much.

LORD MARSHALL PRINCIPLES

*/by Gennady F. Nefedov, former Atomic Energy Ministry
International Relations Lead/*

Lord Marshall of Goring is a well-known British nuclear physicist born in Wales. He received the Lord title for significant merits, also as a scientist. With due account of his scientific achievements, he served in Ms Thatcher's government as a CEGB (Central Electricity Generating Board) practically as a Minister of Energy of Great Britain. The Generating Board included UK generating capacities. During his post as a Minister of Energy of Great Britain, the nuclear industry developed vigorously, especially with regard to the nuclear fuel cycle: The two largest NPPs in Great Britain and Europe were designed and constructed (Sizewell A and B), the largest nuclear spent fuel storage facilities. During this period, cooperation of Great Britain with the USSR was ongoing in the nuclear field at the government level (enterprises of the 4th Directory of the Ministry of Medium Machine Building Industry and SoyuzAtomEnergo of the USSR Ministry of Energy) as well as with commercial enterprises (for example, BNFL). However, this position changed after Ms Thatcher approved the programme of Great Britain power development according to which plant building was put on hold and coal-fired power stations started to develop more intensely. Energy sales were taken out of the state control and a free energy market was developed, where any dealer from any part of the country could sell electricity from any part of the country to any part of Great Britain.

Lord Marshall did not totally agree to Thatcher's policy and left Thatcher's government as a note of protest. He went to work as an adviser to the President of the Lloyd Insurance Company. Nevertheless, the Lord was invited to take part in international conferences and technical meetings conducted under the aegis of international companies operating in electrical and nuclear power industries, such as IAEA, IEC and other companies with the same goals. We frequently discussed the issues related to the further development of these industries. As far as the idea of creating WANO is concerned, it was triggered by an accident at Chernobyl NPP. The initial concept was as follows: WANO covers the performance of all NPPs

worldwide. To this end, four WANO Regional Centres were set up (in the Soviet Union in Moscow (the structure at the All Russian Research Institute was monitored by the Ministry of Nuclear Power of the USSR (by Minister N.F. Lukonin), INPO in Atlanta, USA, (President Zak Pate, retired US Admiral), the European Centre: The structure was positioned at Loviisa NPP in Finland, (the manager: the NPP director), and the Asian WANO Office in Tokyo, Japan (the structure is monitored by Japan's nuclear power company. All centres communicate with one another continuously and operate the same equipment (computers, communication systems, etc).

In the event of an accident at any NPP worldwide information about the accident is made available within one day per similar form with brief description of the accident situation shared through regional centres with all NPPs worldwide. Then, within two weeks information about all plants worldwide is shared with all NPPs worldwide, this time with more detailed accident description with technical details and actions to address the accident. Lord Marshall believed that the main task during the WANO creation was to implement the main principle of enhancing the safety of NPPs worldwide and to prevent the recurrence of prior accidents at NPPs worldwide. And today the main task for the professionals operating NPPs is to stick to this principle! Unfortunately, events of the last fifteen years (the Fukushima accident and emergency situations at Ukrainian stations) show that violations of this principle do happen. It's essential for new leaders in the nuclear industry both from international and national companies, especially for those who are not technical specialists to learn, to be aware of and embrace the principles of the great professional Lord Marshall.



Lord Marshall and Gennady Nefedov, WANO



Lord Marshall, Gennady Nefedov and Boris Prushinsky, WANO



III.

A HISTORIAN'S EYE

WANO BOOK

/from 'Nuclear Safety Has No Borders: A History of the World Association of Nuclear Operators' by Philip L. Cantelon/



Author's Biography
Philip L. Cantelon is a founder and CEO of History Associates Incorporated, an historical, archival, and museum services company. He is the co-author of *Crisis Contained: The Department of Energy at Three Mile Island* (1982), *The American Atom: A Documentary History of Nuclear Policies from the Discovery of Fission to the Present* (1991), a widely adopted college text on nuclear history, and *Core of Excellence: A History of the Institute of Nuclear Power Operations* (2012).

Chapter One.

Forging a Global Safety Net

The large conference hall at the Sovincentr in Moscow buzzed with excitement as more than 300 delegates moved down the aisles and filled the seats in the pale blue auditorium. In the front of the room a simple stage was set with a small table, three chairs, a blotter, several fountain pens and stack of papers. A Soviet flag and a large conference logo hung on a curtain in the background. Six translator booths lined the back of the auditorium. In this ordinary setting, something extraordinary was happening: the ratification of the World Association of Nuclear Operators (WANO), an industry agreement to create a non-governmental international organization with the goal of improving the operation and safety of nuclear power plants worldwide. The meeting was, according to an industry publication, the beginning of a “nuclear glasnost”.

The formal signing ceremony to create WANO began at 14:00 on Monday 15 May 1989. On stage stood the co-chairmen of the

conference, Nikolai F Lukonin, the USSR Minister for Atomic Energy and President of the Soviet Organising Committee, and Lord Walter Marshall of Goring, the Chairman of Britain's largest utility, the Central Electricity Generating Board (CEGB) and Chair of the WANO Steering Committee, which had drafted the charter of the new organisation.

The two men were unlikely partners. Lukonin was an electrical engineer, former Director of the Leningrad nuclear power plant and devoted Communist Party technocrat who rose through the ranks to become the country's first Minister for Atomic Energy; Marshall was a world-renowned and award-winning theoretical physicist, a former Chairman of the UK Atomic Energy Authority (AEA), the head of the CEGB and a product of the capitalist system.

Conservative Prime Minister Margaret Thatcher had awarded Marshall a peerage for his ability to keep the country's lights on during a protracted coal miners' strike in 1984-1985. Of medium build, Lukonin favoured plain grey suits in the tradition of Soviet officials. But whatever he wore, a shock of unruly hair gave him a naturally rumpled look. Marshall's tailored suits covered a tall, heavy-set frame. His reading glasses, perched halfway down his nose, gave the impression, fair or not, that he was always looking down on something or someone. He was an imposing figure. As one associate observed, "he could fill up a room," both with his stature and his personality. Off to the side stood the official photographer, poised to capture each member as he signed the WANO Charter. Although the ceremony was only one part of this inaugural meeting, it was highly significant that in signing the Charter each of the world's nuclear leaders was making a commitment in front of his peers to work toward the improvement of nuclear power safety and performance - a vow, one said, "to work harmoniously to improve the quality of operation of nuclear power plants". The disaster at Chernobyl in the spring of 1986 had brought the conferees together with the realisation that global cooperation was necessary for advancement of nuclear safety and the future of nuclear power. Chernobyl had become the rope that tied the industry together across political and cultural boundaries.

Lukonin and Marshall began the ceremony, each signing the Charter and then shaking hands for the photographer, a symbol of the cooperation, collaboration and dedication that brought the nuclear industry together and that those present hoped would be a major part of its future. Then, one by

one, each delegate came up to the stage, signed the Charter, shook hands with Lukonin and Marshall, posed for the obligatory photo and returned to his seat. For nearly two-and-a-half hours, some 140 delegates from 29 countries representing more than 146 nuclear operators marched to the stage, pledging their support for the new organisation. Throughout the speeches, simultaneously translated into six languages, few left the auditorium. When the last delegate signed the Charter, the room burst into applause - from a sense of considerable accomplishment and great relief.



*Lord Marshall
is signing the Charter*



Lukonin and Lord Marshall

“It was a wonderful moment,” recalled one organiser instrumental in the planning of the meeting. William S (Bill) Lee III, an industry veteran of 38 years, the head of Duke Power Company, and soon to be President-elect of WANO, noted as he watched the delegates sign the Charter, “I was overwhelmed with the most remarkable feelings of being involved in a major evolution of the course of history. Here I was, present in the room where people from all over the world who were responsible for the operation of 420 power reactors were pledging, with deep sincerity and emotion, to work together toward the safe operation of nuclear reactors and the benefit of mankind.” For Lee, the signing ceremony represented not only what “WANO could mean to all of us, and not only because of its promise in the nuclear field, but as a model for cooperation in other areas”. WANO’s birth was greeted with great enthusiasm and with substantial expectations. Matching the promise would be no easy task.



The single event that had assembled the world of nuclear power in the spirit of cooperation was the catastrophic accident at the Chernobyl nuclear power plant in Ukraine on 26 April 1986. An explosion and fire at the Number 4 unit released massive quantities of radiation that fell over large parts of the western Soviet Union and Europe, resulting in the evacuation of the nearby city of Pripyat and an international outcry regarding the safety of the Soviet nuclear power industry.

The accident shook the foundations of the Soviet government as well as its nuclear power programme. Although a scientific team departed for Chernobyl the day of the accident, the Soviet government, with a tradition of operating in secrecy, made no public announcement until a Swedish monitoring station detected the radioactive plume two days later. The initial lack of communication after the event was claimed to be due to a lack of awareness about the severity of what had happened.

But once announced, the explosion and its aftermath “made absolutely clear how important it was to continue the policy of glasnost”, Gorbachev later explained. Chernobyl, in his opinion, proved the wisdom and necessity of the openness policy and allowed change to occur. After breaking the

silence surrounding Chernobyl, one observer noted, Soviet announcements were marked thereafter by “honesty and unparalleled information”.

If Chernobyl had a notable effect in terms of how the policy of glasnost was pursued, it also put nuclear power operators throughout the world on notice that a tragic accident to one plant had serious repercussions for them all. “It has taught us a lesson of stark self-interest,” Lord Marshall warned, “that a nuclear accident has an economic fallout which spreads even wider than the radioactivity which is released.” Although the Americans had learned this lesson in 1979 as a result of Three Mile Island, neither that accident nor the US utility industry’s response had resonated much outside North America. As a result, before 1986 there was little sense of collective responsibility among nuclear operators in Europe and Asia. Most considered their operations to be well run and safe. “There was a lot of complacency in Europe; we know how to do it here,” one European nuclear power official recalled about that period. “The general feeling was that the standards in America weren’t as good as they should have been.” Among nuclear plant operators in Europe and Asia, Three Mile Island was “something that happened over there and not something that will happen to us”.

In addition to an attitude of superiority, the culture of nuclear plant managers outside the US operated against any core belief in collective responsibility. Any lessons regarding the safe operation of reactors were rarely shared within a company, and never beyond. “The idea that a power station manager might actually tell somebody that he had made a mistake so they could learn from it was completely anathema,” according to Andrew Clarke, one of WANO’s earliest employees. “There was great reluctance to get any exchange of experience among operators at the time. The view was that you couldn’t share experience between different types of reactors, so there was very little exchange between the UK operators and the rest of Europe for that incorrectly perceived reason.” Consequently, there were no mechanisms for capturing and sharing operational experience. Chernobyl, however, served as the catalyst to dissolve the arrogance and isolation of the old order and begin the process of preserving a nuclear future.

The road from Chernobyl to the Inaugural Meeting in Moscow ran through the US and France. The initial impetus for some type of worldwide response came from the Institute of Nuclear Power Operations (INPO) in Atlanta, Georgia. Established in 1979 by the US utility industry in the

aftermath of Three Mile Island, INPO was a non-governmental organisation that sought to promote the highest levels of safety and reliability in the operation of commercial nuclear power plants. In its formative stages, INPO found it difficult to overcome the industry's reluctance to share operating information, especially if it exposed any weakness, and a general opposition to add another layer of operational safety and performance review beyond the US Nuclear Regulatory Commission. But as the organisation took shape, it demonstrated the value of Peer Reviews, operator training and the exchange of operating experience in preventing accidents and improving performance. Most US utilities came to see INPO as a good investment. By 1986, the concept of self-regulation had proved effective and gained broad support from the industry and from the Nuclear Regulatory Commission. INPO officials, led by Chairman and CEO Dr Zack T Pate and President William S Lee III, immediately recognised the historical parallels between Three Mile Island and Chernobyl and believed that the INPO model, or some version of it, would be applicable on a global basis.

...The third individual critical to the Planning Committee was Andrew Clarke, who had replaced Eckered as chair of the IPAC. Clarke had been instrumental in shaping the direction the INPO working group had taken toward a new international organisation rather than an expanded INPO. Born in London just as the war ended in Europe in 1945, Clarke took his degree in applied mathematics at Cambridge University and accepted a position with the CEGB, which had been created in 1957 to supply energy in England and Wales. Clarke possessed a quick mind, an articulate tongue and a talent for organisation.

He was a keen observer of people and read others well. In January 1987, Clarke chaired the first Planning Committee meeting in London. He was an ideal choice - he ran meetings well and kept the discussions on point, a highly valued skill for any group, but especially one in its infancy. His boss, CEGB Managing Director Lord Walter Marshall, supported the idea of an international organisation and allowed Clarke to devote some of his time to get it started.

Over the next few months, all three men, Hutcherson, Eckered and Clarke, were in London working on plans for the Paris meeting. With assistance from INPO, UNIPEDE, the International Atomic Energy Agency (IAEA) and British embassies throughout the world, the small staff was

able to assemble an invitation list of the top executives of nuclear operators in 31 countries. The key to creating a viable organisation was to convince all the world's nuclear power operators to participate. This meant putting aside national rivalries and mistrust to coalesce in a common good. Many European nuclear operators resented INPO, in part because it was American and in part because they believed that American standards were not particularly high and that nuclear plants in Western Europe operated more efficiently and more safely than US plants. In addition to distancing themselves from the Americans, "there was a fair bit of rivalry between the other utilities in Europe and EDF, which they saw as a bit of a bully," recalled one early staffer. "If EDF says it's right," he recalled, the other utilities thought "it must be wrong. We had to overcome that."

...To bring Japanese utility executives to the meeting, the organisers believed they had identified the one individual who could do it - Lord Walter Marshall of Goring, the head of the CEGB and a man of international stature in the field of nuclear energy. Marshall was a highly regarded and widely published nuclear scientist who had served as Chairman of the UK AEA. In that capacity he had befriended many in the Japanese nuclear community. His opinion carried great weight in Japan. The Japanese greatly respected Marshall's intellect, technical expertise and scientific accomplishments and treated him accordingly. He once told his aide, not entirely in jest, that "they treat me in Japan like I think I ought to be treated at home." When Clarke approached him about becoming involved in a new international organisation, however, Marshall declined. He could support the concept, but understood the difficulties inherent in creating and operating an international organisation. He would not commit personally to an organisation he thought might fail. At the urging of INPO's Pate and Lee, who realised that no American could lead an international industry group, Clarke returned to Marshall to ask him to chair the Paris meeting. Again, Marshall said he did not wish to be associated with something that was doomed to fail. "That's a bit disappointing," Clarke recalled telling him. "What will I tell all those people from America, from France, from Japan who have said you're the only person in the world that could possibly make this succeed? I'll have to go back and tell them you won't do it." The appeal went directly to Marshall's ego. "I suppose that if they all think I'm the only one to do it, then I'll have to do it, won't I?" With Marshall's involvement, the Japanese were likely

to follow. With the meeting chaired by a man of Marshall's prestige and international stature, the organisers hoped his name might attract other top-level attendees as well. The first organisational steps had evolved into strides on the road to Moscow.

At the end of March 1987, invitations to the Paris conference went out to nuclear utility executives in more than 30 countries. Using the IAEA and UNIPEDE connections to woo a Soviet contingent to the Paris meeting, the invitation letters were signed by Clarke and Saitcevsy, representing IPAC and UNIPEDE/EDF, respectively. Clarke was pleased with the letter, which was the culmination of the committee's months of preparation - Marshall would chair, Blix would speak and EDF would pay. Letters went to every nuclear operator and nearly all responded. In June, Marshall sent a second letter to the invitees outlining some ideas describing how the senior executives might work together and asking them for any ideas that they wished to contribute. The response was, in Marshall's view, "very positive, a clear sign that the time is right for this meeting and a clear sign that there is a general wish to set up a new organisation." He was correct on both counts.

Nevertheless, there were a couple of bumps along the road. Ian McRae, the head of South Africa's nuclear company, Eskom, could not travel on a South African passport because of other nations' response to that country's apartheid policy. McRae worked out an agreement whereby he would travel to the meeting on his British passport, but not speak during the conference. The second issue concerned China and Taiwan. As a condition for attending, the Chinese insisted that Taiwan be listed as Taiwan, China - not simply Taiwan. The French had wanted attendees to have national flags in front of their seats, an idea that also caused an issue with both China and Taiwan. The organisers solved that dilemma by saying that the meeting was of utility executives, not countries, so Taiwan Power and the Chinese National Nuclear Corporation agreed to attend as utilities, not national entities. The idea for flags around the table quietly died.

The most serious bump of all, however, turned out to be the Soviets, who did not respond to the invitation. East Germany, Czechoslovakia and Bulgaria had notified Clarke's committee that they would not be attending, but the Soviets were silent. About three weeks before the executives were to gather in Paris, Saitcevsy had a phone call saying that a delegation headed by Nikolai Lukonin, the Soviet minister of nuclear power, would be

attending and would be pleased to speak. And the East Germans, Bulgarians and Czechs would be coming as well. With a great sigh of relief, the committee rushed to list the new speaker on the programme.



The utility executives gathered at the opening session on Monday morning, 5 October 1987, at the Maison de la Chimie, or House of Chemistry, a grand building on the rue Saint-Dominique with a large auditorium, ample meeting rooms and pleasant gardens for informal discussions during breaks in the sessions. Lord Marshall was thrilled with the attendance. Thirty nations were represented, sending more than 130 delegates, including 26 from the US, 15 of whom were either the chairman or president of their company. One American, the chairman and CEO of Southern California Edison, failed to attend, Marshall explained, due to an earthquake in Los Angeles. "Tell him I do not think that was a good enough excuse," he joked, setting a collegial tone for the meeting. A polished speaker, Marshall relished his role as chair and he quickly took over, guiding the agenda while assuring attendees of the important part they had already played through their letters in helping him shape the form a new organisation might take.

At his best, Marshall could be all things to all people and he was at his best presiding over the conference, helped immensely by his sense of humour, which was skillfully self-deprecating and ego-boosting at the same time. "You know they asked me to be the chairman of this meeting and I have two great qualifications that make me the right person," he told the delegates. "The first one is I am not French, and the second one is that I'm not American." Joking aside, Marshall was exactly right. His duty as chair was to bring the delegates into a larger proposition, a world organisation for nuclear safety. To succeed, he counseled, the executives should put aside politics and focus on the requirements of utilities. "We need not spend much time discussing whether we should improve co-operation, but concentrate our efforts on discussing how we should go about it." That can be done, Marshall promised his audience, "without unnecessary duplication of existing efforts and without bureaucracy", reassuring friends of the IAEA and those with limited funding. "The prime responsibility for nuclear safety lies with us," Marshall reminded the executives. "This meeting provides a

unique opportunity. I hope that we will all leave here tomorrow confident that we have taken full advantage of it.”

Indeed, much of the basic work had been accomplished by the Planning Committee in the months before the meeting convened. The committee had drawn many of its basic ideas from the INPO experience because of its extensive operational history as an industry-led safety organisation. Pate and Lee pressed the importance of top-level executive involvement if the organisation were to succeed. INPO also stressed the value of information exchanges and its Nuclear Network® system, a programme similar to that established by UNIPED in a smaller scale in Western Europe, and one that provided for technical exchange and special assistance visits, and analyses of nuclear plant event reports to identify the potential for future accidents. INPO also pushed publications providing performance objectives and criteria, best practices, operator training and accreditation, and, most important to the INPO leaders, periodic Peer Reviews. Nevertheless, whatever ideas might be adapted from the INPO experience, none of the planners sought to impose the INPO programmes on a worldwide industry group. Any full agreement to move forward would have to emerge from a consensus of all parties, and the pre-meeting communications had laid some of that groundwork.

The central purpose of the meeting of senior utility executives as outlined in the letter of invitation was “to define a mechanism for the association, cooperation and commitment among nuclear utilities worldwide and to explore ways to put such a mechanism together.” By the time the utility executives met, nearly all agreed that a new industry organisation was needed and had settled the basic outline of its structure. In his opening speech Marshall reinforced the suggestions from the Planning Committee that the majority of delegates had largely accepted - a common mission to maximise the safety and reliability of the operation of nuclear power plants, the establishment of four regional centres and a small central coordinating office, and the appointment of a Steering Committee to define the specific tasks to be undertaken. One other decision was left to the meeting - choosing a name for the organisation.

Perhaps the most crucial innovation to help unify a worldwide organisation of nuclear utilities was the creation of four regional centres and a central coordinating office. Early in the planning stages, it became apparent that

a federal, rather than a centralised, structure was the only way to gain wide support. The strong, centralised INPO structure had few adherents outside the US. To unite a fragmented industry - separated by language, reactor type, political differences and geographic distance - the concept of regional centres provided some degree of local control and assurance in an industry that after Chernobyl saw itself under attack from hostile governments and activists who threatened its very existence. While nuclear operators world-wide accepted the idea of nuclear safety, each regional culture - Western European, American, Eastern Bloc and Japanese - had its own idea of how that should be achieved and, subsequently, often rejected the approach to safety advocated by the other cultures. The Planning Committee chose carefully. The original idea for the four centres was the brainchild of Anderson and Clarke, who saw "that we needed an organisation where there was a measure of individual control and choice, and we wanted particular groups to feel ownership. We also needed some coordination, but not central direction, which a lot of places in the world weren't ready for at the time," recalled Clarke. Without granting a large degree of local autonomy, the organisation would have lost broad support and collapsed on the drawing board.

The scheme recognised the four geographic and cultural regions of nuclear power, creating a loose alliance, giving autonomy and control to each within the broader confederation. To best draw on INPO's extensive experience of operating an industry safety group, one centre would be located in Atlanta. The Planning Committee expected North American utilities to naturally gravitate toward Atlanta Centre, but utilities were free to join any centre or, if they so chose, more than one. There would be a centre in Paris that would represent the nuclear operators in Western Europe. Moscow was proposed as a third centre to serve as the umbrella for all Soviet-built reactors in Eastern Europe and the Soviet Union. In Asia, a centre would be opened in Tokyo, an acknowledgement that the Japanese were veterans at operating nuclear power plants and their practices might serve as a model for those nations in Asia and the sub-continent who were beginning to build such plants. There would also be a coordinating centre, but it lacked any management or oversight authority and was designed to serve largely as a clearing house for information. To ensure broad acceptance, the regional centres would have both organisational autonomy and authority. Though connected by the common thread of nuclear safety, the regions did not have

a common solution. This structure ensured that all the parties would have a more or less equal voice in Paris and a measure of regional control in the future.

Despite the promising start, Marshall was correct in his assessment that a new global organisation might fail. Historically, international industrial organisations had formed as cartels, such as in the diamond and oil industries, that promoted pricing arrangements, not operational safety. There were few precedents upon which the Planning Committee could draw in shaping the organisation. All agreed that, whatever lessons could be applied from the American experience after Three Mile Island, the centralised INPO organisational model would not be appropriate. The committee could broadly outline a structure, but the final shape would have to emerge from the delegates' comments in Paris and the continuing discussions that would follow. Moreover, there was no guarantee that an industry that lacked any history of collaboration would come to an agreement or, if it did, successfully implement it. The letters the utility executives wrote to Marshall in advance of the meeting expressing their concerns and offering their suggestions were decisive - indicating for the first time that the nuclear industry could communicate on a worldwide basis in, what Marshall termed, "a spirit of cooperation".

Marshall skillfully led the executives through the broad framework of what he hoped the meeting would accomplish, suggesting, a bit artfully, that their letters had become a large part of his thinking. "Perhaps my proposals are too ambitious," he began, but "in making these suggestions I am reflecting the views you have given me." Everyone agreed that industry collaboration was needed, yet without creating a bureaucracy "which would duplicate existing arrangements". He offered a definition of the new organisation that all could also agree on: "To maximise safety of the operation of nuclear power stations by exchanging information, encouraging comparison and stimulating emulation between the utilities operating nuclear power plants."

It was a definition that Marshall believed provided an umbrella broad enough to offer something for all. He applauded the idea of four regional centres and a small central centre to coordinate "the activities of the main centres", thereby alleviating the fears that a central office might control the organisation, a model feared by those centres not located in Atlanta. He called on the executives to establish a Steering Committee before leaving

Paris to implement the creation of the organisation and the tasks that it should undertake. Finally, he asked them to settle on a name for the new organisation “that instantly conveys the picture of nuclear utilities working together”.

By the end of the first day of extended discussions, two themes emerged: cooperation and a willingness to exchange information among the worldwide nuclear community. Whatever the particular differences, the utility executives agreed that there were common goals, and “we have a joint responsibility and obligation as a nuclear community” to achieve them. There was near unanimity that the utilities should unite in the name of safety. Nevertheless, organisers were aware that the participation of the Soviet Union was of paramount importance to the success of the nascent organisation. Throughout the first day the Soviets had been supportive, but non-committal about the future. With the need to reach a decision to move forward the next day, Marshall’s allies at EDF and INPO urged him to convince the head of the Soviet delegation, Nikolai Lukonin, of the critical importance of his country’s participation.

Marshall’s courtship of Minister Lukonin began that evening. To show Paris in its best light, EDF sponsored a dinner cruise on the Seine for the delegates. Marshall arranged to sit with Lukonin. During a spectacular meal, with splendid wines and glorious views of the city as only the French and Paris could offer, Marshall pressed hard, explaining how important the Russians would be and how necessary it was for them to be part of the new organisation. Marshall was at his persuasive best. He spoke to the great need for a regional centre in Moscow, suggesting that it was an ideal solution for increasing the safety of reactors in Eastern Europe under Soviet direction. With Soviet participation so crucial, Marshall asked Lukonin to host the inaugural meeting in Moscow the following year. Lukonin smiled and nodded, but one could not be certain of the translation and the degree of understanding. In any case, the Soviet minister did not reach his high position by playing his hand early. Marshall realised that Lukonin would need to check with Moscow before making such important decisions. At the end of the cruise they parted with a cordial goodnight. Marshall had performed superbly; now the future lay in Lukonin’s hands.

The next day, in unambiguous terms, Lukonin demonstrated the effectiveness of Marshall’s attentions. Addressing the entire conference, Lukonin

explained the Soviets “must do all we can to improve our safety record. We consequently support the formation of a Union for the Safe Exploitation of Nuclear Power,” whose main role was a forum for “exchanging experiences of nuclear power station operation. We realise only too well that the safe and reliable operation of nuclear power stations throughout the world will enable us to restore public faith in nuclear power.” He wished to be certain that any new organisation would not duplicate the activities of the IAEA, but “work in close contact” with it. The Soviet Union, he said, supported the regional centres for the organisational structure and favoured a small coordinating centre located in Vienna.

Soviet insistence on Vienna had become something of a sticking point during the conference, and Marshall’s staff wondered if it would be a deal-breaker. Lukonin dismissed that concern. “We have no objection,” he continued, “to its location being decided by experts nominated by the various countries concerned.” It was, as Marshall said, “a historic statement.” Lukonin had assured the delegates that the Soviet Union would support the new union, all but guaranteeing its creation.

With the backing of the Soviet government, Marshall could express his confidence in the future. Blix had offered support from the IAEA, Pate had pledged the full support of INPO from the beginning, and EDF and UNIPEDÉ contributed significantly as well. Only Japan had shied from making a formal commitment to the organisation or to setting up a Japanese regional centre. The leader of the Japanese delegation, Kenichiro Matsutani, though supportive of the idea, would not act until assured of the involvement of the USSR. Just before the conference ended, Matsutani accepted the idea of “establishing an Asian Centre in Japan. For that purpose, we expect the active cooperation and participation from the neighbouring countries. That is all.” Although it was unclear to some just what the Japanese were accepting, Marshall expressed his pleasure with that limited commitment. Nevertheless, the vagueness of the Japanese response presaged future misunderstandings.

The historic meeting ended before lunch on the second day. Unquestionably, Marshall had led the show and though he had not obtained the full agreement he hoped to achieve, much had been accomplished. Most importantly the delegates, including those from the Soviet Bloc nations, welcomed the broad idea of an international industry group to improve

nuclear safety. Following the conference, it was Lukonin who underscored the delegates' unanimity to the waiting reporters who had been invited to spread the news of the proceedings. "We must use every available means to improve and maximise the operating level of our plants; we absolutely must achieve the highest level of reliability and safety. All the participants are unanimous about this point." That show of unity was not insignificant. In addition, the attendees had agreed to establish four regional centres and a coordinating centre toward achieving the goal of nuclear safety. Pate, who had been partially responsible for INPO's successes, understood and appreciated Marshall's leadership. "We are all in debt to Lord Marshall," Pate told the delegates, "not only for chairing this meeting, but for the extensive effort he has put into planning for the meeting and into conceptualising how we proceed after the meeting. We are all beneficiaries of his interest and great wisdom." Further, he called upon the delegates to encourage Marshall to "serve as the senior statesman, guiding the initiatives which follow this meeting." Marshall, who had initially opposed his involvement, now was central to its success. Fie jokingly told Pate that "I particularly liked the remarks where you said what a super chap I was." Marshall had become an integral part of the fabric of the new association.

Nonetheless, after a day and a half of deliberation, the name for the new organisation, like the site of the coordinating centre, remained elusive. Delegates shied from using the term organisation. "We are particularly nervous about the use of the word 'organisation,'" Marshall explained. "Although it is an organisation, it portrays the wrong image and I think we should not do that for fear that we just get misunderstanding." Other speakers tried out a variety of terms. Blix suggested a "Utility Association" to differentiate it from the government-oriented IAEA. Leclercq called it the "World Nuclear Utilities Federation," though he also used the term "association". Lukonin suggested naming the new organisation either the "Union for Safe Nuclear Power" or the "Nuclear Power Station Operating Institute." The Bulgarian delegate offered the "Council for the Organisation of the Work of Regional Centres," emphasising the major operational role the centres were to hold. That suggestion caught Marshall off guard. He had thought more along the lines of a "name the instantly conveys the picture of nuclear utilities working together." Although the Bulgarian's suggestion garnered no support among the utility executives, it did indicate the division between

those who supported sovereign regional centres and those who believed that some measure of centralisation was necessary to achieve the idea of working together.

The compromise to establish four autonomous centres and a very subordinate coordinating centre was decisive in reaching a consensus among the nuclear executives and establishing the organisation. Eventually, differences among the centres would expose the weakness of confederation, but that disruption lay in the future. Whatever the level of agreement in October 1987, nearly everyone realised that there was considerable work to be done in hammering out the details of programmes and governance prior to the Inaugural Meeting scheduled for 1989.

Marshall, INPO, EDF, and the Planning Committee staff had accomplished much. They had brought together more than 125 nuclear executives from all but two of the countries that operated nuclear power plants - Romania and Pakistan were the missing pair. The organisers had created a worldwide industry group with few prior connections and considerable political animosities stemming from World War II and the Cold War. In addition, they had gained commitments from all the nuclear power operators, as well as the IAEA, for an industry association; completed a draft Resolution establishing the principles and mission of the future organisation; and secured an agreement to hold an inaugural meeting to formalise the organisation the following year.

In closing the meeting, Marshall outlined the next steps he believed needed to be taken. With so many details yet to be determined, Marshall's summary was a model of vagueness, but also a call to action. "What we are going to do is try to produce a harmonisation between [what EDF and UNIPED do] and what is done in INPO and what is done in Moscow and Tokyo." Marshall emphasised what all did agree upon: the coordinating centre would be small, staffed by no more than four people. As for the location of the coordinating centre site - London or Vienna - he pushed that decision off to a future time. "We should set that matter aside until we get to know one another a little bit better." In the meantime, with the press of time to get the new group organised, Marshall intended to use the Steering Committee, an expanded version of the Planning Committee, and the small INPO office in London to get the work underway. He asked the Soviets and the Japanese to send additional help for that effort. A concern of the East Germans - the

limitation on the exchange of information and data processing with the West, a result of a Cold War embargo on computer hardware and software to Eastern Bloc nations - Marshall could not solve, but would have a "group of experts" investigate. Marshall, a pragmatist, understood the problem. "I think it we would look a little bit foolish if we say we want to collaborate internationally and then we discover that we have all made such choices of computers and data format that, in practice, it is difficult to do so."

While he pushed many organisational details into the future, Marshall had convinced nearly all the delegates that they had played a critical role in the development and planning of a new organisation. He had listened to and considered the views of all delegates. Few had ever enjoyed such attention on a world stage. Marshall was a consummate leader in building a broad consensus. Like a maestro, he shaped the cacophony of the delegates' views into a recognisable melody. It was not yet a symphony and, perhaps, he had inherited an orchestra that would never play one. But as a first rehearsal it boded well for the future.

Another positive omen came from Minister Lukonin. At the end of the meeting he announced that Moscow would host the next conference. Marshall and others from the West were amazed that the Soviet delegation could get permission from its superiors so quickly, but were thrilled with the decision to meet in Moscow. Nearly a quarter of a century later, Lukonin allowed that he had made the decision on his own, without telling anyone in Moscow. "I did it on my own initiative," he said. "It was important that we create such an institution." Nonetheless, Lukonin was still a Soviet bureaucrat and even a bold decision needed approval. On returning to Moscow, he sought official backing for his commitment. He went to Boris Scherbina, the Deputy Chairman of the Council of Ministers. "I explained everything and said, 'You can fire me if I am wrong.' Scherbina replied, 'No grounds for that. You were correct.' My decision was supported by everybody in the USSR government, including Nikolay Ryzhkov, the Chairman of the Council of Ministers." After Chernobyl, Lukonin explained, the nuclear power industry "was fully open for the outside world".



For the next 18 months, from October 1987 until the spring of 1989, the Steering Committee and the Interim Secretariat planned the details of an inaugural meeting for the proposed international organisation based on the resolutions presented at the Paris meeting. Lord Marshall, who, after Paris, or perhaps because of it, had gone from being a supporter to an influential proponent, offered to chair the Steering Committee. Its first meeting in December 1987 was held in INPO's London office, which functioned as the Interim Secretariat of the Steering Committee. The committee drew on the same staff that had planned the Paris meeting, Eckered, the office Director, and George Hutcherson, his assistant. With Andrew Clarke on loan from the CEGB, the three men undertook the task of developing an industry organisation of nuclear utility companies.

The Interim Secretariat soon included representatives sent from the Paris and Atlanta Centres, Bo Sunderson of Sweden and Juan Hurtado of Spain. Eckered found the arrangement of sending engineers from the regional centres quite valuable. They had "specific knowledge about reactors in different countries and knew their own organisations and people. It helped make the whole thing work because the cultural differences between the countries involved made it quite difficult." Four subcommittees, labelled Expert Groups, assisted the Steering Committee: Expert Group One, chaired by Svante Nyman from Sweden, which dealt with communication and database issues; Expert Group Two, led by Paul Dozinél of Belgium, which was to determine the scope of WANO activities; Expert Group Three, chaired by the German Werner Hlubek of RWE, which dealt with organisational and financial matters; and Expert Group Four, headed by Boris Saitcevsy, which was responsible for planning the May 1989 Inaugural Meeting in Moscow. All the Expert Groups worked to report their recommendations to the Steering Committee by the end of the summer of 1988.

The Steering Committee's staff soon resolved one loose end from the Paris meeting, the official name of the new organisation. In spite of all the discussion, none of the recommendations put forward in Paris met Marshall's dictum to adopt a "name that instantly conveys the picture of nuclear utilities working together". The original concept of an association of nuclear operators gave rise initially to naming it, not surprisingly, the Association of Nuclear Operators, or ANO. But ANO, derived from the Latin word anus, meant just that in Spanish and Italian. That acronym was

quickly dropped. To avoid the reference to bodily parts, the committee, at the suggestion of Saitcevsy, added the word "World." Once the letterhead carrying the name World Association of Nuclear Operators, or WANO, was printed up and "sent out," Hutcherson recalled, "it was too hard to take back". To prevent anyone from stealing the WANO name - particularly an anti-nuclear group - the committee registered the company in the UK in late 1988, with Clarke as chairman and Eckered as secretary. Thereafter, the WANO name, which met Marshall's standard, appeared in the committee's correspondence and its letterhead and the nameplate on the door of the office on Fulham Road. There was no further discussion of the coordinating centre being in Vienna. Only London, Eckered pointed out, had direct flights from every capital in countries having nuclear reactors.

Concurrent with the work of the Steering Committee, parallel efforts began in each of the regional locations with the goal of having all centres in operation before the inaugural meeting. By the spring of 1989 they had reached that goal. While there were a unifying mission and common programmes, each region approached its governance and work methods a bit differently.

Paris Centre attracted members primarily from Western Europe, adopted the programmes of the Steering Committee and began operation in January 1989 with Jacques Burtheret as its first director and staff on loan from UNIPED.

In Tokyo, CRIEPI provided office space and several Japanese utilities loaned staff. By early spring in 1988, Japan invited Asian countries with nuclear power stations to a meeting in Tokyo. Utilities from Taiwan, Korea and Pakistan attended; China and India did not. Early in 1989, the countries had developed the centre's charter and programmes and the centre began operation in March 1989. The first director of Tokyo Centre was Kinji Hoshizawa, who was assisted by a small engineering staff. In Moscow, Dr Armen Abagyan, the head of the All Union Research Institute for Nuclear Power Plant Operations (VNIIAES), took the lead in establishing the centre in his organisation's building at 25 Ferganskaya Street. He had attended the first meeting of the Steering Committee in London in December and was an outspoken advocate for nuclear safety. Dr Boris Prushinsky, who had helped assemble the first group of senior scientists to travel to Chernobyl the morning after the accident, served as the first Director. The centre began

operations in April. In Atlanta, INPO provided the new WANO centre both staff and space in its building on Circle 75 Parkway. Stan Anderson, the head of INPO's international programme, became its Director. Atlanta Centre started operations in March 1989.

In the late 1980s, international communication was rarely easy and always expensive. The internet was only beginning to emerge and few at the time recognised the remarkable changes it might bring. But ease of communication was essential to the basic foundation of WANO - the ready interchange of operational information. After Three Mile Island, INPO had pioneered the use of communication links to share information and accident analyses among utilities through its Nuclear Network®. Over its first years of operation, Nuclear Network® had prompted more than 125 safety recommendations to INPO members, a result that caused INPO to offer the system free of charge to WANO. Initially, the French appeared to block the idea. In a show of national pride, EDF suggested that it would be better to run the system on French-built Bull computers rather than US-made IBMs. While there was often an undercurrent of tension between the French and Americans over controlling one WANO device or another in the early years, this issue was soon resolved. No one else wished to reinvent the wheel or pay for something that could be acquired for nothing. Nuclear Network® would become the communication link among the world's nuclear utilities.

...By early 1989 all was in place for the Inaugural Meeting and the official creation of WANO. The Inaugural Meeting in Moscow was the culmination of work of the Interim Secretariat, Expert Groups and Steering Committee over the previous 18 months. The regional centres were operating on an interim basis, each under its own charter and with its own staff and governing board. The result was a remarkable consensus among international nuclear power companies. The Coordinating Centre, while still suspect among centres that wished to run their own affairs, was "to ensure that there are effective exchanges across regional boundaries" and to ensure that the resource and expertise of all the members was "fully utilised to the benefit of all". Eckered had been selected as the director of the Coordinating Centre; Minister Lukonin was serving as WANO's first President; and Lord Marshall had agreed to become the first Chairman of the Governing Board. Marshall was characteristically upbeat on what had been achieved. "Every prospective WANO member," he boasted, "has been determined to find

solutions rather than difficulties. We have a unanimity of purpose that is rarely seen even within the confines of a single company, let alone across 150 companies from all corners of the globe.” All that was needed, Marshall said, was for “every nuclear utility in the world” to implement their commitment to work together by signing the WANO Charter.



The signing of the Charter, central as it was to establish an industry commitment to a global federation in support of safe nuclear power, was not the only highlight of the May 1989 Inaugural Meeting. The mystery of Moscow and the Soviet Union also attracted delegates. Many of the participants had never been to Moscow. Even with the beginnings of perestroika and glasnost, obtaining a visa, travelling to and within the Soviet Union and finding suitable accommodation for the attendees was still not a simple process. In addition, the official Soviet travel agency, Intourist, still controlled access and programmes for foreign visitors. There was also some concern about surveillance, particularly from the American side. To dispel these concerns, the Soviet hosts made certain that the delegates received the very best Moscow could provide. The Sovincentr, a collection of buildings on the Moskva River-which housed hotel rooms, large halls and auditoriums, as well as reception facilities - served as the country’s international trade centre. On Sunday, the day before the meeting, participants and their guests enjoyed a guided tour of Moscow and the Kremlin. That evening delegates boarded buses and, with traffic blocked to speed the motorcade along, were whisked through the city’s rush hour traffic to the Bolshoi Theatre for a ballet performance. During the meeting, spouses were treated to full days of sightseeing at art museums such as the Kuskovo Museum of Ceramics, the All Russian Museum of Applied and Folk Art, and the better known Pushkin Fine Arts Museum; and were taken on trips outside Moscow to the Novodevichy Convent, Zagorsk Monastery and the Vladimir and Suzdal Museum, parts of the important historical and architectural areas known as the Golden Circle. Each evening delegates attended sumptuous receptions with tables full of traditional Russian delicacies. Lord Marshall remarked that in the UK a reception meant a few drinks, but in Moscow it meant a stand-up full meal that went on and on until the ice cream, or moroshina,

was served. After the meeting concluded, participants could choose three-day technical tours to Leningrad for a tour of the city and the Leningrad nuclear power plant that Lukonin had once managed, or a trip to Kiev and a tour of Chernobyl and Pripyat, which could accommodate only a limited number of tourists per day. The meeting and the tours opened up attitudes toward the industry's Soviet colleagues, but also allowed participants to socialise, to meet and speak with colleagues about common concerns, be they at home or at work, on a level not seen before. The interpersonal relationships and common bonds, which INFO had found so valuable for US operators, began to form internationally at meals and during the receptions. Pate emphasised this connection, urging close association among tire friends one made through WANO. "One of the key phrases in the WANO Charter' he said, is "encouraging communication, comparison, and emulation among its members." Importantly, the work of the centres, the WANO programmes and the continuation of the biennial meetings fostered this interaction and strengthened the bonds between the members.

Before the delegates left for their post-meeting technical trips or to head home, they had one last business item to complete, election of the new president. Bill Lee, the American utility executive who had been critical to the formation of INPO in 1979, was elected by acclamation - a standing ovation - an indication of his worldwide reputation. Lee's acceptance speech was different from those given earlier in the meeting, which had been mostly praise for those who had worked on the conference and perfunctory recitations of a company's or country's nuclear programmes. Lee's speech was anything but perfunctory. If Marshall's role as chair was to paper over the differences among delegates in order to gain consensus, Lee's role was to test that consensus. "WANO is not a political entity," he began. "Our members profess varied philosophies and beliefs. But we have in common an absolute dependence on the safe performance of one another's nuclear plants. We must be constantly vigilant to keep our differences from impeding our safety progress. We will have to overcome a tradition of non-cooperation." He first challenged WANO's newly elected leaders, the WANO and regional governing boards. "This has been an exciting beginning, not only for what we have done here, but even more for what we expect." He urged them to build on that enthusiasm to improve safety and reliability. "Nuclear plant performance improves," he said, "when leaders set specific goals and a schedule to

meet those goals.” He asked each regional board to set “quantified goals for WANO regional performance to be met over the next two years” with quarterly mileposts or measuring points along the way. The WANO Governing Board should review those goals and incorporate them into a two-year system of overall goals to share with members “so we will know the specific WANO progress...”

Chapter Two. The Second Marshall Plan

Lord Walter Marshall of Goring: it was an impressive title for an imposing - and complex - man. While the fact that he was neither American nor French aided his selection as WANO’s first Chairman, nationality was not the key criterion. Marshall had impeccable credentials. He was something of a polymath - a renowned physicist, an experienced administrator, an eloquent and forceful advocate for nuclear power and a proven, well-liked leader with both industry and international experience. He had been instrumental in the creation of the World Association of Nuclear Operators. In 1989, all agreed he was the perfect choice to lead the fledgling WANO as Chairman of its Governing Board.

Marshall’s career had been meteoric. Born in Rumney, near Cardiff, Wales, in 1932, Marshall was the son of a baker and the youngest of three children. He developed a love of mathematics in primary school and a serious interest in chess, becoming the Welsh Junior Chess Champion at 15. He earned a scholarship in 1949 to study at the University of Birmingham, graduating with a First in Mathematical Physics in 1952. He received his doctorate in theoretical physics two years later at age 22 for his work on magnetism and neutron scattering under the direction of Rudolf E Peierls, a refugee physicist from Nazi Germany who had helped work out the theory for creating an atomic weapon and who joined the Manhattan Project during World War II. Upon receiving his PhD in 1954, Marshall, through his connection with Peierls, joined the Atomic Energy Research Establishment (AERE) located at Harwell, Oxfordshire, the centre for nuclear research and development in the UK. Soon after accepting his first job, he married his Rumney childhood sweetheart, Ann Shepperd.

Marshall’s rise continued as if powered by destiny. From 1957 to 1959 he studied in the US, first at the University of California, Berkeley, and then at Harvard University, before returning to Harwell. In 1960 he became

Division Head of Theoretical Physics and rose through the ranks to become Director of Harwell in 1968. Marshall's performance at Harwell confirmed his ability to lead organisations and motivate the work of others, leading to a switch in his career from pure science to administration. Three years later he was elected a Fellow of the Royal Society. In 1972 he joined the board of the UK Atomic Energy Authority, rising to Deputy Chairman with special responsibility for the AEA's scientific and technical policy in 1975. At age 45, he was elected a foreign member of the Royal Swedish Academy of Engineering Sciences.

During the oil crises of the 1970s, Marshall became increasingly concerned with questions of energy policy and became an outspoken advocate of nuclear power, demonstrating, said one observer, "an evangelical commitment" to its expansion. He advocated building a pressurised water reactor at Sizewell and a major construction programme of nuclear power plants in Great Britain, focusing on questions of operational safety and large-scale accidents. During this period he built "an unusually warm and productive relationship with the Japanese". By 1981 he had become chairman of the AEA and was knighted the following year. A champion of nuclear power - he was known in government circles as "Mr Nuclear" - Marshall was appointed, in July 1982, Chairman of the Central Electricity Generating Board to revitalise the UK nuclear power programme. According to his biographers, "it was the start of some of the happiest years of his life." For his success in "keeping the lights on" during a protracted coal miners' strike in 1984-1985, Prime Minister Margaret Thatcher rewarded him with a life peerage. Sir Walter Marshall became Baron Lord Marshall of Goring, a town on the Thames where he lived most of his career. He was 53.

Marshall's intellectual strengths and forceful personality made him a prominent participant at international conferences. The Times of London said that he combined "intellectual brilliance with a forthright manner and a bulky presence. His energy was formidable." His whole career, according to his close friend John Baker, "was a high-wire act, combining showmanship and skill". A self-confessed workaholic, Marshall was a man "big enough physically as well as intellectually to be worthy of caricature, and he could happily exploit this by poking fun at himself". His sharp wit and "effervescent sense of humour" were formidable weapons in his armory, helping to explain "the extraordinary affection he could command among

his colleagues and staff despite his ability also to make enemies". On public platforms, Marshall deftly applied these skills, reducing the audience "to helpless laughter with exquisitely timed [jokes], deploying his larger-than-life personality with its unapologetic egocentricity...and his great sense of theatre." Baker's friend was also a man who measured his value in his salary. Marshall, remarked one former colleague, had "the aura of a man who knew his worth and could command his own terms on such matters as living and travelling arrangements." In short, he revelled in being a leader and in the perks that accompanied a high position.

Marshall's first direct involvement with an international nuclear accident came in August 1986, when he led the British delegation to the special conference on Chernobyl convened by the International Atomic Energy Agency. In his analysis completed in early May, Marshall had told industry executives that the RBMK reactor was a flawed design, lacking satisfactory safety characteristics... 'He's admitting faults in the design, in training, in Soviet safety philosophy'... Marshall jumped at the opportunity to help the Soviet government. But responsibilities at the CEGB prevented Marshall from taking an active, on-site role regarding Chernobyl. Instead, he agreed to assist with the development of a proposed international nuclear safety organisation.

Just before the WANO Inaugural Meeting in Moscow in 1989, a policy change in the British government to privatise the electricity industry eliminated Marshall's nuclear expansion programme. He mistakenly thought his personal connections with Prime Minister Thatcher would preserve his position, but politics prevailed and by the end of the year he found himself out of a job as Chairman of the CEGB. Officially, Marshall's departure was a resignation. In fact, he was left with no other option. This was a harsh blow for a man who had given so much of his life to public service. At age 57, with no desire for retirement and a considerable concern for his finances, Marshall wholeheartedly embraced the chairmanship of WANO. After a life in the public sector in the UK, Marshall embarked on a new career in private service covering the globe.



When Marshall was unanimously elected Chairman of the WANO Governing Board in May 1989, it was evident that WANO had come a long way in a short time. In just 18 months, a group of senior utility executives had met in Paris, agreed on a need for a global organisation, and established WANO “to maximise the safety and reliability of the operation of nuclear power plants”. Robert C Franklin, the head of Ontario Hydro and newly elected Chairman of the Board of WANO’s Atlanta Centre, was awed by the accomplishment. “Anyone who has had any experience whatsoever in achieving international consensus will know just how difficult that has been and the accomplishments that these steps represent. These initiatives testify to the international spirit and cooperation that gave birth to WANO. Now we must make an honest effort to learn from the experience and expertise of others and to use that.” Franklin warned that the new organisation was “only as strong as its weakest link. If one member country, one utility, should fall down on the job, then we will all fail.” He challenged all WANO members to compromise, to be conciliatory, from time to time. Doing so would be “a sure sign that we are all contributing to and seeking excellence, the standard that we’ll never compromise.”

Marshall’s role in the formative days of WANO had, at times, been from a distance - most of his time was taken by his responsibilities at the CEGB. Although he had been supportive in assigning his close aide, Andrew Clarke, to the organisational planning staff, his personal involvement with the early activities of WANO was limited to encouraging the Planning Committee and keeping it to a schedule. Nevertheless, his individual success and public attention on larger stages, initially at the organisational meeting in Paris and followed by a greater triumph in Moscow, provided the enthusiasm and impetus for assuming the top WANO position. In addition, the opportunity to continue working in the nuclear safety field after the loss of his position at the CEGB convinced Marshall that WANO could best succeed with him at the helm. Subsequently, he threw himself into his job, visiting members throughout the world with Lady Ann during the early 1990s, and seizing on the idea of mutual self-help to improve the operations of nuclear power plants and restore the industry’s damaged reputation.

As Chair of the WANO Governing Board, Marshall initially saw his role as the leader of a worldwide organisation whose choices would set the precedent for the level of collaboration between the four regional centres.

Although his vision for the position and WANO would shift as circumstances changed, he remained optimistic and fully committed to improving the safety and operations of nuclear power plants and rescuing the industry's reputation from the damage inflicted by Chernobyl. At the Inaugural Meeting in Moscow in 1989, Marshall stated that he firmly believed in the importance of strengthening the cooperation and collaboration among nuclear operators across political and cultural barriers through four regional centres and a small coordinating centre "because we are anxious to avoid all bureaucracy. The whole idea is that we should learn from one another so that we emulate the best practices which are available throughout the world." Throughout Marshall's tenure, a high level of collective responsibility as preached by Marshall and WANO President Lee would be crucial in determining WANO's success or failure.

After Moscow, Marshall's chairmanship began much as the creators of WANO had envisioned: a part-time Chairman who travelled to the regional centres as a booster for WANO programmes, to rally members to participate in operator-to-operator exchange visits, extol the value of exchanging operating experience through the use of Nuclear Network®, and encourage the identification and use of best practices. Marshall spent most of his time, which he estimated at 10% on behalf of WANO, on the road. But his role as Chairman changed radically in the late fall of 1989 as a result of the privatisation of the British utility industry. In November of that year, the Thatcher government surprised many utility executives - and especially Marshall - when it broke up CEGB, but did not privatise the country's nuclear plants. Marshall opposed the decision to exempt nuclear power, a decision made more onerous when a close associate and friend, John Collier, was named to head the new utility, Nuclear Electric Pic. The new situation, which left him in professional limbo, prompted Marshall's departure from the CEGB in December.

The change in Marshall's employment status was just one of the transitions occurring at the time that affected WANO members. The arrangement put additional financial pressures on the regional centres, but especially Moscow Centre, which was beginning to experience a cash flow problem due to political and economic instability in the region. Not long after the founding of WANO, a series of protests in the summer of 1989 shook the foundations of the post-World War II political structure of the Communist

states in Central and Eastern Europe and, eventually, the Soviet Union. In Poland, the Solidarity Movement under Lech Walesa ousted the Soviet-backed government. By the fall of 1989, Germans pulled down the Berlin Wall and began the process of reunification. Hungary, Czechoslovakia, Bulgaria and Romania all established non-Communist governments and, by 1991, the Soviet Union had dissolved, replaced by the Russian Federation. “The political changes in Eastern Europe created a new problem and a new opportunity for WANO which we did not anticipate when the organisation was set up,” Executive Director Thomas Eckerred recalled later. “The old reactors were all built by the Soviet Union to the standards of those early days. They are robust and easy to operate, but they are not as sophisticated as modern-day safety analysis would demand.” How to move forward from Chernobyl became WANO’s first major safety challenge.

The sudden political changes in former Soviet Bloc nations between 1989 and 1991, particularly the reunification of Germany, opened the way for closer inspection of Soviet-designed and -built nuclear power plants by the West and a reassessment of their safety risks.

This led to an appraisal of the safety of Soviet-built reactors by the IAEA and the countries of Western Europe, which shared a collaborative framework and common values regarding the safe operation of nuclear power. The West sought to impose safety upgrades on Chernobyl-type RBMKs - they lacked such safety features as containment buildings - and WER-440/230s as they showed some safety deficiencies in their emergency core-cooling systems. The East German plant at Greifswald was particularly worrisome, as it had “deficiencies in safety technology,..in nearly all areas investigated,” according to a West German report. A nuclear expert from the Paris-based Organisation for Economic Cooperation and Development observed that the Greifswald units “are very far off our own regulations and requirements. Not marginally off, but incredibly far off.” A West German news magazine claimed Greifswald was an “atomic bomb that could blow up any second”.

Problems elsewhere indicated that Greifswald was no exception. With the events of Chernobyl and the collapse of the Soviet Union, the West began to question the continued operation of the string of nuclear power plants along the spine of central Europe. The Iron Curtain described by British Prime Minister Winston Churchill in his famous 1946 speech at

Westminster College in Missouri had been lifted to expose nuclear facilities using outdated technologies and lacking Western safety standards, in a line extending from Ignalina in the Baltic to Kozloduy on the Danube. Moreover, initial studies of the plants indicated that there was no standard solution for all plants.

The Kozloduy plant in Bulgaria, about 200km north of Sofia on the Romanian border, was a particularly complex and thorny problem. It consisted of four first-generation WER-440/230s and two newer VVER-1000 units supplying 40% of the nation's electricity, largely operated by a Russian staff. As economic chaos gripped Bulgaria, unpaid Russian workers left the site, followed by local operators who reportedly could make more money driving cabs in Sofia. An IAEA review team "found appalling housekeeping, significant fire hazards, ignorant and powerless inspectors and poorly trained operators," The sorry situation at Kozloduy was "due to a lack of safety awareness...and a bias toward production" that discouraged consideration of operational safety. "It would be imprudent," an IAEA nuclear safety expert concluded, "to continue to operate the plant until imperative repairs were made." The damning IAEA report seemed to confirm Western perceptions that the former Communist nations had defective reactors, unfit operators, deficient regulations and misguided management priorities. In the months after the collapse of the Soviet Union, a consensus hardened in the West, including among WANO members, that the Eastern European nations "could not be trusted with reactors of dubious safety".

In addition to the VVER pressurised water reactors, the Chernobyl-type RBMK reactors - water-cooled, graphite-moderated units - also drew Western attention, though to a lesser degree than the VVERs because most were located farther east in the Soviet Union. Derived from the first Soviet power reactor built at Obninsk in 1954, the RBMK reactors were designed to be quickly built and easily maintained. Again, production of electricity, not operational safety, was the primary goal. A new generation of these plants had been installed in the 1970s and early 1980s at Leningrad, Kursk, Chernobyl, Smolensk and Ignalina in Lithuania. Located some distance from Western Europe, the RBMKs had operated satisfactorily and did not cause the same level of concern as the VVERs. But the fallout from Chernobyl intensified Western interest in the lack of containment and other safety features at RBMK units, as well as the mode of operations. Subsequently, the

West urged design modifications in addition to the closure of the units at Chernobyl and Ignalina.

While the Europeans planned a response to retrofit or close former Soviet Bloc WER reactors, the US Department of Energy (DOE), long worried about the operation of Soviet civilian reactors, began an initiative in early 1990 to improve nuclear safety in the Soviet Union at the RBMK sites, dubbed *bezopasnost*. “We want to help the Soviets develop an INPO-like approach toward improving plant safety because we believe they recognise the need to develop a culture of safe practices” similar to those developed by the Institute of Nuclear Power Operations (INPO) after Three Mile Island, a DOE spokesman explained. DOE contracted with INPO to run a two-phase project: first, to involve senior Soviet nuclear operation policymakers, then later to include plant managers, operations superintendents and training supervisors in improving reactor safety. INPO assistance included substituting symptom-oriented emergency procedures for event-oriented procedures; analysis of tools, skills and knowledge needed by operations and maintenance personnel; and development of performance indicators. Although many of these efforts were also part of WANO’s programmes, the US government had the funding and the institution, INPO, to carry out the programme without WANO involvement.

In any case, WANO’s Charter prohibited such handling of government funds. “WANO will have nothing to do with governments, with regulators, with research or with commercial matters,” Marshall had reminded delegates in Moscow. “Our sole concern is the safe management and operation of nuclear power plants throughout the world.” Nevertheless, as Western Europe became increasingly troubled with the operational safety of Soviet-designed reactors, pressure built on WANO to get into the game. In a speech to the Paris Centre Governing Board in Toledo, Spain, in the spring of 1990, Governor Werner Hlubek warned of the dangers of the Eastern European WER reactors, particularly in their “deficiencies in design [and] in their management.” He argued that the actions of the IAEA were not sufficient and called on WANO “to deliberate on whether and possibly how operators outside Eastern Europe could participate financially” in the retrofitting of the Soviet-built plants. “We should try to exert influence on the politicians,” he maintained, convinced that WANO should “take the lead and should not leave action to others.” Marshall, who attended the meeting, was sufficiently

convinced to bring it before the WANO Governing Board a week later. The board agreed that WANO must address the problem.

At the WANO Governing Board meeting in Moscow in July, Vitalii Konovalov, Minister for Nuclear Power and Industry, urged the Board to determine what help WANO could provide. The board decided to create a special organisation for this purpose. "We did not think this was a matter which should concern the entire WANO organisation and we therefore set up a special project which concerns only the Paris and Moscow Centres and which has extremely limited objectives/" Eckerred later wrote in a background report to the Governing Board on the history of WANO's involvement. Drawing on an IAEA technical analysis of the reactors, WANO hoped to define a solution "which obeys the ALARA principle; that is, a risk which is 'As Low As Reasonably Achievable'," WANO hoped that the Commission of European Communities (CEC), later known as the European Commission, or EC, would fund the work, but WANO was "not seeking [a] contract for this work and neither do we seek to make commercial decisions between contractors. We are not trying to replace the [contractors]; we are trying to help them reach a consensus judgement on what it required."

WANO also wanted to make certain that there would be no opposition to its proposed VVER Special Project from the IAEA. Marshall wrote to Hans Blix, head of the IAEA, seeking a cooperative arrangement soon after the Moscow meeting. WANO officials met with Blix and his senior staff to further explain WANO's Special Project. The meeting, Eckerred reported, "was very constructive and friendly and mutually supportive. The IAEA senior staff had already analysed that WANO and the IAEA were doing different jobs [and] that neither could attempt the work of the other."

As a result of the discussions at the Moscow meeting, the WANO Governing Board created the VVER Special Project. It consisted of two expert groups, one from Moscow Centre and one from Paris Centre, headed by a Steering Committee chaired by Marshall. The Moscow group included Armen Abagyan, Alexandr Lapshin, the Deputy Minister for Atomic Power, and the Director General of the troubled Greifswald nuclear power plant. WANO would provide short-term "practical assistance to utilities in the USSR and Eastern Europe to improve the shortcomings of VVER plants". Jean-Pierre Baret, the technical resources director at EDF International, headed the Paris Centre group. To comply with WANO regulations, the

new activity was to be carried out by a joint Moscow/Paris Centre subsidiary that would be part of WANO, "but operate outside the main mission of WANO." The subsidiary, not WANO, would channel funds from the CEC for the backfitting programme. The WANO Governing Board and Marshall agreed that the subsidiary "would be a one- off activity and not interfere with the prime task of WANO," though the expectation was that the project would take up to five years to complete.

Not all WANO members were enthusiastic about this new WANO initiative. Zack Pate was uneasy about the new direction WANO was taking with the VVERs. While he was in favour of the concept of retrofitting the plants, he stated that WANO's involvement in a consultative capacity or as an agent went further than its mission, and effectively did "stretch the Charter". He explained that neither the Atlanta nor the Tokyo Centres should be involved with European Communities funds, though he would accede to the Paris and Moscow Centres forming "a joint subsidiary to specifically handle this initiative." Lee agreed, hoping the subsidiary "would help to avoid any diversion from the established WANO mission". With those strictures in mind, the Governing Board approved the initiative to "provide practical assistance to utilities in the USSR and Eastern Europe to improve the shortcomings on VVER plants."

Throughout the fall and winter of 1990-1991, the two expert groups met to decide on a course of action related to the design and operation of the WER reactors. Working from a paper drafted by the Moscow Centre group, the team sought to create a list of actions that would make the safety of the WER-440/230 reactors acceptable and permit their operation for another three to five years. The Moscow/Paris team concluded that backfitting might aid in correcting some design flaws, but an equally serious issue - fixing the slack safety culture of plant operators and managers - demanded considerable WANO assistance. The broad agreement reached between the Moscow and Paris Centres was an important precedent for WANO. "We can certainly expect that this way of working together will continue in the future and achieve a full understanding of two different cultures," the Paris Centre director reported optimistically.

As Chair of the Steering Committee, Marshall became increasingly involved in the special backfitting programme, which some governors thought came at the expense of WANO core programmes. In addition, he

also became heavily invested in another major VVER project - an IAEA effort to funnel assistance to Bulgaria's Kozloduy power station. Kozloduy became the West's poster child for reactor assistance when, in the fall of 1990, the European Economic Community designated significant funding to upgrade the plant. Pate and the Atlanta Centre staff worried that Marshall's personal interests were drawing WANO "into extensive involvements" with governments and commercial matters, such as the "distribution or administration of government funding of nuclear plant improvements," to the detriment of the organisation.

Nevertheless, by the summer of 1991, Marshall focused on Kozloduy. He also visited a number of the WER-440/230 reactor plants, all of which had "generic issues that were well defined". Kozloduy, however, was a "special case," he cautioned the VVER Special Project Steering Committee. "In addition to the generic issues, they have unique, specific needs that have to be addressed in an urgent manner," he told WANO's WER Advisory Group. The needs, which pertained to twinning and management, or "housekeeping" problems at the plant, were so great that "they could not be adequately addressed by the Special Project in its present form," according to Marshall. The problems at Kozloduy were only partly technical. "There are considerable shortcomings both in the morale of the staff and the organisation and management of the plant," a WANO report noted. The Advisory Board agreed and ended its support for backfitting in favour of Marshall's new emphasis on sponsorship of the Kozloduy Twinning Programme and management reforms, both of which would be underwritten by the CEC. Over the next few years, the Bulgarians operated two units at Kozloduy while upgrading the safety features of the remaining two. The Bulgarian government raised salaries for the plant workers, and many of the experienced operators returned. The plant continued to produce electricity, and WANO pushed both Bulgarian regulators and Kozloduy management toward a more safety-oriented culture.

The tensions between the Americans' focus on WANO's core safety programmes and the Western European emphasis on upgrading Soviet-built reactors, which Marshall favoured, appeared more serious to outsiders than they actually were within WANO. The Americans based their position on the successes of INPO. Marshall had a broader and more complex constituency to consider. He was sorting out priorities for what a new international

organisation could do to establish a viable role among the majority of its members. While the Americans differed with Marshall and the Europeans on how WANO should proceed, both sides, importantly, agreed that the old nuclear order in Eastern Europe had to be supplanted and that WANO was the organisation to accomplish the job.

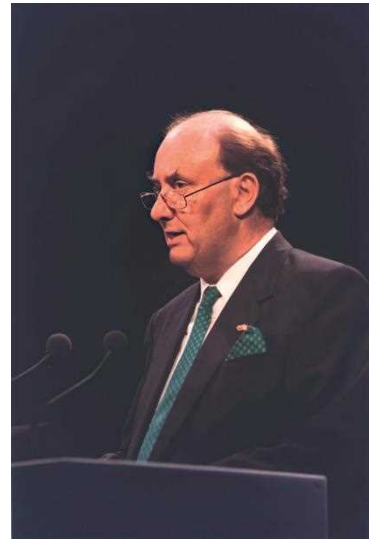
There were no differences regarding the importance of WANO's programme of exchange visits between Moscow Centre plants and utilities from the other three centres. By December 1990, 45 of 50 exchange visits had been completed in spite of visa issues or postponements. For an association just beginning to co-operate internationally after years of isolation and mistrust, the organisation of the technical and social aspects of the visits and the willingness for detailed discussions of technical matters were "without exception, very good and appreciated", Marshall reported. Moreover, a "number of operators expressed their interest in more intensive exchanges of operating practices, personnel, technical documents and other means of making their operational experience valuable to their Technical Exchange Visit partner and to other operators." Some plants, such as Catawba in the US and Zaporozhye in Ukraine, entered into long-term exchange agreements. One WANO concern with the exchange visits was the reporting of the visiting teams. The reports lacked uniformity and "could be more technically detailed in some cases," the head of the programme explained. Good reporting of the visits could "help stimulate other operators in preparing visits in the future." At WANO's insistence, the visits continued.

Gathering consistent reports proved to be a nagging WANO problem elsewhere as well. The Operating Experience Information Exchange programme, established to report significant events, remained unsatisfactory. Language differences were the major, and toughest, problem to overcome. Another issue was that a number of members had yet to be connected through Nuclear Network, and technical shortcomings remained in other areas. After analysing the programme, Eckered reported that the number of events was "too low" and only a small percentage of those were reported to the regulatory authorities. Experience at INPO had demonstrated that even events that seemed minor at the time, when put together, were important in indicating generic weaknesses or common malfunction trends. The WANO Governing Board agreed to sponsor a workshop with the goal of better explaining the necessity and use of event reporting, though Remy

Carle questioned the programme's value if operators did not make use of it. Carle's query went to the heart of the matter. The fear of repercussions from reporting a minor accident, the different cultural responses to operational errors or "failure," the linguistic tangles of explaining technical events, and connecting to Nuclear Network® all worked against the success of the information exchange programme and would continue to frustrate WANO's goals for the programme.



Amid the geopolitical and economic changes in the Soviet Union and Eastern Europe, WANO held its first Biennial General Meeting (BGM) in Atlanta, Georgia, in April 1991 at the Waverly Hotel, not far from WANO's offices. More than 240 delegates representing 27 nations attended. Marshall reported on the progress of the association over the previous two years, and members had an opportunity to express their views and concerns on how WANO had functioned, how it might improve and what direction it might go in the future. "There was a clear consensus that WANO was on course to achieve its goals," Marshall reported, but reaching those objectives required more member commitment and participation in the programmes. One goal, however, was attained soon after the meeting: the Romanian Power Authority (RENEL) became a member of WANO. Thus, by the fall of 1991, every nuclear utility in the world had joined WANO and was involved with its work.



BGM 1991 in Atlanta, USA

The Atlanta meeting was an opportunity for WANO's Atlanta Centre to showcase North America's strong embrace of nuclear safety through INPO, in whose offices the WANO centre was housed. Lee, who was stepping down as WANO's first President, was honoured not only for his commitment to WANO and "his inspiration and guidance during the formative years of WANO" but also for his leadership

in creating INPO and a vigorous safety culture in the US. A number of the American hosts firmly believed that the INPO example held great value for WANO and hoped that utility- executives and workers in other countries would learn from and adopt INPO's example. To replace Lee, the delegates unanimously elected Shoh Nasu, a former president of the Tokyo Electric Power Company (TEPCO), as the next President of WANO and host of the second BGM to be held in Tokyo in 1993.



*Shoh Nasu and Lord
Marshall, BGM 1993
in Tokyo*



The Atlanta BGM was the first time many officials from the Soviet Union and Eastern Bloc nations had been allowed to travel freely and visit the US. For many, Atlanta meant an outstanding opportunity to shop, and the meeting's organisers planned a schedule for attendees' spouses with that in mind. Buses fanned out from the Waverly to Atlanta's popular shopping malls. For storekeepers and shoppers alike, it was Christmas in April. Nevertheless, planners did not ignore Atlanta's cultural attractions. Pate's wife, Bettye, made certain that spouses could visit the Atlanta Historical Society and the Swan House, as well as take a private tour of the "new Southern estate" of Mrs Deen Day Smith, which was filled with antiques from around the world. The social programme also included tours of Atlanta, the Carter Presidential Center, the CNN Center, the Atlanta Botanical Garden and the High Museum of Art. On the final evening,

delegates and guests banqueted at a noted downtown restaurant, tapped their feet to the Peachtree Strutters jazz group and listened to the Atlanta Pops Orchestra. To end the evening, they toured Underground Atlanta and wandered through the Coca-Cola Pavilion, home of Atlanta's best-known export.

By the summer of 1991, Marshall was spending more than 90% of his time working on Kozloduy and the Special Project regarding other WER reactors in the East. Marshall's level of participation continued to cause unease in Atlanta and London. "I am distressed that you are having a series of discussions with US government officials regarding WANO," Pate wrote to Marshall in May 1991. Pate had learned that Marshall was lobbying a senator to include WANO in a proposal that would have the US government match European funding to improve Soviet-designed reactors and sought to nip the initiative in the bud. On behalf of the Atlanta Centre's Governing Board, Pate warned Marshall not to engage in discussions that would "result in any WANO involvement, direct or indirect, with US government financial aid intended for nuclear improvements".

Pate worried that Marshall's intensive commitment in the WER retrofitting programme and Kozloduy, both of which benefited about 10 nuclear units, was coming at the expense of the broader WANO core programmes, which were aimed at assisting more than 400 units: "The signal that this is clearly sending is that those special projects are the primary business of WANO, rather than the mainstream programmes that are spelled out in our Charter and our long-term goals." Pate complained that Marshall's focus on other projects was not leaving sufficient time at Governing Board meetings to adequately discuss WANO's budget and core planning goals and objectives. The regional directors, Pate argued, "had spent a lot of time preparing them and we owe them more of our time and attention". Due to Marshall's activity, Pate said, WANO must be careful to carry out the mandate of its membership, especially during the association's formative years "when the credibility we build will be our most important asset in the future". As it was, WANO was "losing credibility with many Atlanta Centre members and with key elements of the US government. That trend," he warned Marshall, "must change."

Unspoken in Pate's opposition to Marshall's initiatives was the fact that Marshall had trod on INPO's turf. During a trip to the US that

spring Marshall had spoken to Admiral James Watkins, Secretary of the Department of Energy, asking if Bulgaria and Czechoslovakia could participate in a DOE-sponsored project providing training and operating procedures to the Soviets. It did not take long for word of the meeting to get to Pate, to whom Marshall had said nothing of the visit. INPO had a contract with the US government to provide assistance with the reactors in central Europe. Thus, Marshall's conversation with American officials such as Watkins, who believed that the safety issues of Eastern European reactors were damaging the American nuclear power industry, was moving in on INPO's turf in addition to being outside the boundaries of the WANO Charter.

The Americans' concern that the Special Projects had occupied much of Marshall's time was somewhat accurate. Marshall had indeed expanded his role beyond that of the WANO Charter at a time when worries about precedents loomed large in the minds of many of WANO's incorporators. As Marshall and WANO withdrew from an active role in retrofitting VVERs in the former Soviet Union and provided assistance to Kozloduy, the fledgling organisation, in retrospect, may have missed an opportunity to push incentives for operational safety to the European Union or, at the least, have significant influence in international safety discussions. As an international collaborative framework evolved from the Western nations' efforts with reactors in Eastern and central Europe, the result was, to many, disappointing. The Convention on Nuclear Safety, adopted in 1994 and based largely on IAEA standards, lacked incentives, and there were no verification or enforcement mechanisms. It was not until the European Commission issued Agenda 2000, a roadmap for EU enlargement, that the West had sufficient leverage to demand that former Soviet Bloc nations meet Western nuclear safety standards as a condition for admission. As WANO's Charter limited direct involvement with governments, it could only play a lesser direct role than Marshall would have liked in this aspect of improving nuclear safety.

To be fair to Marshall, he was extremely sympathetic and sensitive to the needs of the central European nuclear plants. He was also responding to a pointed concern among many WANO members to allow an expansion of the WANO Charter to permit the chairman such direct involvement, or so Marshall interpreted that sentiment. Such a revision of the Charter might well have positioned the organisation to respond more flexibly in the future

with more direction from the chair. But direct involvement with governments, with one notable exception, would remain outside the Charter.

What WANO could accomplish within its Charter and the framework established by the IAEA was a backfitting programme of hardware and software advances which, when implemented, would “lead to substantial improvements in the safety of WER- 440/230 reactors” as well as technical aid. But the Governing Board halted Marshall’s retrofitting initiative and further cautioned him not to intrude on the IAEA, to which the CEC had given the leadership role in dealing with the Bulgarians and Kozloduy. While WANO’s role was not all he had hoped for, Marshall made Kozloduy its highest priority. WANO held three contracts to upgrade the operational safety at Kozloduy that comprised a twinning arrangement with Bugey, a Paris Centre plant, to exchange information and technical staff, an outage assistance team of engineers to restore the operations at the plant and assistance to backfit the hardware projects. But the Governing Board, led by Carle, insisted that backfitting be handled by others and that even the “urgent management issues” of Kozloduy “be clearly defined in scope and nature” before giving its approval. By 1993, WANO’s role was “entirely to advise and assist the Bulgarian operator to implement safety improvement programmes”.

If frustrated in not playing a larger role in the retrofitting of the reactors in the former Soviet Union and its satellite countries in Central and Eastern Europe, Marshall eventually found WANO’s voluntary pilot Peer Review programme to be an exciting alternative. WANO’s first President, Bill Lee, had pushed hard for Peer Reviews, arguing that they had been enormously successful for INPO. Bill Cavanaugh and Zack Pate, Atlanta Centre’s representatives to the WANO Governing Board, also favoured an international Peer Review programme. Marshall, however, had taken a European view of Peer Reviews, otherwise termed “technical reviews” or “audits”, and did not push for them, favouring instead the twinning arrangements between plants such as that between Kozloduy and EDF’s Bugey station. But in the spring of 1991, while visiting the US, Marshall saw for the first time how an INPO peer review was done.

At INPO’s initiative, Wesley von Schack, President of Duquesne Power, invited Marshall to participate in the peer review at the Beaver Valley nuclear power plant near Shippingport, Pennsylvania, also the site of the

country's first commercial nuclear plant, which had been decommissioned in 1982. While accommodations at the La Quinta Hotel near the Pittsburgh airport were hardly the calibre to which Marshall and Lady Ann were accustomed, von Schack recalled how engaged Marshall became during the two-week long on-site review. He worked with the evaluation team, ate dinner with them and spent evenings around the bar at the hotel learning how the peer review process unfolded. Von Schack was impressed by Marshall's "roll-up-the-sleeves" approach to Peer Reviews to the point of placing a fold up bed at the plant on which Marshall could take naps during the visit. Von Schack felt some guilt over putting up an English lord in a chain motel, so he hosted them for a weekend in the Mellon family cottage at the exclusive Rolling Rock Club east of Pittsburgh. It was an expensive week, von Schack later recalled, but the visit accomplished what Pate had intended. Thereafter, Marshall became a convert to Peer Reviews. His backing of Peer Reviews earned him high marks from Atlanta Centre and eased the tension that had developed over his involvement with Kozloduy.

Even so, the Governing Board's support of Peer Reviews remained mixed - there would be no rush to judgement. Although the concept was backed by Paris Centre, Carle believed that Peer Reviews should be done on a voluntary basis and that each country that carried out such evaluations should report on its experiences with regard to the usefulness of the reviews and how they were conducted. Adolfo de Ubieta from Spain believed that the reviews could "be a powerful tool to close the operating experience feedback loop" but indicated that Spanish utilities were not "institutionally prepared" to conduct them. The director of Moscow Centre thought Peer Reviews were a good idea but declared that it was "premature in the context of Eastern European plants" and that it would "take some time to build up the necessary confidence to achieve the openness required". Members from Tokyo Centre worried that evaluations might be harmful if the results were not properly restricted, India conducted what it termed "introspective" reviews. The Japanese allowed that an international approach would be valuable "provided it was attempted slowly and on a friendly basis. The cultural questions," Ryo Ikegame, a member of the Tokyo Centre Governing Board cautioned, "should not be underestimated", meaning that Peer Reviews in Asia would not conform to Western standards. According to Tokyo Centre, one size for a peer review did not fit all plants; Peer Reviews would need to be tailored to each situation".

At the Atlanta BGM, Lee, Pate and Marshall vigorously pushed to make Peer Reviews “part of the forward-looking programme for WANO”. The Governing Board remained cautious “in order to account for cultural differences and national practices”. The Governors agreed to initiate a pilot voluntary peer review programme that, though led by Atlanta Centre, would lack any fixed implementation procedure. The programme consisted of a series of pilot Peer Reviews to be held at a number of “volunteer plants” before the next BGM in Tokyo in 1993. The pilot Peer Review programme was to test the procedures and assess the benefits of Peer Reviews, which would investigate the organisation, operations and practices of a nuclear power plant and note its strengths as well as areas in which improvement could be made. At the end of the review, the team would provide recommendations for improvement. The distribution of the final report was not resolved, though the intent was to keep the reports confidential within policy guidelines to be established by the WANO Governing Board. Peer Reviews would serve two functions. The immediate objective was to improve safety and reliability at the plant. In addition, the programme also sought to train team members from the various regional centres in conducting future reviews, as there was no tradition of peer review among WANO members outside North America and, to a lesser degree, France. The Paks plant in Hungary offered to be the first to host a peer review team consisting of experts from all the regions.

Although WANO’s Governing Board approached the pilot programme gingerly, the Americans, convinced of the effectiveness of Peer Reviews, believed it would become a major WANO programme by the end of 1993. In a July 1991 memo entitled *Desired Outcome, Pilot Peer Reviews*, Walter J Coakley, the Acting Director of the Coordinating Centre, wrote to Stan Anderson at Atlanta Centre that “we expect that by 1993 all regional centres will commence a peer review programme”. The final programme “will be most effective if it resembles to the extent feasible the methods we [at INPO] have developed”. Yet “any attempt to impose our methods on the Peer Review programme directly would be met with strong opposition. Our goal then should be to adapt our methods to the situation posed by the pilot Peer Review programme, package them in special documents, and use them to conduct productive visits.” If the Peer Review programme were to go forward as a separate programme in 1993, Coakley argued that “there must be strong endorsements” from the management of the utilities receiving the

site visits. To achieve that, he advised that the host plants see “real value as well as perceived benefits from the reports. Acceptance will be greater if the teams can find some valuable strength that can be published during 1992 to WANO membership.” In short, Coakley thought WANO should adopt a peer review programme that emulated INPO’s evaluation process “to a significant extent but is flexible enough to satisfy the autonomous views of the regional centres.” The programme was given an extra boost when Coakley replaced Eckered as the Acting Director of the London Coordinating Centre at the end of 1991.

The Paks plant in central Hungary consisted of four second-generation WER reactors, 440/213s, that had been designed to include the containment buildings and emergency core cooling and auxiliary feed water systems lacking in the older 230 models. The units were relatively new, having come on-line during the mid- 1980s. When WANO informed the IAEA staff of the pilot Peer Review programme in September 1991, the IAEA was “unhappy” claiming the reviews would only duplicate the IAEA’s OSART (Operational Safety Review Team) programme. “We tried to convince them that this was not true,” Eckered reported of the encounter, “but only our promise to meet with them directly after the first peer review [and] inform them about our experiences could lighten the atmosphere somewhat.” By November the situation with the IAEA was defused, the IAEA concluding that both approaches were “valuable and complementary”. Plans went ahead for the first pilot review at Paks, which occurred over two weeks in February 1992. By the end of 1993, seven more pilot Peer Reviews took place: at Diablo Canyon in the US; Bruce nuclear generating station in Canada; Koeberg nuclear power station in South Africa; Chinsan nuclear power plant on Taiwan; Angra 1 nuclear plant in Brazil; Balakovo nuclear power plant in Russia; and Tomari nuclear power station in Japan.³⁹ Pate hand-picked the team leader for all of the pilots except Tomari, and he personally attended the last few days and the exit meeting for Paks, Balakovo and Koeberg.

While the Special Projects and Peer Reviews occupied much of Marshall’s time, WANO established precedents for operating its principal programmes that were fundamental to the association’s mission, such as the exchange of operating experience through the Nuclear Network® computerised messaging system, operator-to-operator exchange programme, plant performance indicator programme and good practices programme, as well

as a series of workshops and seminars designed to increase the sharing of operating experience between plant personnel.

Based on the INPO experience, there was much hope that the information exchange of operating experience would become a valuable weapon in WANO's safety- improvement arsenal. Staff in London carefully crafted specific criteria for nuclear plants to use in reporting events, so that the report content would be analysed and distributed to operators around the world. The event reports, WANO officials hoped, would provide "the opportunity for each plant to examine its operation and, where applicable, take steps to preclude a similar problem from occurring". But even with upgrades to Nuclear Network® to simplify reporting and improvements in the quality of event report content, most plants outside the US were reluctant to report operating deficiencies; consequently, the number of event reports did not meet the "lessons learned" expectations of the WANO Coordinating Centre and Atlanta Centre. The Governing Board, led by Carle and Hlubek, believed that valuable opportunities to share experiences were being lost. The programme did, however, accumulate an extensive data bank of operating experience, even if its utilisation was disappointing. Nevertheless, by the end of 1993, the Operating Experience programme remained very much a work in progress.

Far more successful was the programme of exchange visits between plant operators and the seminars and workshops that gave nuclear personnel an opportunity to meet, discuss and learn through direct dialogue, particularly among the operators in the West and those from the former Soviet Union and Eastern Europe. Vladimir Fuks, a governor from Moscow Centre who ran a nuclear power plant in Ukraine, told the Governing Board in 1992 that "the real value of WANO was in assisting operators to improve the quality of plant operation and performance, against unhelpful and critical advice of other [unnamed] organisations and institutions." Marshall admitted, however, that "there is still much to do if the best professional operating standards are to be achieved across the world."

The Good Practices programme had languished on several fronts. Many of the WANO Governors believed the problem lay in the fact that the practices were not fully identified and communicated to the membership. The lack of acceptance in individual plants stalled the adoption of good practices. The Governors proposed that introducing the topic into workshops

and seminars would encourage individual plants to adopt them. Marshall suggested singling out good practices at top operating plants, rewarding excellence as INPO did, but the Governing Board blocked such a move, citing the “national sensitivities involved”. The Board also labelled a report on good practices from Tokyo Centre as “complex” and needing “further consideration”. Hung up on identification and application issues, as well as a lack of widespread member interest, the Good Practices programme remained in limbo.

Although events forced Marshall’s initial vision for WANO to vary from the original script, with the Governing Board’s approval he adroitly switched course to take advantage of opportunities - such as the VVER Special Projects programme and Peer Reviews – as they arose. In doing so, he involved the Paris and Moscow Centres into the core of WANO activities, expanded the Charter accordingly and gave WANO a higher profile internationally than it might have otherwise experienced in concentrating solely on its core programmes. Of course, Marshall did not hold together this new multinational organisation by himself. The experience of INPO, the extraordinary work of the Coordinating Centre staff, the contributions of EDF and the crucial participation of the Soviet Union all ensured the success of an international association committed to nuclear safety. Nevertheless, Marshall was the glue that held together the confederation of regional centres under the WANO banner in its formative years, kept critical utility leaders involved, established its worldwide credibility and provided a foundation on which the association could prosper. If Marshall had once scoffed at WANO’s potential, he was largely responsible for shaping a flourishing international organisation to promote and enhance nuclear safety.



Marshall did not look forward to stepping down from his WANO chair. There was some discussion that he could be elected President of WANO, but that idea received little support beyond Marshall’s friends in Japan. Rather, Pate worked out an alternative plan, one that recognised Marshall’s considerable contributions to WANO while making use of the great reservoir of goodwill and the respect with which he was held by WANO’s members. The position, as Pate envisioned it, recognised Marshall’s “skill and the great

value of [his] visits to countries operating or wishing to operate nuclear power plants". The Governing Board wanted Marshall to continue these visits in a new role - as "Special Ambassador for WANO". Importantly, the position came with a "Special Assistance Fund" of £50,000, controlled by the London Coordinating Centre, to allow Marshall to "undertake specific assignments on behalf of WANO". But the Special Ambassador was put on a short leash. With Marshall's tendency to ignore budgets, regional chairmen who would foot the bill wanted to ensure that "costs are carefully evaluated and monitored. And expense reports meet audit standards."

While Pate was creating the position of WANO Special Ambassador for Marshall, the Chairman's Russian friends were drawing up a plan that would also put his services to use. Relations between Russia and Ukraine had been strained since the collapse of the Soviet Union. These political divisions had by and large ended effective cooperation between the utilities in the two countries. However, the newly appointed Russian Minister of Atomic Energy (Minatom), Viktor Mikhailov, and President Leonid Kravchuk of Ukraine both saw the need for assistance at their troubled nuclear power plants and agreed in principle to a "Users' Group" headed by Marshall. They believed that a non-governmental organisation led by someone of international stature might be able to circumvent the political differences "preventing cooperation within the states of the former Soviet Union" and coordinate the needs of the various utilities in Russia and Eastern Europe. Abagyan, Eric Pozdyshev, who was the head of Concern Rosenergoatom - which governed Russian nuclear plant operations - Hlubek and Carle backed the idea for the prospective Special Ambassador to bring the utilities together in the face of governmental estrangement. When the Governing Board began discussing the devil's details rather than the concept itself, Fuks, who knew firsthand the problems of running a nuclear power plant in Ukraine, stopped them. He reminded the members that the situation was critical and "only the influence of WANO stood any chance of bridging the political divisions." That was sufficient for the Governing Board to support the plan for Marshall to assist Moscow Centre utilities "in working together to achieve common objectives in the field of operational safety".

In his four years as Chairman, Marshall had accomplished much. The fledgling organisation that Marshall had been certain would not survive had thrived under his leadership. WANO firmly established itself as an

Самостоятельно Подписавший
на своем месте
Президент государственного концерна
по производству электроэнергии и
тепловой энергии из атомных станций
РОСЭНЕРГОАТОМ
UNIT 1, Moscow, Russia tel. 7
A.T. 20140 Moscow, Fax 2204401

The Lord Marshall of Goring
WANO Chairman

No _____
Its No _____ of _____

Dear Lord Marshall,

We would like to cordially thank you for your great contribution to the world nuclear power while being the WANO Chairman. You are the creator of WANO and the inspirer of all its ideas. Personnel of the Russian nuclear power plants have felt the fruitfulness of your initiatives on experience feedback of the Eastern and the Western NPPs. We highly appreciate your noble efforts to canalize the Western assistance for the Russian nuclear power plants into realistic way and we hope for success.

We would like to give special thanks to the Lady Marshall whose kind attitude we have been feeling through all the period of your Chairmanship. Please send her our best regards and feelings of sincere gratitude.

Let us wish you and your family excellent health and happiness. We do hope that our mutual cooperation will be as fruitful in the future as it has been up till now.

Sincerely yours,

E. Pozdnyshov
President of "Rosenergoatom"
and
Directors of Russian NPPs

WANO
Chairman
in Russian
Signature: E. Pozdnyshov



WANO-TC/L91/92
March 7, 1993

The Lord Marshall of Goring
K. CRE, FRS
Brick Way House
Goring-on-Thames
Oxon RG5 0NS
The United Kingdom

Dear Lord Marshall,

We would like to express our deepest appreciation to you for the tremendous efforts you have made for the establishment and steady progress of WANO up till now. It has been our privilege to work under your leadership for the past four years. We wish you success as Ambassador of WANO.

With very special wishes of
WANO Tokyo Centre Staff,

Takashi Saito
Chairman

A. Higuchi
Secretary

SS

Handwritten signatures and notes, including "Hara" and "K. Pozdnyshov".

WANO-TC/L91/92
March 7, 1993
E. Pozdnyshov
President of "Rosenergoatom"
and
Directors of Russian NPPs

Государственный
концерн "Росэнергоатом"
по производству электрической и
тепловой энергии из атомных станций
РОСЭНЕРГОАТОМ
"РОСЭНЕРГОАТОМ" АС
129550, Москва, Россия, Пресненский
район, Б. Дудинский пер., д. 1
Телефон: 800-324477
Телефакс: 272483-1000

For Lord Marshall of Goring
Chairman of WANO

Dear Lord Marshall,

I am heartfelt grateful to You for your contributing so much to development of world nuclear power industry during your service as Chairman of WANO. The people in Ukraine nuclear power industry appreciate very much your efforts and initiatives for exchange of good practice between operators of Ukrainian and other countries' nuclear power plants. Time will be the best judge to reveal the place and the great role of WANO which was established with your leadership.

May I wish You and dear Lady Marshall good health and happiness.

Your sincerely,

V.P. Fuks

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*Sincerely yours,
Eric Pozdyshev*

Dear Lord Marshall,

I am heartfelt grateful to You for your contributing so much to development of world nuclear power industry during your service as Chairman of WANO. The people in Ukraine nuclear power industry appreciate very much your efforts and initiatives for exchange of good practise between operators of Ukrainen and other countries' nuclear power plants. Time will be the best judge to reveal the place and the great role of WANO which was established with your leadership. May I wish You and dear Lady Marshall good health and happiness.

*Your sincerely,
V. Fuks*

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*With very special wishes of WANO
Tokyo Centre Staff*

effective international nuclear safety leader. Although Marshall claimed, with some exaggeration, that the four programmes that formed the core of WANO's activities - the exchange of information on significant events, exchange visits between plants, the identification and dissemination of good practices and measuring plant performance indicators - were "well established", they at least had begun to function. The exchange visits were the most noteworthy and successful, clearly demonstrating the value of direct dialogue between plant operators. The Operating Experience programme had a patchy reporting record, and most of the data submitted came from American plants. Judgement was still out for the Performance Indicator programme, as WANO had only recently distributed a set of measurement criteria on "which operational excellence will ultimately depend". However, the Good Practices programme, assigned in 1989 to Tokyo Centre, had not worked as designed. An analysis of the Governing Board in the fall of 1992 determined that "good practices were still not fully being identified and disseminated to the membership." As a result, "too many opportunities were being lost."

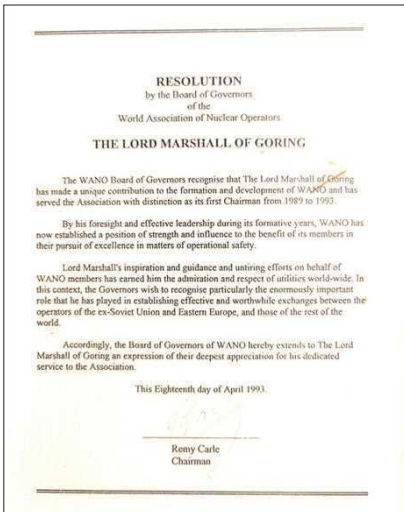
As he turned over the chairmanship to Remy Carle in the spring of 1993, Marshall reflected on WANO's successful evolution during a time of momentous political and economic upheaval. At the top of his list was the support WANO provided to the utilities of Eastern Europe that were affected by the breakup of the Soviet Union and the political upheavals that followed throughout the former Soviet Bloc nations, particularly Kozloduy. "These tasks are far from easy," he wrote. Technical complexities and the vagaries of governmental and international bodies added to the difficulties. In addition, "vested interests, lack of urgency and shortage of resources have all hampered the work, but progress is being made. I am proud to have been involved in this activity on behalf of WANO...and look forward to continuing this association in the future."



*Lord Marshall hands over the
chairmanship to Remy Carle,
BGM 1993 in Tokyo*

Marshall also praised WANO for the enthusiasm the utilities demonstrated toward the pilot Peer Review programme. While the value of Peer

Reviews had been proven for a decade in the US, Marshall was impressed with how the reviews had been embraced by WANO's members - far beyond the expectations of the organisation's founders. Led by Atlanta Centre, the translation of Peer Reviews "across cultures and national boundaries and the willingness of so many plants worldwide to undergo review "he commented with pride, "was in my opinion a most remarkable demonstration of the mutual confidence and respect that exists between our members'.



Marshall's feeling was fully reciprocated by the WANO Governing Board. He had made "a unique contribution to the formation and development of WANO and has served the Association with distinction as its first Chairman from 1989-1993. By his foresight and effective leadership during its formative years, WANO has now established a position of strength and influence to the benefit of its members in their pursuit of excellence in matters of operational safety."

The Governing Board's resolution in thanking Marshall emphasised his "inspiration and guidance and untiring efforts", which had earned him "the admiration and respect of utilities worldwide". The Governors specifically honoured his dedicated service and work to develop "effective and worthwhile" exchanges between operators in the former Soviet Union and Eastern Europe, and those of the rest of the world. Of course, the resolution papered over the occasional tensions that Marshall's chairmanship had experienced, but there was no question about the great respect and affection that WANO members had for him. WANO's first Chairman, who had done so much to hold together all the WANO programmes and parts, would continue as Special Ambassador. He would be stepping down but, thankfully in the eyes of most, not away.

Chapter Three. Protecting the Core

Although not widely recognised at the time, the election of a new Chairman, Remy Carle, at the Tokyo Biennial General Meeting in April

1993 allowed WANO to refocus on the core programmes upon which it had been founded, plus the Peer Review programme. As long as Lord Walter Marshall was both the WANO Chairman and the head of the VVER Steering Committee and Users' Group, the Governing Board found itself stretching WANO's financial resources and splitting the chairman's time between two tasks - one toward its core programmes and the second toward its special role in assisting Eastern Europe. While many members considered Marshall critical to the success of WANO's Special Projects in Eastern Europe, several of the board members, led by those in Atlanta Centre, worried that the core programmes were being neglected in favour of the retrofitting and safety programmes directed at Soviet-designed power plants. Now, with Marshall stepping down from the chairmanship, Zack Pate recommended that he become a Special Ambassador to those efforts assisting with nuclear plants in the former Soviet Union. With that move, Carle could refocus on WANO's core programmes while Marshall served as WANO's Special Ambassador working with troubled Eastern and central European nuclear plants. As an initial part of his refocusing effort, Carle pushed for a review of WANO's first five years and an analysis of what the international voluntary organisation of utilities had achieved – or not achieved – since its founding.



*Lord Marshall welcomes Eric Pozdyshev,
BGM 1993 in Tokyo*

Carle's election, however, was not without controversy. Marshall's friends on the WANO Governing Board from Russia and Japan urged that the Articles of Association be changed so that Marshall could continue as chairman. Atlanta and Paris Centre governors, led by Pate, William Cavanaugh III and Carle, strongly disagreed, partly because they did not want to set a new precedent. In addition, while they believed Marshall had done an excellent job in launching WANO, they did not support his personal emphasis on the Soviet-designed reactors if it in any manner was at the expense of developing the organisation for the benefit of all members. In short, they did not believe WANO could move forward if Marshall continued at the helm. The Russians, led by Armen Abagyan and Eric Pozdyshev, argued that if Marshall did not continue, they might withdraw. A Tokyo Centre governor, Ryo Ikegame, sided with the Russians.

The impasse was felt throughout the association. The chilly relations filtered down to the regional boards. On top of it all, Eckered had left as the director of the Coordinating Centre. The impasse was finally broken by Eckered's replacement, Andrew Clarke, who, with Pate's strong backing, brokered a deal that would retain Marshall as WANO's Special Ambassador assisting the Eastern and central European nuclear plants with funding from INPO and Electricity de France. The Russians and the Japanese agreed to the compromise. Marshall, who was initially cool to the idea, finally accepted the concept on the premise that WANO might be severely impaired if those programmes failed. The deal opened the way for Carle's unanimous election in the spring of 1993.

WANO's second chairman had an impressive CV, though his career focused on the application of nuclear energy in the business side of the industry rather than the basic research that had been the hallmark of Marshall's career... Carle had been crucial to the success of the Paris meeting in 1987 and had continued his strong involvement with WANO as a member of the Paris Centre Governing Board since that time.

...The activities of WANO's Tokyo Centre were especially weakened by political problems, which included seemingly insurmountable language and cultural differences, festering wounds from World War II and sharp differences between the governments of India and Pakistan and between Taiwan and mainland China. Tokyo Centre, according to one WANO official, struggled to implement WANO programmes because Asian cultures

were embarrassed by failures and reluctant to share problems, preferring to solve those matters privately. Many governors believed that the failure of India and Pakistan to sign the Treaty on the Non-Proliferation of Nuclear Weapons (commonly known as the Non-Proliferation Treaty, or NPT) and a determination by the Japanese utilities, led by TEPCO, to define WANO's core programmes on their centre's own terms had sapped WANO's effectiveness. The absence of staff from the Asian sub-continent placed more pressure on the Japanese utilities to fill those positions, an additional cost they were hesitant to assume, leading to underfunding and understaffing at the centre. Tokyo Centre complained, with some justification, that "there are so many differences among our members [that] it is difficult to apply a single policy or working method to all members equally." The Canadian government withheld assistance to India's CANDU reactors, and other countries followed the same NPT-based policy, to the detriment of WANO's work in Pakistan. Engineers from India and Taiwan could not travel to Pakistan, and Pakistani peer review team members could not enter Canada. As a result, meetings for all members could only be held in Japan or Korea. The Governors were also troubled that India had not fully informed WANO about a turbine fire and shutdown at the Narora nuclear plant in the northern state of Uttar Pradesh, releasing only an internal report to Tokyo Centre rather than to the WANO Governing Board, thereby endangering WANO's credibility and causing "considerable disquiet among the governors".

Although divided, many of the governors had also become "disquieted" about the Users' Group, headed by Lord Marshall. Formed in June 1993 by operators of Soviet-designed reactors, the Users' Group sought to work together to upgrade the safety of those operations. While it was functioning well in their opinion and Lord Marshall had achieved a "remarkable result in difficult circumstances", the group "still had some way to go to achieve its objectives". Specifically, the board worried about the extended timetable and the implications that held for additional funding, particularly a Special Assistance fund established to underwrite Marshall's activities that had gone over budget. Marshall's penchant for overspending had been more or less tolerated during his chairmanship, but many on the Governing Board had grown impatient with nagging delays and cost overruns from the Users' Group. A majority of governors wanted the project accelerated and, if possible, to find funding for Marshall outside of WANO. Moscow

Centre continued to support the Users' Group, arguing that it had finally identified "some eight to ten common projects to be completed". To others, that was not much of an achievement after more than a year. They stressed that WANO should support neither an open-ended time frame nor an open chequebook. In a compromise, the Governing Board agreed to fund Lord Marshall for the next six months; after 1995, the board wanted alternative funding agencies to underwrite this work and there would be no formal links between WANO and the Users' Group.

By the end of Carle's first term as Chairman, the Governing Board had completed its review of WANO's programmes. The verdict was mixed - Atlanta Centre was performing above expectations, others below what the governors expected. Nevertheless, Carle was upbeat, though with a caveat, reporting to WANO's members that overall the board was "satisfied that the programmes were on course and producing good results". However, he warned, "we have to be on our guard against complacency that could rob us of all that has been achieved." He noted that although there had been a reduction in the number and importance of abnormal events, "some mistakes are still being repeated and we must do more to improve our analysis and the communication of results." He called on WANO members to do more in sharing the results of exchange visits, to make more effective use of performance indicators, and to renew efforts to identify areas of good practices. Although Carle noted publicly that these challenges were a "normal part of the development of a still young organisation", the undercurrent among the Governing Board was that these issues had been slow to change. There was broad agreement that support from senior utility executives had declined in some regions and that top management had sent lower-level plant managers in their stead. WANO needed to be valued at the highest levels, and senior utility management needed to be convinced of the benefits of participating in the organisation's activities.

That Carle demanded better results did not indicate that WANO's programmes were failing. In fact, the opposite was true for several of them. The Operator to Operator Exchange programme, initiated at the Inaugural Meeting in Moscow with the challenging goal that each Moscow Centre nuclear plant would arrange a reciprocal visit with a plant from another region by the spring of 1991, had succeeded beyond expectations. Those initial visits had given the organisation a strong foundation for continued

exchanges. By the end of 1994, more than 250 exchange visits had taken place. The programme had also matured. The focus of the exchanges moved from general information to specific operational and managerial issues identified in the earlier exchanges such as maintenance, training, radiological protection, plant organisation, chemistry, quality assurance and emergency planning. Workshops, seminars and expert meetings, which provided the opportunity for power plant personnel to focus on specific subjects, grew and matured like the exchange programme, playing an increasingly important role in sharing operator information and advancing WANO's goal of maximising nuclear safety and plant reliability.

WANO's Performance Indicator (PI) programme was a keystone to the goal of plant reliability. Most utilities kept internal records of their plants' performance. But the WANO programme permitted them to benchmark against utilities from all over the world. WANO's performance indicators "let us know where we stand and how we compare" with other members, according to one site manager. "WANO's Pi's are the cornerstones of our own 'what gets measured, gets done' approach, which is the most powerful management tool we all know." By mid-1994, 95% of WANO's members reported on seven of the ten indicators. Nuclear plant performance continued to improve, with unit capability increasing from 72% to 80% between 1990-1994. There were similar gains in the unplanned capability loss factor, in lower collective radiation exposure, and in the number of unplanned automatic scrams. Utilities with good performance indicators translated into better managed, more reliable, and safer nuclear plants. Nevertheless, WANO members agreed that while the programme had been "extremely effective in providing a clear picture of trends in nuclear plant performance", there was still room for improvement...

Carle also saw a need for two regional centres, Moscow and Tokyo, "to be more cooperative". In a heated encounter in Tokyo, he urged an influential former member of the centre's governing board to replace the centre's director, whom Carle considered obstructive to WANO's programmes. Though this change was very difficult for the Japanese to swallow, Carle finally prevailed. He wanted all centre directors to be "team players". The new Director of Moscow Centre, Farit Toukhvetov, a former Station Director at the Bilibino nuclear power plant, agreed with the team approach. He told Inside WANO that he would work with his centre's members to

increase their participation in WANO's activities, placing "a special emphasis on new WANO initiatives to address existing problems and to anticipate future challenges". If the top- down approach - from the chairman and governing board to the regional governing boards and centre directors - had not accomplished WANO's mission as quickly as Carle had hoped, perhaps a shove from the broader membership could get the regional governing boards back on a single track to move WANO ahead. Carle wanted to ensure that all WANO members would buy into its strategic plans for the future, especially Peer Reviews - which he believed needed more volunteers in some regions - and sharing of operating experience. This might be accomplished by listening to as many members as possible about the strengths and weaknesses of WANO - its valued programmes as well as its less useful ones and how they might be improved.

To accomplish this, Carle and the WANO Governing Board called for a full review of the organisation, a "self-examination" led by Raymond W Hall of Paris Centre and Robert C Franklin of Atlanta Centre, "two elders we all respect." Ray Hall had a long career in nuclear energy, initially with the CEGB and later as Chief Executive of Nuclear Electric and of Magnox Electric Limited. For many years Hall had served as a member of the Paris Centre Governing Board and, after 1993, as its chair. Bob Franklin, a former Canadian railroad executive, had become the head of Ontario Hydro in 1986 and led that utility's entrance into nuclear power. In addition, he had chaired Atlanta Centre's first governing board. Both men were highly regarded in the industry; both would be retiring soon and would be able to devote much of their time travelling and speaking to WANO members throughout the world. Their task, as Franklin explained to the Atlanta Centre board, was to review all WANO activities by asking opinions of as many personnel as possible regarding the organisation's strengths and weaknesses, focusing on WANO's programmes, the performance and resources of regional centres, and WANO's structure. During the summer and early autumn of 1997, the team would investigate members' views on WANO's programmes, with a goal of completing their report to the Governing Board by the end of the year. Their report would be Carle's legacy.



WANO under Remy Carle had matured considerably. From an uncertain organisation largely held together by the force of Lord Marshall's personality, WANO had become accepted within the international atomic energy industry as a force for nuclear safety. Marshall had traded the centres' autonomy in return for WANO's stability. Intractable problems between the regional centres and the WANO Governing Board were often postponed until some later date for the sake of general harmony. Carle believed that the time had come to emphasise WANO's goals and core programmes

...To drum up support, Carle, usually accompanied by Clarke and occasionally Pate, travelled extensively to meet with utility executives and plant operators. By including more executives in his discussions, Carle hoped to strengthen regional support for WANO's programmes. These contacts forged strong relationships with members, building on and expanding Marshall's work in Eastern Europe and Russia and in the Far East. "He was a fine statesman for WANO," Pate later commented regarding Carle's visits to WANO members' plants, "and highly dedicated to the [WANO] mission." He had witnessed the growth of the Peer Review programme and new efforts to improve communication among members with an expanded Nuclear Network® and the publication of Inside WANO. The safety and reliability of nuclear plants had improved, and Carle believed that WANO's programmes had contributed to this. But, he warned, "behind this progress lies a decisive improvement in safety culture, but which remains threatened wherever the financial situation is precarious. We should make nuclear energy a model technology and aim for excellence. There is a margin of progress which we should and can fulfil whatever country we are in." Implementation of the Long-Term Plan and the Franklin-Hall Report, he expected, would provide the roadmap by which WANO could succeed.

Chapter Four. Securing the Mantle of Nuclear Safety

The election of Dr Zack T Pate to the chairmanship of WANO in Prague in May 1997 marked another stage in the progress of the organisation.

...WANO members had seen their new chairman at every Governing Board meeting and BGM, where his passion in promoting worldwide nuclear safety had cast a keen and steady eye over WANO's development. Confident and experienced from his time with Rickover and at INPO, Pate could be both a tough taskmaster in advocating change at WANO and a careful

diplomat in dealing with WANO's diverse membership. He was well aware that if opposition to American leadership at WANO had dissipated, it had not disappeared. Pate was every bit as physically imposing as his unshakable commitment to nuclear safety. Tall and athletically trim, he possessed a rich bass voice that embodied authority. When Pate entered a room, he captured it - the remarkably sonorous voice, the shining shaved head standing above the crowd and his whip-sharp knowledge of nuclear safety all demanded attention.

Just as he had been an early advocate for an industry response to the Three Mile Island accident, he had been in the vanguard to establish an international organisation soon after the details of the Chernobyl accident became known. The cause was just, but the timing, for Pate, was not. On the 25 April 1986, he and his wife Bettye arrived in Bermuda to celebrate their 25th wedding anniversary. It was their first vacation in more than five years. They had been there less than 24 hours when the first news of Chernobyl arrived. Soon Pate was on the phone to INPO to discuss what could be done. "The end result," he later recalled, was that "I didn't get a lot of credit from Bettye for a vacation."

Pate and others at INPO were uncertain how to approach the disaster. In the middle of the Cold War, he had visited the Soviet Union during his days as a submarine commander, looking through a periscope at the lights of Murmansk and secretly monitoring shipping traffic moving in and out of the harbour. But this was hardly the CV with which to open discussions with the Russians. In addition, Americans in the mid-1980s questioned the sincerity of glasnost, a policy more publicised than practised at the time. Nevertheless, Pate and others at INPO were determined to find a way to communicate with the Soviets and create an international approach to nuclear safety. INPO could serve as a model, but the Americans agreed that an international INPO would not work.

When Pate finally set foot in the Soviet Union, it was to attend the WANO Inaugural Meeting in Moscow in 1989. To the Soviets and others he was not just another delegate. In the months prior to this first gathering of the world's nuclear utilities, Pate directed part of INPO's staff to draft the organisational guidelines and functional programmes for the new association. As a result, there was a prominent stamp of INPO's experience on the WANO Charter. In addition, Pate and his wife were travelling with Lord

and Lady Marshall, whom they had joined in London a few days before the meeting. Their first stop was Leningrad and a visit to the Leningrad nuclear power plant some 70km west of the city on the shore of the Gulf of Finland. The plant, once managed by Nikolai Lukonin, had four Chernobyl-type RBMK reactors. Pate was impressed with the attention and deference Marshall and he received in Leningrad.

But the enormous gap in tourist accommodations between the Soviets, who were new at hosting international conferences, and the modern hostels in the West with which Marshall and Pate were familiar, became evident when the two couples checked into the convention centre hotel in Moscow. "The Russians were treating Marshall as a visiting dignitary, and they lumped Bettye and me into that [category] because they had heard of INPO," Pate remembered. "We thought we were getting the royal treatment on the coat-tails of the Marshalls, who were assigned a suite. So they take our baggage and escort us to our room, give us the key, and leave. Actually there were two rooms, with a door between. In one room there are two double beds. In the other room two sofas, two coffee tables, and several chairs. Marshall and I soon realised that this is how the hotel had created a suite." For the next half-hour, Marshall, a Knight of the British Empire, Pate, the CEO of INPO, and their wives moved furniture and reconfigured the rooms. "We didn't know who to talk to," Pate explained, "so we just fixed it." Soviet egalitarianism and Western ingenuity had won the day.

The tour of Chernobyl following the Moscow meeting had a great impact on Pate. Based in a hotel in Kiev, the WANO group took a hydrofoil up the Dnieper River to the vicinity of the plant and boarded buses for a tour of the ghost town of Pripyat, a short distance from the Chernobyl plant. While they were not allowed into the plant, Pate took pictures of the city. "Every tree was dead. You could see curtains open and towels hanging on the balcony. People had just abandoned it. Trucks were spraying water on the streets to keep radioactive dust down." It was a stark, jolting reminder of the extent of the accident... INPO, Moscow and Chernobyl all served as milestones in Pate's history and in his preparation for becoming Chairman of WANO...



IV. IN THE FIRST PERSON

FROM THE WANO STEERING COMMITTEE

/by Lord Marshall of Goring/

In October 1987, senior representatives from most of the world's nuclear utilities met to discuss the need for increased cooperation among nuclear utilities worldwide. At the end of that meeting, the delegates, many of whom are here today, resolved to strengthen the existing links and cooperation among nuclear operators by setting up a worldwide association. We agreed that the mission of this new association, subsequently called the World Association of Nuclear Operators, (WANO) would be "to maximize the safety and reliability of the operation of nuclear power stations by exchanging information and encouraging comparison, communication and emulation amongst its members."



We also agreed that WANO would operate through four regional centres based in Atlanta, Moscow, Paris and Tokyo together with a small coordinating centre. But although we agreed upon the principles of our new Association, there were many questions needing resolution before we could say that WANO was in business. Therefore, the meeting participants decided to form a steering committee to develop detailed proposals. It was an honour and a pleasure for me to be asked to lead that steering committee. It is with even greater pleasure and with some relief that I have come to Moscow only 18 months later to tell you that WANO is now ready to start work. It will be effective, it will not be bureaucratic, and it will cut across all political and cultural boundaries. Nearly every nuclear utility in the world has already joined WANO through one of its four regional centres. Today,

I am going to invite each nuclear utility, either present or represented, to declare their individual commitment to WANO by signing its charter.

Before asking you to do that, it is my duty to explain the proposals that have been developed by the steering committee. But first, I would like to remind you why international co-operation among nuclear utilities is so important.

Of course, international collaboration in the nuclear industry is not new. The early emphasis was on the exchange of technology and research information. That has been helpful and effective in achieving progressive improvements in reactor designs. Furthermore, the free exchange of information on safety matters has always been a traditional approach in the nuclear industry. We also have strong international collaboration between national governments through the activities of the International Atomic Energy Agency in Vienna. The IAEA has played an exceptionally important role to stimulate discussion between governments on all kinds of nuclear activities. It has the central role to play in connection with non-proliferation, and following the Chernobyl accident, its Director-General, Dr Hans Blix, gave vital leadership to us all. But all this is not enough. The benefits of nuclear power can be brought to mankind only if nuclear safety performance is kept at the highest possible level; and nuclear safety must ultimately depend upon the nuclear utilities that own and operate the plant.

The ultimate safety responsibility for a nuclear plant cannot rest with any individual engineer because individual people may have been trained badly, or they may be operating a reactor with a design fault or they may simply have been given too much responsibility.

The ultimate responsibility cannot rest on the station manager either, because although he has a vital safety role to play, he is implementing the policies of the nuclear utility that employs him. The ultimate responsibility cannot rest with the nuclear designer, because the utility was not compelled to buy a reactor of that particular design. The ultimate responsibility cannot rest with the regulator, because if it did, the utility would only need to obey the written regulations. Therefore, the ultimate safety responsibility must rest with the corporate organization that owns and operates the plant. Regulators, designers, manufacturers and individuals all have an important safety role to play, but the ultimate and fundamental safety responsibility must rest with the nuclear utility. Therefore, each nuclear utility has

an individual corporate responsibility to guarantee nuclear safety, and no amount of international collaboration or discussion, can interrupt or replace that responsibility.

Given that important but simple thought, it follows that each nuclear utility also has a responsibility to learn from others by seeking out good practices and avoiding mistakes that have already been made elsewhere. Therefore, all nuclear utilities have a collective responsibility to work together, and to help one another upgrade the safety and reliability of the plants that they operate. The nuclear community has learned these lessons in a very painful way. We have learnt these lessons through the accidents which have occurred at the Windscale reactor in my own country, at Three Mile Island in America and at Chernobyl here in the USSR.

The Windscale accident occurred more than 30 years ago. A military reactor, moderated with graphite, caught fire and distributed radioactive iodine over the county of Cumbria. With the value of hindsight, in a strange way, the United Kingdom was lucky to have had its accident at a very early date. It taught us to be very careful about safety and it stimulated the British Parliament to pass some very wise laws which have stood the test of time in my country ever since. The cardinal principle of the British law is that the utility that owns and operates the plant is unambiguously responsible for safety.

The nuclear regulator has an extremely important auditing role and in setting safety standards. He can, of course, close down a nuclear plant at any time if he is not satisfied. But nothing done by the Government, the regulator, the researchers, or the manufacturers disturbs the fundamental responsibility carried by the nuclear utility. This emphasis, on the role of the nuclear utility, is now widely recognized throughout the world.

The need for greater cooperation amongst utilities was brought home to us all by the accident at Three Mile Island in the United States in 1979. The precursors to the accident had occurred several times previously at plants owned by other utilities, but the information had not been transmitted to the operators of the Three Mile Island plant. It was self-evident after the event that if the utilities had been collaborating together effectively the accident would not have occurred. Furthermore, the accident had an appalling affect on public acceptance of the nuclear industry throughout the United States, and the rest of the world. We all learnt that the accident at Three Mile

Island was an economic blow to the entire nuclear industry. To their credit, the 54 United States utilities that operate nuclear power stations, reacted quickly by forming the Institute of Nuclear Power Operations (INPO) in Atlanta, and they gave authority to INPO to achieve effective information exchange and self-improvement for all its members. At the time there was considerable scepticism that INPO would be effective. But now there is no doubt that INPO's work over the last eight years has led to real improvements to the safety and operation of the United States nuclear power stations. I am delighted that so many U.S. utility leaders have responded to the invitation to come to Moscow to demonstrate their commitment to the same principles that they adopted at INPO, but on a worldwide scale. INPO also has utilities outside the USA participating in some of its programs. They have achieved an effective information exchange across National and cultural boundaries.

Finally, as we all know, the Chernobyl accident has taught us that the benefits of nuclear power demand constant vigilance on safety matters. Of course, the greatest effect was here in the Soviet Union. Those of you that elect to visit Chernobyl later this week will see what a tremendous recovery job our Soviet hosts have done but that does not disguise the huge economic and social costs that have been paid. The accident has also taught us that radiation does not respect National boundaries, and it has taught us that an accident in one country inevitably affects all countries. It has also taught us a lesson of stark self-interest; that a nuclear accident has an economic fallout which spreads even wider than the radioactivity which is released. It follows that nuclear utilities have a collective responsibility to help one another for both safety and economic reasons.

That collective responsibility can be encouraged but cannot be implemented by agreements between Governments. With hindsight, we can see that the famous Atoms for Peace initiative launched some decades ago, when Eisenhower was President of the USA, gave full weight to science, technology, manufacture and design - but did not properly recognise the importance of the operator's role. We are all here today to get the balance right.

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After the Chernobyl accident, there was a widespread reaction among the American utility industry. They argued that the constructive lesson of INPO should now be applied on a worldwide basis. Their thoughts were echoed in Europe and especially by France with its large investment in nuclear power. Together, it was agreed to press for a worldwide collaboration among nuclear utilities to improve safety to the maximum possible extent. The end result of that thinking was the decision to press for this worldwide collaboration by calling for a conference which was held in October 1987 in Paris.

It was, for me, a great honour to be asked to be chairman at that conference, and to take the lead in setting up a new worldwide organization. Of course, at this point the collaboration, enthusiasm and commitment of our Soviet colleagues was absolutely vital. Our President of this meeting, Minister Nikolay Lukonin gave his immediate encouragement to our ideas. Subsequently, he won the approval of the soviet government to the whole idea of WANO and to our proposal to hold the inaugural meeting here in Moscow. He agreed that Minatomenergo would be a joint sponsor of this meeting. I know that our patron, Deputy Prime Minister Shcherbina, has also given his enthusiastic support to WANO.

Deputy Prime Minister Shcherbina, Minister Lukonin, I am most grateful to you for the support that you have given to our ideals and objectives during the past 18 months.

Of course, the Chernobyl accident has been a horrible shock to the Soviet people and to the Soviet system. It has coincided with the Mr. Gorbachev's determination to introduce "Glasnost" and "Perestroika" into the whole way of life in the USSR. I am delighted that, through WANO, we have the opportunity to respond to that determination in the nuclear safety operation field. We have the opportunity to set up the best example of international collaboration across east/west boundaries.

It is not simply by chance that we are holding our inaugural meeting here in Moscow. The choice of Moscow does have a real reason. It demonstrates that Chernobyl has created a determination amongst the nuclear utilities throughout the world to work together in a way which crosses all political and cultural boundaries. It demonstrates that the Soviets are committed to international collaboration in their nuclear business and since every nuclear operator in the world is represented here, it demonstrates that we all accept that commitment as genuine.

I would now like to turn to the work of the WANO steering committee. The committee has been truly multi-national having the active participation of senior representatives from all parts of the world. We have been supported by several expert groups who have provided us with excellent advice. We have not sought to avoid problems, we have faced them square on and we have found solutions that every steering committee member has been able to accept. We have achieved the consensus that will be so important to the work of WANO. We have made such rapid progress because of the hard work of the expert groups and of the interim secretariat based in London and led by Thomas Eckered.

But hard work alone would not have been enough. Every prospective WANO member has been determined to find solutions rather than difficulties. We have a unanimity of purpose that is rarely seen even within the confines of a single company let alone across 150 companies from all quarters of the globe.

WANO will operate through four regional centres based in Atlanta, Moscow, Paris and Tokyo. All four centres have started work. They each have their own charter, their own Directors and their own Board of Governors. Member Utilities are already sending staff to them. The regional centres are linked to each other and to their individual members by means of a

computer based in Atlanta. This same computer allows direct utility-to-utility contact to be established.

A small coordinating centre based in London will ensure that there are effective exchanges across regional boundaries. The coordinating centre, like the regional centres, will be small because we are anxious to avoid all bureaucracy. The strength of WANO lies in the resource and expertise of its individual utility members. A primary role of the regional centres and of the coordinating centre will be to ensure that this resource is fully utilised to the benefit of all.

WANO will have a president who will be chosen on the basis of outstanding contributions to the objectives of WANO. I am delighted that Minister Lukonin agreed to accept the presidency of this important inaugural meeting. Towards the end of the meeting, we will elect a new president who will serve until the next WANO conference in two years time.

The WANO Governing Board will consist of two representatives each from the four regional centres. These representatives have already been appointed and will be introduced to you during the meeting tomorrow. The first chairman of the Governing Board will be elected by this general assembly. I have declared that I am available for election and the Steering Committee has been kind enough to recommend me for the job. I do not know of any other candidates but I do hope that you will decide that you are, anyway, assured of a good, or a better man.

WANO will have a director who will also lead the staff at the coordinating centre. The Steering Committee have unanimously proposed Mr. Thomas Eckered for that appointment. You all know Thomas Eckered. He has led the work of the interim secretariat during the last 18 months. He is fully committed to the concept and ideas of INPO, and the new worldwide organization.

WANO will have nothing to do with governments, with regulators, with research or with commercial matters. Our sole concern is the safe management and operation of nuclear power plants throughout the world.

Dr Hans Blix will give his speech immediately following my report. He will tell us how he sees WANO and IAEA living and working together. WANO will not replace or duplicate the work of the IAEA. The IAEA is an association set up by governments; it will continue to take a leadership role in all matters concerning governments as well as continuing the specific

scientific and non-proliferation roles which governments have assigned to it. We will work closely with IAEA to achieve objectives we share.

Dr Blix, we have been impressed with the speed at which you have developed your OSART programme. All of us who have been involved with that programme look upon an OSART visit as an important audit of what we are doing. We think that forms an important part of our overall professional approach to nuclear safety. We see an OSART as an important extension of the regulatory procedures in our own country. WANO is not going to replace any of that. To use a simple analogy; WANO is the school to which all nuclear utilities must go in order to do a better job - and incidentally get better examination results from you. The world would be a better place, and a safer place, if we, the utilities, had set up this school in earlier years. It is sad that we have needed accidents to persuade us of the necessity of it, but we are now persuaded. And I predict that your OSART teams will have to look harder and harder and harder to find any defects in our management and operations in future.

WANO is going to be a business-like operation that gets things done. Let me repeat that the mission of WANO is to maximize the safety and reliability of the operation of nuclear power plants by exchanging information and encouraging comparison, emulation and communication among its members.

WANO already has an efficient means of communication and we must use that to effect good, rapid and meaningful communications. We will have feedback of operating experience, technical exchange and assistance visits, an exchange of good practices, an exchange of staff and workshops on topics of common interest.

To the extent possible, we will encourage the use of common performance indicators and common databases. We will encourage the comparison of training and education methods.

But it is unrealistic to think that we can establish everything overnight and it is unrealistic to think that we can immediately establish a tough auditing role internationally, along the lines that INPO has established in the United States.

For this reason, in my opinion, our most important role will be to encourage each utility to emulate the best practices from other utilities. Each one of us will be trying to demonstrate that we are handling safety better than anyone else.



FOREWORD BY THE CHAIRMAN FROM THE GOVERNORS' REPORT 31 DECEMBER 1989

This is the first Report of WANO. The successful launching of this international organisation on 15 May 1989 was a landmark in the maturity of nuclear power worldwide and a clear demonstration by electricity utilities of a commitment to work together to improve reliability and safety of operation of their nuclear power plants. Virtually every nuclear utility is now a partner in WANO and as Chairman it gives me great satisfaction to witness the purposeful way in which the aims and objectives of the organisation are now becoming a practical reality. The four Regional Centres and the Coordinating Centre are now operational. The communications networks are established, methods and procedures are being tested, and WANO is now pursuing those goals which it has set itself. There are still challenges to be met, but I have no doubt that the skill and professionalism of our world-wide team will ensure that WANO is able to provide an effective and coherent service to its utility members. I am appreciative of the support which I have received during the past months following my retirement from the Central Electricity Generating Board and for the endorsement which the members of WANO have given me as Chairman of its Governing Board. I am quite sure that in spite of setbacks from time to time, nuclear power will have an increasing role to play on the world energy scene in the future and that WANO is now on course to make a substantial contribution to the success of that role.



World Association of Nuclear Operators
Coordinating Centre

5 December, 1991

Ordinary and Joint Members of WANO

Dear Member

PEER REVIEWS

At the Biennial Meeting of WANO held in Atlanta earlier this year we discussed at some length the idea of having Peer Reviews as part of the forward-looking programme for WANO.

As those of you who were present will recall, I explained the way in which Peer Reviews were aimed at the improvement of safety and reliability of plants, by providing expert evaluations of operating procedures both in the technical and organisational sense.

Such evaluations by external experts have already proved to be of immense value to the membership of INPO. Moreover, several groups of utilities elsewhere in the world are developing mutual review programmes. With this knowledge, there was, I believe, a clear consensus on the part of those present at the Biennial Meeting that WANO should explore the possibilities of instituting such reviews on a more general international scale.

The matter has now been considered by the Governing Board of WANO and I would like to tell you what has been decided.

The Board recognised from the outset that in extending reviews across national frontiers a fairly cautious approach was needed in order to account for cultural differences and national practices. Nevertheless, we were conscious that there existed considerable mutual respect and goodwill between members, and accordingly, it was decided that between now and the next Biennial Meeting, WANO would institute a series of Pilot Peer Reviews to be held at a number of volunteer plants with the aim of testing the procedures and assessing the benefits.

I am pleased to say that for this initial exercise the Atlanta Centre has agreed to share its past experiences by taking the lead in organising the pilot reviews in collaboration with the respective Regional Centres. The latter will, of course, retain overall responsibility. The first such Peer Review in this pilot programme will take place at the Paks plant early next year with a team of experts drawn from a number of countries including the USSR.

For your information, I am attaching a general note for guidance which gives further details of the pilot study. I would, in addition, like to emphasise the intention that such reviews should be voluntary and confidential.

I believe that Peer Reviews could prove to be a major step forward in achieving the aims and objectives of WANO and I very much hope that all members will give their support to this work.

Yours sincerely,

A handwritten signature in cursive script that reads "Marshall of Goring". The ink is dark and the signature is fluid, with a long, sweeping tail on the final 'y'.

The Lord Marshall of Goring, Chairman

cc: The President

Governors Regional Centres

GENERAL GUIDANCE FOR PILOT PEER REVIEWS

This General Guidance is produced specifically for the Pilot Peer Reviews which are to be performed during 1992 and the first part of 1993. The experience of the pilot activities will tell if requirements and procedures need to be revised for a future permanent Peer Review Programme. Furthermore, as the Atlanta Centre has been requested to take the lead in conducting the Pilot Peer Reviews the General Guidance takes into account how the Atlanta Centre plans to perform its task.

1. Definition

A Pilot Peer Review comprises a visit of WANO experts who, at the request of a WANO member, review organisation, operations and practices of a nuclear power plant, note strengths and areas in which improvement could be made, and provide recommendations for improvement.

2. Objectives

The objective of a Pilot Peer Review is to help nuclear power plant management to improve safety and reliability by reviewing the plant organisation, operations, and practices; and by noting strengths and deficiencies primarily associated with operational reactor safety in selected areas of operations, maintenance, radiological protection, chemistry, technical support, training, event reporting, some operational elements of emergency planning and other aspects of nuclear power plant management. A further objective is to train team members from the various Regional Centres in this type of future activity.

3. Plant involvement

Pilot Peer Reviews will be voluntary and will be initiated by a request from a nuclear operating organisation of the WANO member to its Regional Centre. The Regional Centre will contact the Atlanta Centre to propose the Review and discuss scheduling. Notwithstanding any recommendations resulting from the review, the operating

organisation retains the responsibility for operation of the plant and its nuclear safety.

4. Scope

The scope of the Pilot Peer Reviews has to be flexible and is to be defined by the operating organisation requesting the review, with help from the Regional Centre, if requested. The scope may cover several or many aspects of plant operation and management. The activities most important to safety should be the focus of the reviews.

5. Peer Review Team

The composition of the Pilot Peer Review team assembled by the Atlanta Centre will be determined by the scope of the Review. Teams will normally include members from other Regional Centres.

6. Planning

The Pilot Peer Review Plan will be developed by the Atlanta Centre and approved by the requesting operating organisation prior to the start of the review. To keep the applicable Regional Centre informed, a copy of the Review Plan will be provided to the Centre. Early review of appropriate documents, such as general plant descriptions, drawings, and procedures, prior to the visit, will be arranged to enhance the overall effectiveness of the Pilot Peer Review.

7. Duration

The scope of the review will determine the duration of the team visit, but it is expected visits will be about two weeks in length.

8. Logistics

There will be no charge for labour from any involved WANO parties. The Pilot Peer Review team members will normally arrange and pay for transportation to and from the host country. The host organisation will normally pay for hotels, meals and transportation while the Pilot Peer Review team is in the country, unless other arrangements are mutually agreed to. Final arrangements are left to agreement between the Pilot Peer Review team and the host organisation.

The host organisation should, if needed, assist in making arrangements for transportation to the host country, and in applying for visas or other necessary formalities. The Regional Centre involved and the Coordinating Centre should assist to the extent needed.

9. Documentation

A briefing will be conducted for the host organisations at the end of the Pilot Peer Review to highlight the strengths of the plant and provide preliminary identification of areas in which improvements could be made.

The team leader will prepare a draft report using the team's field notes. The Atlanta Centre will forward the draft report to the operating organisation for concurrence and responses about one month after the visit.

The final report will be distributed strictly in accordance with a policy to be established by the WANO Governing Board.

File
World Association
of Nuclear
Operators
Coordinating Centre
From the Chairman

please 3/20
SSA
see p 11, 12, 13.
see 3/20

ZTP.

as from:
Bridleway House
Goring-on-Thames
Oxon RG8 0HS
Tel 491 875017

MEMORANDUM

6 MARCH 1992

TO: DR A ABAGYAN
MR R CARLE
MR V FUKS
DR W HLUBEK
MR R IKEGAME
MR S KATI
MR S NASU
MR Z PATE
MR A DE UBIETA
MR G VAMOS

FROM: LORD MARSHALL

Here is a lecture I recently gave in Germany. It covers the work of WANO, the latest interpretation of the Chernobyl accident and our VVER project; primarily the VVER project in Bulgaria. I thought you might like to see it because, amongst other things, it spells out in very simple language that it is not WANO's job to decide whether the reactors should operate or should not operate.

Lord Marshall

The Lord Marshall Of Goring

“CHERNOBYL NEVER AGAIN”

When the civil nuclear power industry began in the 1950s, it set out with the laudable ambition of having no accidents at all but, as everyone knows, it has not succeeded in fulfilling that ambition. First, we had the big accident at Three Mile Island (TMI) in America where no one was hurt but where the power station itself was a write-off, and then we had the colossal accident at Chernobyl in the USSR where some 30 people died immediately combatting the immediate effects of the accident and local countryside was contaminated with radioactivity.

After TMI the American utility industry examined what lessons were to be learned from the accident and they decided that they had not sufficiently stressed the responsibility of the operating utility to ensure safety and they therefore founded the Institute of Nuclear Power Operations (INPO) in Atlanta to act as their agent in improving the management of all the American utilities. The founding of INPO was an act of American mutual self-interest. Another accident in America by one utility could destroy the business of all the other utilities in America who had nuclear plants. Therefore every nuclear utility in America had a vested interest in the efficiency and good management of every other utility in America.

The founding of INPO and the formal recognition of this mutual independence was a very important institutional step in improving the safety of nuclear power in the USA. The story is one of great success. Under successive directors, Denis Wilkinson and Zack Pate, INPO has stimulated improvement in the quality of American management beyond recognition and the American industry should take pride in the constructive reaction they gave to the TMI event. Unfortunately, the rest of the world looked upon TMI as an exclusively American matter and did not realise or accept that the same arguments applied worldwide. It took the disaster at Chernobyl to

convince us all of that. Therefore, following Chernobyl, the Americans and the French took the initiative of launching a worldwide effort to set up a new organisation which subsequently became known as the World Association of Nuclear Operators (WANO). It was my privilege to lead the discussions setting that up and it is my present privilege to be the Chairman of that organisation. Our discussions, particularly our discussions with the Soviet Union, were successful and WANO was born at an inaugural conference held in Moscow in May 1989. The Mission of WANO is:

“To maximise the safety and reliability of the operation of nuclear power plants by exchanging information, encouraging comparison, communication and emulation amongst its members.”

The membership of WANO is restricted to utilities that operate nuclear power plants and I am pleased to tell you that every nuclear utility throughout the world is now a member of WANO and everyone is contributing in a constructive and enthusiastic way to fulfilling our Mission. I am convinced that this is producing overall a much safer nuclear power industry and I am satisfied that WANO is a positive force which is acting to bring the management standards of all nuclear utilities up to the management standards of the best utilities. In thinking about WANO, it is very important that every member utility thinks, “What can we put into WANO?”. They must not think, “What do we get out of WANO?”

Today I am talking to a German audience and therefore to German utilities. I do not pretend that WANO can make big contributions to improve the management of German nuclear power plants. Maybe we can do something but it would be marginal. That is because German management is very good by any standards. But WANO can do a great deal to protect your economic investment by making sure that nuclear accidents do not occur elsewhere in the world. This is a powerful reason why German utilities should support the work of WANO and I am grateful for the help and enthusiasm which German engineers have put into our worldwide programme.

To fulfill our Mission we have set ourselves seven important goals.

GOALS

- 1) Promote the bilateral and multilateral exchange of operating information and good practices amongst members.
- 2) Collect and maintain data concerning operation of nuclear power plants and make data readily available to WANO members.
- 3) Provide early notification to members and information on significant events.
- 4) Screen and analyse events that occur at nuclear power plants worldwide to identify possible precursors of more serious events and disseminate the lessons learned.
- 5) Encourage sharing of methodologies and standards among members through sponsorship of workshops, seminars and technical exchange visits.
- 6) Assist in providing technical and organisational support amongst members.
- 7) Maintain close co-operation with other international organisations, such as IAEA, working to promote safety and reliability of nuclear power plants.

We have agreed to promote the exchange of information about operating plants and we carry out that exchange of information by computer through a system which is entirely confidential to WANO and therefore is totally uninhibited. I am pleased to tell you that power stations from the Soviet Union (I must now call it the ex-Soviet Union) are making full and frank returns of every mishap that occurs and our experience since 1989 suggests that every utility is interpreting their obligation to communicate in this way in a very conscientious fashion.

We also promote the exchange of information by direct face to face contact and there is no doubt that this is the most effective method of motivating management to do better. Since WANO was set up, every nuclear power plant in the Soviet Union has visited the West at least once and all

of those plants have received a visit from the West at least once. The practical effects of this exchange of people are very large and the psychological effects are enormous. Station managers in remote parts of the Soviet Union now feel part of an international community. They feel a pride in doing well and have a determination to win the respect and acceptance of their peers; namely station managers in the West. This is exactly the mental attitude which WANO set out to create in the first place.

I myself put very high weight on the motivational aspects of these visits. In most cases, when a Soviet team has visited the West, it is the very first time that the people have ever been out of the Soviet Union itself. The visits are professionally worthwhile and rewarding and the Western hosts have always made the Soviet visitors very welcome. The Soviets want to maintain that good relationship, they want to visit again and they therefore have a very high motivation to take value from the visits, improve their plant, improve their management and do better all round. And I am quite sure that we in the West will also learn from plants in the East as our co-operation intensifies.

I shall not give any detailed discussion of goals 2, 3, 4 and 5 except ask you to note them because, today, I want to spend most of my time on the last two goals which are:

GOAL 6 – Assist in providing technical and organisational support amongst members.

GOAL 7 – Maintain close co-operation with other international organisations, such as IAEA, working to promote safety and reliability of nuclear power plants.

It has turned out that these last two goals are an important part of our work because they cover the activities of WANO in the Soviet Union and in Eastern Europe, particularly in Bulgaria.

But I was asked to speak to the title “Chernobyl Never Again” and therefore let me digress from WANO’s work by giving you a reminder about Chernobyl. Most of us knew very little about the RBMK reactors before the Chernobyl accident and therefore the origin of the accident was not immediately clear to us. Soon after the event, Mr Gorbachev made a speech which blamed the operators of the station. He labelled their behaviour as a criminal

action but it subsequently became clear that the main blame for the event must lie with the original choice of the physics characteristics of the plant. This was an elementary and fundamental error of judgement which should not have been made in the first place and should have been challenged by the nuclear establishment of the USSR which existed at that time.

We now know that all the original RBMK reactors had the following characteristics:

- 1) a large positive void coefficient in all circumstances (undesirable)
- 2) a positive power coefficient in some circumstances (totally unacceptable)
- 3) an appalling design of control rods - in some circumstances the insertion of control rods could actually increase reactivity!
- 4) they all gave poor diagnostic information to the operator
- 5) in the operation of the plant, there was a total absence of Western style "procedures"
- 6) perhaps there was poor management of the utility - at that time the plants were not managed by a specialist nuclear organisation
- 7) the accident happened during a very unusual experimental situation where safety devices were deliberately switched off, and
- 8) perhaps the operators made errors of judgement at the time.

There has been much analysis and discussion about the Chernobyl accident. I will not review it all today but I should mention a recent paper by Mr Malyshev, the regulator of the Soviet Union, which puts the blame very solidly upon points a, b and c of the above list. The Malyshev paper goes on to exonerate the operators (and the regulators) completely. We should not accept everything in the Malyshev paper (including the innocence of the regulators) but we can clearly draw the conclusion that the prime cause of the accident lay with the original physics design of the plant and control rods. These design errors were so serious, so fundamental and so elementary that it is impossible to imagine that they would be permitted in a Western

society or permitted ever again in Russia itself. No existing plant anywhere in the world has these forbidden characteristics so talk about “Chernobyl again” is totally misplaced.

All these design blunders have been corrected in the existing RBMK reactors and therefore we can really be confident that a Chernobyl type accident never will happen again. But of course that is not the actual reassurance we want. Even if we cannot have an accident at the Chernobyl scale, we could in principle have an accident of more modest proportions and therefore if I had chosen my own title for this talk, it would have been “Nuclear Accidents Never Again”.

This is actually what WANO is all about. It is not WANO’s job to correct fundamental design defects of the kind the RBMK reactors had; those should never have been permitted in the first place. It is WANO’s job to help, cajole and encourage all the nuclear utilities to improve their management and to improve their operations so that nuclear accidents actually never do happen again. Of course there always will be incidents happening in nuclear power plants. By the very nature of engineering, every nuclear power plant will have something of interest happening every day. It is our collective responsibility to make sure that all those incidents remain at an unimportant scale.

I mentioned to you earlier that all nuclear plants are members of the WANO club and they are all contributing to an open discussion one with the other. Organisational improvements are steadily being implemented, training is being improved, the use of simulators is spreading and most of the Eastern plants are now preparing procedures and procedural documents to parallel the operations techniques of the West. All this is an important part of the WANO Mission. Every utility is communicating and exchanging information with other utilities and every utility is trying to emulate the best. We are all trying to come up to the same high standards and we are motivated by professional interest, professional pride, economic necessity and sheer terror. If any one of us makes a mistake, then the reaction of the public is likely to be so severe that the remainder of us will suffer a large economic setback. Given this good start, in my judgement, a decade of hard work amongst all WANO members will bring the operational standards of all up to the standards of the best.

I think that is a good story and I take some pride in it. It is as good a result as we could possibly hope for given that WANO has only existed for under three years. But now we must face a new and unexpected challenge which arises from the collapse of the communist empire and the disintegration of the Soviet Union.

Of course in general terms we all welcome the political changes in Eastern Europe and the Soviet Union but we rightly worry simultaneously about the safety of nuclear weapons in the new Republics and, at a much lower level of concern, we should be concerned about the safety of nuclear plants in the new political regime. For example, all the republics of the former USSR now have independent governments and independent nuclear power stations. But only one of those republics, Russia, has engineering and scientific infrastructure to support such a nuclear programme.

A specific question that has concerned WANO in recent months has been the fate of the old 440 WER 230 plants which have been built in Eastern Germany, Czechoslovakia, Bulgaria and Armenia. These plants were designed and built a long time ago. They were designed with large safety margins but without much sophistication or redundancy. So, for example, the fuel design is very conservative with a large margin between operating conditions and those which would permit boiling in the core. They also have a large inventory of water so they have a large intrinsic heat sink. But they have no explicit safety injection systems, little diversity and redundancy, poor diagnostics, no containment and a localization system which is not proven. Most important of all, they have pressure vessels which are susceptible to neutron irradiation.

Because these plants were all designed by the same organisation, there has, in effect, been an international design group for these plants for more than a decade and regular meetings of the nuclear regulators have existed for about the same time. But for these plants there has been no “international operators group” until WANO fortuitously provided one by forming the Moscow WANO Centre. The bringing together of utility operators from the East with utility operators from the West has permitted some real decisions to be made and the collaboration under the WANO umbrella has led to several conclusions.

- 1) Any attempt to up-grade the Greifswald plants (in East Germany)

to West German safety standards is doomed to failure. The costs would be both high and problematical and, furthermore, the unification of Germany has led to the collapse of industry in East Germany and therefore the continued operation of Greifswald is not actually a necessity or even important. Therefore we are led remorselessly to the view that Greifswald must be closed down and it cannot therefore be a lead plant for the other stations to follow.

- 2) WANO has argued that we should identify improvements which give good value for money and are sufficiently common in purpose to attract funding from the European Community. We should try to exploit the good features of the reactors and compensate for the bad features but not attempt to have them mimic Western standards and styles of design.
- 3) Although WANO is taking a part in defining the improvements which should be made to the plant, we think it is important for us to stand aside from the judgement whether these improvements are, or are not, sufficient to justify further operation of the plant and, if so, for how long. Decisions of that kind are not a responsibility for WANO and we do not argue for /the continued operation of a plant, or for its closure, or for a limited lifetime. It is a policy decision of the WANO Board not to be drawn into such decisions. Our sole concern is that, if a plant is going to operate, we want it to operate as safely as it possibly can.

Policy decisions of the type I have just described must be made by the regulator of the country involved advising the government of the country involved. That government may seek advice from the IAEA and that would be appropriate because the IAEA is a government body. But WANO does not give advice to regulators or governments; it gives advice and help to operators which is quite a different thing.

During our study of these reactors, we became concerned about the standards of operations in Bulgaria at the Kozloduy plant. That unambiguously was of direct concern to us and therefore we welcomed the simultaneous concern expressed by the IAEA and the subsequent discussions

between governments which led to the operator in Bulgaria seeking assistance and advice from WANO to improve their management.

Because the Kozloduy plant has been very much in the news recently, I think it is appropriate to make some remarks about it and I should begin by explaining that, if Bulgaria were as rich as Germany, and if Bulgaria had indigenous coal reserves on the scale of German coal reserves, and if Bulgaria had oil supplies or could afford oil supplies on the scale of Germany/ or if it had gas or could buy gas supplies on the scale of Germany, then it would be best if the old WER plants in Bulgaria were closed down, just as the old WER plants in East Germany have been closed down. But, unfortunately for Bulgaria, none of those suppositions are true and the actual facts facing Bulgaria are of an extreme kind.

I will remind you that Bulgaria is an ancient country which suffered under the Turkish Empire for five centuries. But in 1878 it was freed with help from Russia and had a democracy from 1878 until 1944. It has suffered a second oppressive, ruthless dictatorship since 1945. The country therefore has little experience of democracy - only 66 years in six centuries. The first steps towards a new democracy took place only 24 months ago and some considerable controversy remains about the demerits of the communist regime which dominated all Bulgarian society for such a long time.

This is in stark contrast to the situation in Czechoslovakia and in Hungary where the citizens have been quite clear and unanimous about their opinions of communism for many decades but unable to express this until recently.

The management of the Kozloduy station in Bulgaria has reflected this unhappy history and the difficulties which it causes cannot be cured overnight. I have every reason to believe that Bulgarian engineers are good and are conscientious and anxious to do their best but, unless they are given the right management environment, they cannot actually be effective. And until two years ago they had an oppressive Stalinist management/throughout the country - which was considered extreme even by other members of the communist empire.

There are further resource considerations which are very important in the case of Bulgaria. Their supply of hard coal is very limited and difficult to mine in I deep, narrow, fractured seams. Their supply of lignite is of poor grade. Like most communist countries, it has a high capacity

of hydro-electric schemes but the existence of these is actually misleading. Lenin had an early proclamation, "Communism means electrification!". This concept has led to severe over investment in hydro-electric schemes. Bulgaria fits into this same pattern. It has a high capacity of hydro-electric schemes but not enough water in the rivers for that capacity to be available for very long. Therefore hydro-electric power cannot supply many megawatt hours in Bulgaria. Bulgaria has limited opportunity for electricity imports, its coal imports from the Ukraine now cost dollars which Bulgaria cannot afford and its oil supply used to come from Iraq on a barter system and is now defunct.

As a result of all this, electricity is rationed throughout all Bulgaria. Last year domestic users of electricity were rationed to three hours out of every four.

Given this background, the Bulgarian government has decided that the Kozloduy nuclear plant must run and, in my opinion, it would be presumptuous for anyone to challenge that decision in these particular circumstances. Given that situation, WANO's task is to help the Bulgarian operator make the plant as safe as possible in the circumstances. These plants do not have the fundamental faults of the original RBMK type so accidents on a vast Chernobyl scale are simply impossible. Therefore the Bulgarian government is not balancing people's need for electricity against risks on a Chernobyl scale.

In more detail I should explain that at Kozloduy, units 1, 2, 3 and 4 are all 440 MW/WER 230 reactors. Units 5 and 6 are each 1000 MW/VVER 1000 reactors. Unit 5 suffers from the generic fault common of all early WER 1000 plant. It has four steam generators, all of which are likely to fail sometime within the next few years. Therefore, at some appropriate time, unit 5 will have to be closed down for substantial refurbishment.

Unit 6 was commissioned just a few months ago. It has an improved design of steam generator and a more sophisticated control system. We can hope it will run reliably for many years to come. At the present time units 3, 4, 5 and 6 are running and the plan is to up-grade units 1 and 2 over the next year. The management of all these plants needs to be improved but I am pleased to tell you that the Bulgarian operators are now settling down with their WANO advisors and I have every hope that matters will get better rapidly.

Looking beyond the next few months, it is not at all clear what is the best policy to follow. The collapse of the Comecon economic agreements has been a severe blow to Bulgarian industry and therefore the industrial demand for electricity has fallen (just as it did in East Germany), so surely the demand for electricity will be less than it previously was. Furthermore, the Bulgarian government made the brave but correct decision to increase electricity prices drastically and that also has led to a decrease in demand. But in previous days, the demand was more than the country could supply (electricity was rationed). The final balance between supply and demand is therefore uncertain and the balance of advantage between fossil plant and nuclear is uncertain.

Until recently, Bulgaria has had a coalition government with a slight majority for the socialists (ex-communists). It has since had a second election and a consortium of democratic parties has now formed a government. Both the previous government and the present one face exactly the same problems at Kozloduy and are likely to make broadly similar decisions. It is not WANO's job to take a part in this. European governments, the European Community itself or the IAEA may wish to give advice to the Bulgarian government or the Bulgarian regulators on the overall position but, as a matter of principle, WANO will give no advice either positive or negative. Our sole concern is to help the operators operate those plants as safely as possible and, if we are requested to help, we will help whether that is for a short time or for a longer time.

But at this point I would like to acknowledge the far-sightedness and leadership of the European Community in encouraging WANO to help in this situation and for their generosity in agreeing to reimburse us (through the host utility) for the expenses involved in this programme. In the circumstances I have described, this is an appropriate responsibility for the CEC.

In Czechoslovakia and Hungary the situation is quite different. When Hungary ordered a WER plant from the old Soviet Union, there was an early dispute between the two governments which lasted a long time; such a long time, in fact, that by the time real construction took place, the design of the plant had changed and dramatically improved. The Paks plant in Hungary is therefore not of the 230 type, it is of the 213 type which is much better. Furthermore, the Hungarian plant has been managed throughout by Mr Josef Ponya, a man of outstanding character and determination who has for

himself invented a management style equal to anything in the West. The Paks plant, therefore, has good technology and outstanding management.

In Czechoslovakia the Dukovany plant is of the same generation as the Paks plant and here again the Czechoslovakians have provided good management right from the very beginning. There are some old 230 plants at Bohunice but those have Czech components and also have been up-dated year by year. All these plants could benefit from Western technology and it is very satisfying to see that the European Community is making funds available for this purpose. Most of you in this audience will be familiar with these facts because the vigour of German industry is providing a good deal of the technology which is required.

The disintegration of the USSR is so recent that it is not really wise for me to comment in much detail about the situation. If I prepare a text one day, by the time the lecture is actually given, the situation will have changed once again. But a simple glance at the map shows that the civil nuclear power stations which used to be in a single sovereign state, the USSR, are now distributed between four sovereign states; namely Russia, the Ukraine, Lithuania and Armenia. Each of these states has taken ownership of the power stations on their territory and each of these new sovereign states have appointed their own nuclear regulator. They will each also have separate operators.

However, these Soviet stations need considerable back-up technology and only one of them, Russia, is equipped to provide that. Therefore we must all pray that these new governments can find sufficient common purpose to work together to maintain the safety of the WER plants and the RBMK plant which must, of necessity, continue to operate in this part of the world. I must remind you that the severity of a Russian winter does not permit a relaxed attitude to the supply of electricity to the population.

Only one of these states, Russia, is rich in energy resources and Russia has an economic necessity to maximise the export of gas and oil to earn hard currency. All four states therefore have a powerful, unambiguous argument to use nuclear power to the maximum possible extent. Of course it is WANO's task to help them operate all plants safely and I consider it a fortunate fact that WANO already exists and has already established good relations with all the power stations in all these new states. Unfortunately,

the power stations themselves cannot remain insulated from the political turmoil all around them - and that remains a concern.

If Chernobyl had not already stimulated the formation of WANO, the new political situation in the ex-USSR might well have led to a WANO type organisation. But, by good fortune or perhaps by good judgement, WANO is a worldwide organisation of nuclear utilities. We are not an organisation of governments, we are not concerned with political matters and governments do not determine what we do and what we do not do. That is turning out to be a great advantage. I cannot tell you what the future brings for WANO but it seems certain that the next three years will be just as exciting and just as satisfying as the three years we have had since WANO was founded.

Thank you for your attention today.

FROM THE DAUGHTER OF LORD MARSHALL DR VICTORIA MARSHALL

Dad was born in Rumney, Cardiff but was raised in near-poverty as his father who worked at the nearby flour mill died when Dad was about 5 or 6 years old. This must have been devastating for a small boy and his family.

My parents lived just round the corner from each other in Cardiff, and knew each other from school, church and youth club. Dad's hobbies were "doing physics," gardening (he loved dahlias, playing chess and go, and origami. He was fascinated by Japanese culture, and loved the food; he even tried fugu. (Mum refused.)



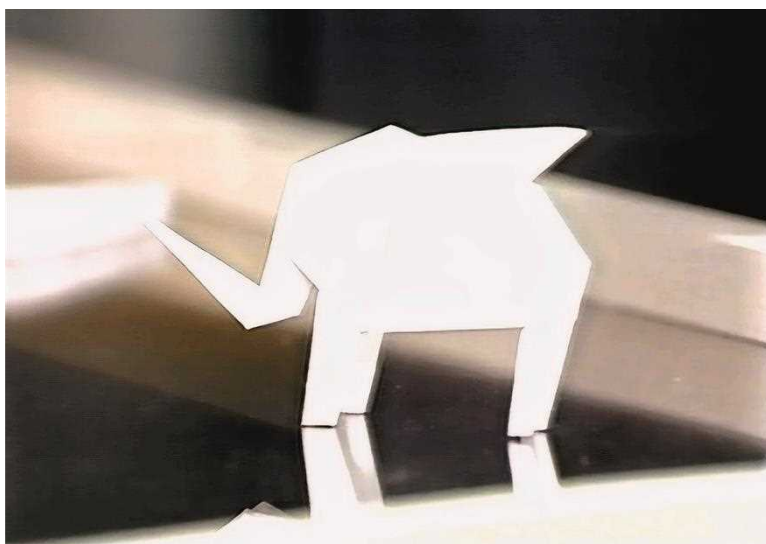
*Lord Marshall playing computer chess;
title shot from the documentary "Playing for power"*

Dad tried to do DIY, but like all men (according to Mum), relied too much on power tools. His attempts to strip paint off a brass doorknob using a power sander did not end well for the doorknob.



Here are some screenshots from “Take nobody’s word for it” (BBC2, Thursday 2 February 1989) to show his origami works.

<https://www.youtube.com/watch?v=2FSPqCplbT0>



I liked your idea of using the portrait of Dad to illustrate Dad’s “lordship.” The artist was Theo Platt: <http://www.theoplatt.co.uk/> The portraits (of both parents) would have been painted in the 1988, and Theo was given a spare office in Sudbury House in which to work.

Theo Platt, “They were an amazing couple, very generous and considerate towards this 27 year old portrait painter.”



1988.Theo Platt portrait of Lady Marshall



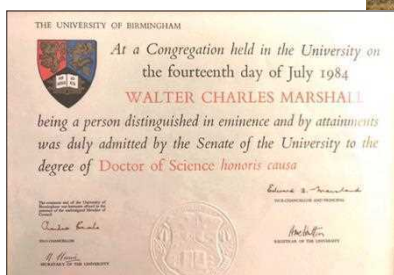
1988.Theo Platt portrait of Lord Marshall



Theo Platt left

<http://www.theoplatt.co.uk/>

The University wanted to award Dad a DSc and the Chancellor invited him to address the convocation. Dad said he would be happy to do it if it was arranged for the same year in which his daughter graduated.



*Graduation ceremony
Victoria (Bachelor of Science, Hons)
Dad (Doctor of Science)
14 July 1984*

Victoria. You are aware that my parents were very much a team, but perhaps not aware of just how much work Mum did behind the scenes. She often accompanied Dad on CEGB-related visits, even more so as part of the WANO work. These are various letters from Dad to the tax office to explain Mum's role – a story which perhaps has not been told before.

What is not reflected in these letters is just how upset Mum was to visit Chernobyl and drive through Pripjat. She told us how her heart broke seeing the town just abandoned at a moment in time, and the sadness she felt for the people who had lived there.

Mrs C Stirling 7 January 1994 Inland Revenue Scotland

Dear Mrs Stirling I understand that you are enquiring about my wife's travel when I was on business trips as Chairman of the World Association of Nuclear Operators (WANO).

.....

We were faced with a long task of building confidence and making friends. It was my task to take the lead in doing that and I made an early judgement that I had no chance of success unless I could demonstrate in an unambiguous way that I wanted to be friends with the Soviet operators. It was absolutely essential that they treated me in an open and frank way rather than with the secrecy and reserve which had been the cardinal feature of a lifetime's training before the Chernobyl accident. I therefore made the deliberate judgement that I had a chance to win their confidence only if I travelled with my wife.

She came to all the meetings I had, visited all the power stations I visited and took responsibility for organising modest social events which in some ways were more important than the technical discussions.

My wife and I were the first Western people to be allowed to visit Chernobyl itself. We have visited that disaster area three times so far and each visit has been physically uncomfortable and stressful. We were the first to visit the nuclear stations at Zaporezhe, the South Ukraine and Balakovo.

We did win the confidence of the Soviet operators and we retained it when the Soviet Union collapsed and the separate nations emerged. Within the world of nuclear safety, that is very important indeed because we now have regular visits between Eastern and Western operators and a growing conviction that we must work together to avoid any future accidents.

.....

To: **Lady Marshall**
From: Erik Pozdyshev
President "Rosenergoatom"

Dear Lady Marshall,

I am pleased to greet you on the occasion of your birthday and to wish you and your nearest and dearest good health, happiness and prosperity.

My wife and my colleagues who are privileged to know you personally and to experience the hospitality of your home in England are sharing my congratulations.

We know you as one of the few ladies in the world who is practically familiar with Nuclear Power Industry and makes contribution to the promotion of the Industry among the world community. I am delighted of the care and support you provide to your husband in his noble efforts aimed at strengthening the cooperation between the East and the West.

Once again, all the best and many happy returns!

Very cordially yours,

 Erik Pozdyshev
14.09.93



Lord Marshall and Erik Pozdyshev, 1997

My main responsibility during this time was to win, and retain, the friendship and professional involvement of the nuclear establishment in the Soviet Union and subsequently the divided engineers of Russia, Ukraine, Lithuania and Armenia. These people had all previously belonged to the secret "Middle Machine Building Ministry". Almost without exception, each engineer had been part of the Soviet weapons programme which was isolated even within the Soviet Union. Winning the trust and confidence of those people is not a trivial task; my wife has a special knack of making friends and her help in this work was essential and necessary. To support this view, I attach one letter, entirely unsolicited, from the President of Rosenergoatom on the occasion of her birthday last year. May I now invite you to consider this additional information and agree that the circumstances were sufficiently unusual that we warrant special consideration.

Yours sincerely
The Lord Marshall of Goring

To: Lady Marshall from: Erik Pozdyshev President «Rosenergoatom»

Dear Lady Marshall.

I am pleased to greet you on the occasion of your birthday and to wish you and your nearest and dearest good health, happiness and prosperity.

My wife and my colleagues who are privileged to know you personally and to experience the hospitality of your home in England are sharing my congratulations.

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Once again, all the best and many happy returns!

Very cordially yours.
Erik Pozdyshev
14/05/1993



Lady Marshall with Lord Marshall and William S. Lee

ANALYSIS OF LORD MARSHALL'S TRAVEL EXPENSES

From ANALYSIS OF LORD MARSHALL'S TRAVEL EXPENSES

Paid for in year to 5 April 1992 (printed with reductions)

3-9/2/91 Switzerland World Economic Forum Meeting

I had just been elected to the Governing Board of the Energy Section of the World Economic Forum.

17/2-5/3/91 South Africa Promotion of WANO

I needed to go to South Africa to persuade the Chairman of ESKOM to take an important initiative inside WANO. He kindly asked my wife and I to be his guests.

1-3/4/91 Russia Promotion of WANO

This was an important meeting with a Cabinet Minister of the Soviet Union and his Deputy Minister in which I persuaded the Soviet Union to open up their nuclear power stations for a formal inspection by Western utilities.

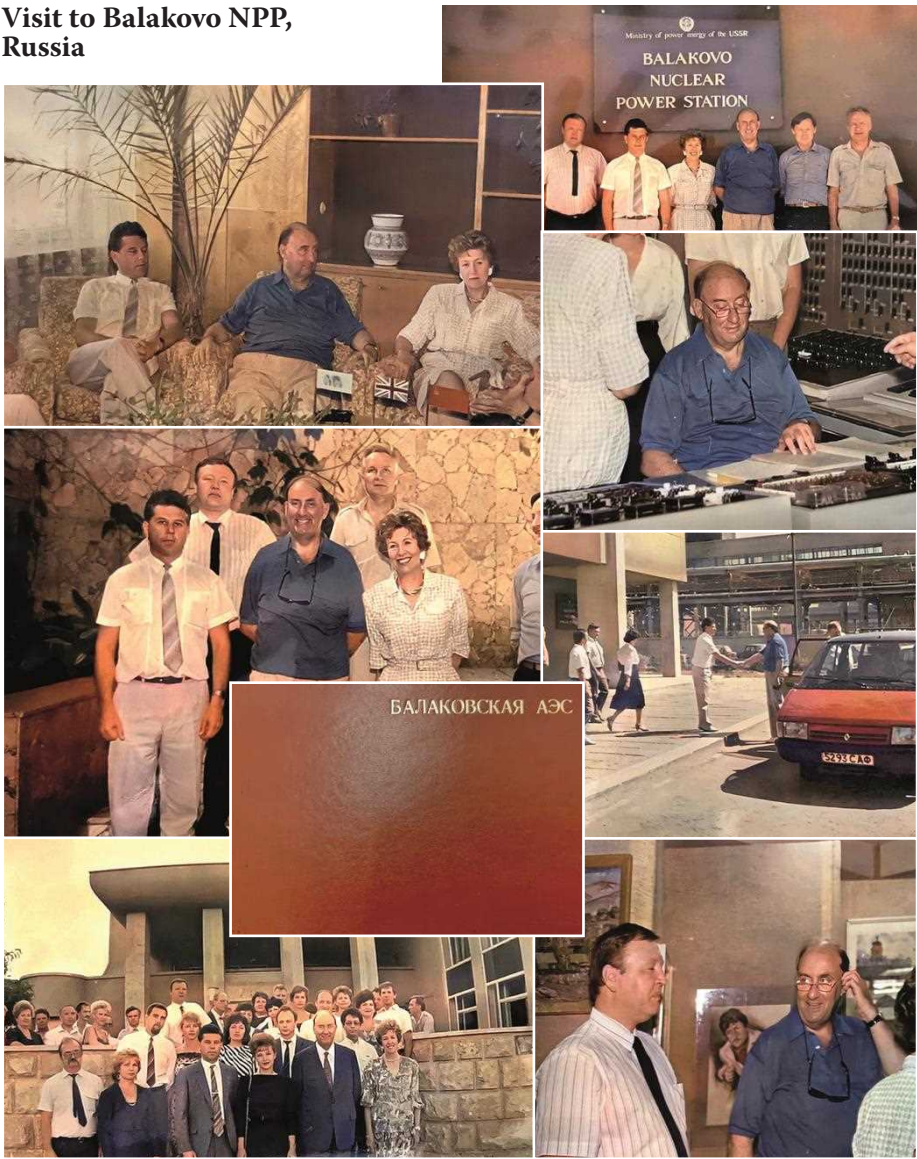
18/4-12/5/91 USA USCEA Meeting, WANO Press Conference, Governing Board Meeting, Mtg with US Dept of Energy, Attend Westinghouse Symposium. Lecture on WANO

This was the large Biennial General Meeting of WANO where the Chairman of every nuclear utility renews his pledge to operate nuclear plants safely. In this meeting, everybody wants to meet the Chairman and his wife. It was therefore essential that my wife came as hostess to this meeting. To support this argument, may I point out that, when Mr Nasu became President of WANO, he felt obliged to bring his wife to the meeting to act as hostess and that is extremely unusual in Japanese society.

2-8/6/91 Czechoslovakia Discussions re WANO

On this trip I visited the VVER reactors at the two sites in Czechoslovakia. I thought it proper to take my wife. She helped me make friends with all the people emerging from the Soviet Empire and she has a significant knowledge and intuition about nuclear power stations.

Visit to Balakovo NPP,
Russia



27/6-4/7/91 Russia. Visit Nuclear Power Plants and Meetings in Moscow

At this point in time, the Soviet plants were opening their doors to Western inspection but I judged it necessary to encourage this process by visiting myself the large plants at Balakovo and Kursk as well as renewing my policy discussions in Moscow. I took my wife because the plant staff were entertaining us as important 'visitors and the management were involving their wives. I therefore judged it important that my wife should come with me to help make friends. We were, in fact, the guests of honour at each place we visited.

14-17/7/91 UK-London WANO Governing Board Meeting

The Governing Board Meetings of WANO rotate to the various centres of WANO. On this occasion, they met in London and it was obviously appropriate for my wife to come with me as the hostess for all our overseas visitors.

18/7/91 UK-London Buckingham Palace

It was obviously appropriate for my wife to attend on this occasion.

25-26/8/91 Germany Meeting on WER Reactors

At this meeting I reported to the Chairman of the WANO Paris Centre about the impression my wife and I had got from the Czech reactors. It was appropriate for my wife to come to give her impressions also.

28/9/91 UK-London Meeting

My wife and I hosted a dinner meeting with Dr and Mrs Selin. Dr Selin is the Chairman of the Nuclear Regulatory Commission in America.

13-21/10/91 USA Meetings re WANO, Lecture re WANO at Edison Illuminating Conference

This was a prestige lecture to the Edison Illuminating Conference about the work of WANO. On this occasion my wife and I were the guests of Edison.

26-31/10/94 Russia, Armenia and Lithuania Meetings in Moscow, Visits to Nuclear Power Plants This was an important visit to Moscow, Lithuania and Armenia. I made this visit at the request of my Russian colleagues.

They gave us a private aeroplane to go to both newly independent States and I therefore met the senior people of Lithuania and the President of Armenia to talk to them about nuclear safety. I thought it proper to take my wife on this visit and she certainly contributed to the success of my mission.

**6-20/11/91 Canada, USA,
Japan Meeting of Canadian
Nuclear Association,
Institute of Nuclear Power
Operations CEO Meeting,
Governing Board Meeting of
WANO and Visit to Nuclear
Power Plants**

This was a very long visit because, fortuitously, several events followed in immediate sequence. The Canadian Nuclear Association did me the honour of presenting me

with the Canadian Nuclear Association International Award for 1991. This involved my wife and I being the guests of honour at a Banquet, a laudatory speech from the Chairman of the Nuclear Association, a lecture from myself and a letter of congratulations from the Canadian Prime Minister. I submit it is right and proper, since we were the guests of honour, that my wife should accompany me on this visit. As we were already on that side of that Atlantic, we accepted an invitation to the Institute of Nuclear Power Operations CEO Meeting.

We then flew onto Japan for the WANO Governing Board Meeting during which my wife had her first discussions with our Japanese colleagues about the ladies programme for the forthcoming Biennial Meeting. We had also received an invitation from the Tohoku Electric Power Company in Japan to be their guests for a week and tour their facilities. This was an invitation addressed to us both.



6-15/12/91 Hong Kong & China Talk at POLMET'91 Conference and Visit to Daya Bay

I was asked by Hong Kong to talk at their POLMET Conference about nuclear power and my wife and I were invited to visit Daya Bay in China just before that nuclear station started up and just prior to their joining WANO. Of course my wife came with me to the Conference and she came with me to the nuclear power station at Daya Bay in China. I expected this to be a valuable visit and I expected to meet Chinese engineers of importance.

28-31/1/92 Germany German Atomic Forum - Lecture/Visit

I gave a lecture at the invitation of the German Atomic Forum. The invitation included my wife and myself.

10/2/92 UK-Sizewell Site Visit to Sizewell B

This was a tour of the Sizewell plant which I initiated when I was Chairman of the CEGB a few years previously. My wife was invited and I thought she should come.

KARAOKE STORY

Victoria: A talk given by Mum to the local WI (Women's Institute) about Japan (1997). The karaoke story is at the end (in reduction).

Visits to Japan were initially a problem for Mum because she was a woman, and women were not permitted in company board rooms even when accompanying important men. With their impeccable diplomacy however, the Japanese circumvented this problem by declaring Mum an honorary man, something which she found somewhat strange, but was very pleased that a solution had been found. (Her Majesty the Queen is the only other honorary man that we are aware of.) Mum was less pleased when (by accident) she ended up in a karaoke bar, but at least was able to preserve diplomatic relations when Dad refused to take a turn. Dad was not a singer. He could whistle, he could hum, but sing? Oh dear...

Ann Marshall

For the last 60 years, my late husband and I have been visiting Japan at least twice a year. My husband, as some of you may recall, ran the electricity industry in this country for eight years and was chairman of the central electricity generating Board, and he was also a world expert on nuclear power.

And five years ago, the Japanese invited my husband to work for them and help them with their nuclear industry. Throughout these years, we came to know and understand the Japanese culture and developed a love for the country, especially its beautiful scenery, its customs, the food and the people themselves. It takes many years and a lot of hard work to gain their trust, confidence and friendship.

Given the fact that the country was closed to the West for many hundreds of years. They are at first very unsure as to our reaction to them and appear to be inscrutable. But once these barriers are broken down and you become friends, then you have the most loyal and trusted friends for life.

.....

It was in 1980 on my first visit to Japan that I was made aware of my position as a female in this society. My husband had been invited to visit the country by the Chairman of the atomic Energy Commission of Japan.

.....

Japanese husbands never, ever take their wives out to dinner. On all our visits to Japan I was always the only woman present at dinners, lunches and every business meeting, at first they must have found this odd, but my husband wanted me to be there and I would take notes at the meetings for him.

I soon became regarded as an honorary man and very much accepted by the Japanese men. No longer did I sit at the end of the table as I had on my first visit. Now I sat in the honoured guest position next to my husband in the middle of the table. With my husband I visited every nuclear power plant in Japan and indeed visited every country in the world that has nuclear power.

And in time became quite knowledgeable about the industry. When my husband died the kindness, generosity and genuine grief at his death shown to me and my family by the Japanese was quite overwhelming. He was obviously deeply respected, loved and honoured by these people. Last May, the Japanese electric utility for which my husband worked, invited me and my daughter to visit for two weeks at their expense.

I was very honoured also to be asked to give a speech to the advisory board of the company and this was quite an honour but a very nerve wracking one for me. I remember walking into a large room expecting to only see about 20 men, but instead of 20 men I found there were at least 50 Japanese men all beautifully dressed in their navy suits and beautiful white shirts, sitting very solemnly around a gigantic table.

Also, I noticed there was a television camera, microphones and press reporters. I was not aware that this was going to happen, so I was feeling very nervous and quite worried about the whole thing. But I gave my talk. It was about half an hour long, but of course it took nearly an hour to get through because every sentence had to be translated into Japanese.

This is a slow process and there was no clapping at the end. That is not Japanese custom. Instead, the whole company rose, turned towards me and bowed very low. Then I retreated from the scene.

A few years ago, we went to visit one of Japan's nuclear power stations, and after the visit, the manager at the power station took us to a Japanese restaurant for dinner.

A Japanese host decided to take us to his favourite bar for a drink. We climbed some stairs and found ourselves in a room filled with cigarette

smoke and Japanese men. There were about six Japanese women who were hostesses.

We sat down and one of the hostesses came over to us and produced a hot towel like a face flannel and started to wipe my husband's face and his hands and also wash the face of our host. And his hands. But she didn't know what to do with me and avoided washing my face, thank goodness.

And then I was now beginning to feel slightly uncomfortable and embarrassed. And in fact, my presence there was a bit perplexing. Now, over another part in this bar was a karaoke machine and a Japanese man singing very loudly. And to my horror, my husband stood up and he walked over to the karaoke machine and asked if he could have the microphone.

I thought to myself, my goodness, he is never going to sing because he couldn't sing. But even worse horror. He took the microphone and the sheet of paper looked back to me and handed me the microphone and a sheet of paper and said that it'd be best if you got up and sang. I said - No, I don't want to sing.

He said - I think it would be better if you do. It would save a lot of embarrassment. Well, it looks quite clear, I was very, very cross. To put it madly about all this, but not wishing to upset anybody, I decided, well, I would have to do it. So, I pick up the microphone and I walk over to the machine.

I look down at the sheet of paper, and thankfully there was a song I knew. And it was written in English. It was "Yesterday" by the Beatles. So very nervously, I proceeded to sing the first verse, and as I was singing and listening to myself at the same time, I began to think, maybe this doesn't sound too bad, because of course I have the microphone which has enhanced one's voice, and I had the music as a background.

And after I'd finished the song, everybody clapped. And in fact, I was asked to sing it again. So now full of courage and thinking that wasn't so bad after all, I then proceeded to sing once more "Yesterday", and when I had finished there was more clapping. And one of these ladies dashed to the corner of the room where there was a very large vase and stuffed into this vase a bunch of rather dusty artificial flowers. She grabs hold of all these flowers, runs over to me and presents me with this dusty artificial bouquet. Well, I was quite flattered when it was at that point, because my husband then said, I think the time has now come for us to leave. So, we said thank

you to our host and hastily ran down the stairs, out into the street and got a taxi back to our hotel.

Thank you all for your patience and listening to this.



At restaurant "Ippo", Japan, April 10, 1989

A BBC RADIO INTERVIEW WITH LORD PROVIDED BY VICTORIA (1983)

Moderator

When you meet him, Marshall comes as a considerable surprise: large, round and jovial. He looks more like a West Country publican than the head of Britain's electricity supply industry. Behind the smile is a formidable scientific mind, Sir Walter Marshall was elected a fellow of the Royal Society when he was only 39. By then he was already director of the Atomic Energy Research Establishment at Harwell.

He's best known publicly for his unwavering support for the American designed pressurized water reactor for a British nuclear power stations instead of the British AGR.

Former colleague and boss Lord Kirton

Always Mrs. Thatcher's blue-eyed boy in a big way. She in fact, consults him and bypasses her own ministers to consult with him directly. She's charged him very specifically with making a great success and getting on with this pressurized water reactor. To a certain extent I suppose he rises



With Margaret Thatcher

or falls to the success of the PWR, but no doubt at all about it that Mrs. Thatcher has got the highest possible opinion of him.

Moderator

He's an internationalist. Sir Walter Marshall is adamant that British is not necessarily best.

Lord Marshall

There's no point to getting hung up on national pride. If the PWR is the best value for money, we call for that. I mean, it doesn't really matter where the original concept came from. It's just trying to decide what's the best for the nation that's important. I actually am a great enthusiast for fast reactors, but unfortunately, I can't see how they can be economic until the next century.

And I think the AGRs have a lot to commend them. But I don't think they will be as economic as the PWR.

Moderator

Sir Walters appointment as chairman of the Central Electricity Generating Board last year was a clear political signal about nuclear power, not least to the board itself. His rapid replacement of Glyn England, as the board's chairman brought with it a new style of management as well as his deputy, Fred Bonner explains.

Fred Bonner

Well, I think he's quite a different individual from the previous chairman, who was very much more inclined to seek a consensus by consultation with his colleagues, as compared with Sir Walter, who is much more incisive and much more likely to have made up his mind as to what he wants to do. For example, I think one of his main preoccupations is obviously with the PWR.

And in that connection, he has certain clear-cut views as to the way ahead.

Moderator

Are you saying that he's completely at loggerheads with the rest of the organization over that?

Fred Bonner

No, I don't think that is the case, but I think it's one thing to have a general discussion and then to arrive at conclusions as compared with perhaps Walter's approach, which is more or less to come to the board with a view as to how we think it should be done.

Moderator

And that's exactly what he has done.

Fred Bonner

And that's exactly what he has done.

Moderator

Sir Walter Marshall is well known for his logical mind and strong views. He has a capacity to inspire loyalty and admiration as well as antagonism. Lord Kirton, a distinguished energy scientist himself, first met Marshall when he was a pure scientist and watched him become a manager as well.

Lord Kirton

I think he's got due consciousness of his own excellence it'd be foolish not to have such a consciousness of his own excellence. That might have struck some people as arrogant, but he was extraordinarily good and he had this terrific zest for life which came through in everything he did, all the conversations he had, all the suggestions he put forward.

His particular strength is great thoroughness. If he prepared a scientific paper, for instance, or an argument which is going to develop in a public lecture, he goes over the ground over and over again. He will cross-check and recross-check and cross-check again. I remember one very well-known paper he gave. It went through 49 drafts before he was satisfied to give it for public delivery.

Moderator

Having gone through all that, is he right at the end of it?

Lord Kirton

Not always. It would be a miracle if he was always right. I would say that sometimes he's ahead of his time. Sometimes he doesn't always fully

appreciate all the practical difficulties. Like many distinguished scientists, he tended at one time to rather take the practical difficulties as something which really any competent plumber could cope with. I would say that the last few years, of course, as these responsibilities have changed, he's found that the practical business of getting things done is almost as important as the science.

Moderator

Born in Cardiff in 1932 of English parents, Sir Walter Marshall has few happy memories of his childhood. His father was a baker. His family was very poor, and he's reluctant to dwell on that period in his life.

Lord Marshall

Well, my father died when I was four. My mother was left as a widow to bring up three children. We had a very hard time of it, you know, making ends meet. And I mean, that gave me the compulsion to study and work because if you were in Wales in those days, the only way to get ahead was to pass examinations and get to university.

The only way out of poverty was to pass exams.

Moderator

In fact, his compulsion to escape asserted itself on his very first day at school when he was four. He was delivered to the nursery class at lunchtime. He endured the sandpit for an hour before insisting to his surprised teacher that he'd come to school to do sums and not play with sand. He was moved up immediately. When he was seven, he pointed out a mistake in his teacher's arithmetic and got a thrashing for impertinence.

He was already becoming a child prodigy with a single mindedness to match his intelligence. The combination led him quickly into the company of some of the most brilliant minds in science at Birmingham University not long after the war.

Lord Marshall

Let's start at the beginning. I decided at age four to be a mathematician and age 14 to be a mathematical physicist. And I located that the only place where I could take an honors degree in both mathematics and physics

was Birmingham University under the great Professor Peierls, who, amongst other things, was the inventor of the atom bomb. I didn't know that at the time.

When I got to Birmingham, there was a large department full of Jewish refugees from Hitler. Those professors lectured to me in broken English, and since I was at an impressionable age and I very much admired these great scientists. Unconsciously I started to mimic them and I didn't even realize that I'd done that until a decade later when I listened to recordings of myself.

And I could see why some people recognized a Welsh accent and others recognized a Central European accent

Moderator

From Birmingham the Welsh mimic moved straight into Harwell Atomic Energy Laboratories and into fundamental research. He was head of theoretical physics there by the time he was 28. Some contemporaries believe that he might have been a Nobel Prize winner if he'd stayed in pure research. But it was at Harwell that the scientists began to discover that he had political skills as well.

Weapons research had gone to Aldermaston. Research on nuclear reactors was running down and Harwell was threatened with closure. David Fishlock, the science editor of the Financial Times, remembers this as a turning point in Sir Walter's career.

David Fishlock

Well, his major early achievement undoubtedly was the salvation, let's call it, of Harwell, one of Britain's great national laboratories, one of the world's great laboratories. Now, Marshall had spent his career at Harwell after leaving university and he was in no doubt whatever that Harwell was the world's greatest research center, but he did not see the Harwell he wanted surviving as a university.

And so, he came up with a different solution and argued it through against a good deal of opposition at the time. And his solution was that Harwell should hustle, so to speak, for work outside of Harwell at work that would be funded by other people than the taxpayer. And it should apply the very powerful instruments and the very powerful talent that had accumulated at Harwell to a whole range of activities, which, as he saw it, would

be crying out for the application of really good science and technology and the government of the late 1960s, and specifically Wedgwood Benn, as his minister at the time, eventually did encourage him to take Harwell down this road.



Lady Cockcroft unveils a plaque at the rededication of the Cockcroft Lecture Hall at AERE Harwell with Dr Walter Marshall looking on, May 1969

Moderator

Effectively, what he did was to privatize half of Harwell's work from the inside with the backing of his first political patron, Tony Benn. To support this plan, Sir Walter Marshall invented the principle of maximum unfairness. Instead of Harwell's knowledge, being free to all comers and paid for by the taxpayer, only the person who had paid for the research could now see it.

It was a sort of free market in applied science, rather along American lines. In the meantime, Sir Walter Marshall had other things on his mind. He married his childhood sweetheart from Cardiff.

...

Moderator

He bought a large, tumbledown house on the banks of the Thames at Goring in the early sixties. He's still restoring it himself, and he developed other interests. He's a master of origami, the Japanese art of folding paper,

and he makes his own wine. His friends say they like it, and he tells the story of what happened when he hosted a dinner for two eminent German scientists at home.

He was trying to persuade them to bring an important European experiment to Britain.

Lord Marshall

It was rather naughty, actually mischievous. We decided to serve them the best wine we could get. And so, I think it was Chateau Latour. We served excellent wine. I mean, I don't know much about that quality of wine, but I knew this was a good one. And then just for fun, I filled up a carton of wine with my homemade wine that I had made in the cellar.

And so, I served it to the Germans without telling them its source. And one of them, who was a real wine buff, was so impressed to have Chateau Latour in the first course that he decided that this second wine must be something very, very special. And he managed to place it as an obscure and very expensive vineyard somewhere in southern Germany, I forgot exactly where.

When I told him that it was homemade wine made from blueberries down in my cellar. He was appalled because his wine reputation was ruined overnight. And mine of course was made.

Moderator

And he won the experiment for the joint European tour. But how good a political operator is Sir Walter Marshall when he's not talking to other scientists? Eric Varley made him chief scientist of the Department of Energy in 1974. But three years later, when his old patron, Tony Benn, took over, the minister and his adviser fell out.

Some say Walter Marshall was over blunt with Tony Benn, but according to Lord Kirton, this was an exceptional case. As a rule, Walter Marshall copes very well with his political masters.

Lord Kirton

He's a very good politician in the sense he has almost an uncanny knack of being able to judge what the politician wants to hear and applying what the politician wants to hear. But in such a way, the politician wants to

hear what Walter also wants him to hear, as it were. In other words, he can use politicians very skillfully. Not always, he failed with Benn, but I think this is a case where Walter underestimated Tony Benn. He had a sort of scientist contempt for the fact that Benn it was not a scientist, but he really misjudged Mr. Benn's extraordinary practicality in matters of ministerial policy and the way in which the ministry coordinated with other governments and within Whitehall. At the time,

and Walter was quite new to this, you know, and misjudged the temperature and got very unhappy as a result.

Moderator

Did he say this in front of the minister?

Lord Kirton

He more or less let the minister know he had very low opinion of him. But on the other hand, and I would say that he exceeded his brief and exceeded authority on more than one occasion, and I wouldn't blame either of them for the break.

Moderator

Sir Walter Marshall went back to research after that and sulked for a year. He never looked back at the £30 million research programme into alternative energy, which he started under Tony Benn. He bounced back into favor under the conservative government when he was made chairman of the Atomic Energy Authority in 1981. Then he moved across to the central electricity generating board a year later. It's clear from what his deputy chairman, Fred Bonner, said earlier, that Sir Walter Marshall and the CEBG are still coming to terms with each other. The board member responsible for power station construction is retiring at the end of this month, and Fred Bonner himself may not stay much longer. Lord Kirton thinks that other changes may be on the way as well.

Lord Kirton

He likes to have what I call a kitchen cabinet. Everywhere he goes, he feels very much more comfortable if he has half a dozen or even a dozen people whom he's worked with for many years before, who know him and

know his moods and know how he likes to have speeches and so on. And in other words, he likes quite a considerable supporting staff.

Moderator

He hasn't actually taken a staff like that with him to the CEGB yet. Do you think he will?

Lord Kirton

I think he's in process of correcting it, yes. He certainly has already moved a man from the Atomic Energy Authority to Bourneville, the very big engineering establishments seem to be he's taken the publicity man from the AEA. He did the same with some of his secretaries and so on. And I know he's got his eyes on quite a few more of his old entourage whom he'd like to see down from the AEA into the CEGB, which might be the best place for them.

Moderator

But what may be most revealing about Sir Walter Marshall is that he still prefers to describe himself as a scientist, not a politician, to understand his approach, the way he thinks, the way that he solves problems, one has to go back to those heady, early days at Birmingham University when he was rubbing shoulders with brilliant men.

Lord Marshall

I am sure in my own mind that Professor Peierls was the biggest influence on me that there ever has been, and that influence concerned a method of thinking and presenting yourself. He followed in the great tradition of Pauli and Landau. Now those names don't mean anything to the general public, but they were the towering intellects in quantum mechanics.

I mean, together they did more than Einstein and their tradition was that although you had to understand everything by strict mathematics and rigorous, careful calculation, in the end you had to be able to summarize the results in very simple language and in a very simple, unambiguous way. And the philosophy of the Pauli Landau Peierls school was this: When you have finished a piece of work, there are only two possible outcomes either it is obvious or it's wrong.

In other words, when you've understood it well enough, it's trivial. It only seems complicated when you haven't understood it properly.

Moderator

Whether or not Sir Walter applies the same methods to political problems in public life is open to question. He says he's willing to change his mind and will always acknowledge his mistakes in public. When the debate over the PWR began years ago, he was against the American design, but the weight of opposition was so strong he felt, characteristically, that someone should test the argument.

So, he set out to do it himself. He was still a sceptic six months later, but after three years of hard study, scientific logic told him that in fact the reactor was sound and he hasn't changed his mind since. As far as today's debate about his proposal to build a PWR reactor at Sizewell is concerned, sir Walter Marshall has said that he will resign if the public enquiry finds against the PWR on safety grounds, but he has left his position open if the inspector merely recommends postponement. Will he win? Will the PWR be built in Britain?

Lord Kirton

I think if anyone's capable of winning the debate on his own terms, it's Walter. I think the business about whether the AGR or the Sizewell type reactor the PWR is the better bet for the country is a very open one. One of the great dilemmas at the moment, of course, is that no particular need for a new position anyway for the next five years or so.

Lord Kirton

And I think that as time goes on, you've always got a risk that one of the existing PWRs in America would have another accident which might affect the whole programme here. On the other hand, I think the latest generation of AGRs is going to show up very well. One's going up, for instance, at Torness in Scotland and at Heiton, they look like major winners, they're being built at time in fact those around the Heiton factory have only about a fortnight to go and they're being built to budget.

Moderator

Do you think then that Sir Walter Marshall has made an error of judgement and shouldn't have stuck quite so closely to PWR, and left a little more leeway for alternatives like the AGR?

Lord Kirton

No, I don't think so. Walter knows the AGR backwards just as he knows the fast reactor backwards. He's like all of us, we all need a little luck. And I think Walter's capable in many ways of making his own luck.

That profile of Sir Walter Marshall was presented by Rodney Smith, the producer was Julian Coles.

BOMB AND STRAW

Victoria: One of Dad's rather lengthy jokes, there's a lovely example of his view of the problem in "Playing for power" (Saturday 8th April 1995, Lindley-Stone/Independent Image)

<https://www.youtube.com/watch?v=OaelMis7pao>



Pathe newsreel:

The giant tanker Torrey Canyon aground off Land's End. On the Seven Stones Reef she lies like some stranded ocean monster shedding her lifeblood.

Narrator:

It's 1967 and a national emergency. The oil spilling from the shipwrecked Torrey Canyon threatened Britain's beaches. Promising action, Prime Minister Harold Wilson, turned to Harwell for help.

Lord:

I got into the office the next day and there, on the desk, was a telegram from Solly Zuckerman.

He was then the chief scientist in the Prime Minister's office. And he said "Yesterday the Prime Minister assured the house that the entire resources of the United Kingdom were devoted to fight the dreaded oil menace. For God's sake think of something!"

So, we got five barrels of crude oil... nasty crude oil...and we brought it here, to this effluent tank.

The tank was full at that time. The water was slightly radioactive but that didn't matter.

And we poured in the oil so the whole surface was covered with oil. And we went to a local farmer and demolished his hayrick, brought the hay back and spread it on the water. We went down to the local hardware store and bought some chicken wire, and we used the chicken wire to gather up all the straw with all the oil sticking to it. And I remember we pulled it out with the pitchforks and it all burned. And so in fact we had done something. With chicken wire and straw and we had shown how to clean oil off water.

Narrator:

Transported by military plane to the scene of the disaster, Marshall and his men prepared to put their high-tech Harwell solution into practice with a squad of soldiers and a lorry-load of straw.

Lord:

Then I was finally trapped by the television. They said "Now we know why you're here, but we'd be grateful if you'd confirm it. We understand the Prime Minister has ordered you to put an atom bomb in the wreck and blow all the oil up into the upper atmosphere. And you've got the bomb in that lorry over there, covered up by straw, and with a platoon of the Warwickshire Fusiliers defending it."

I said "Well, if that's what you believe I can't dissuade you, but I'm going for dinner. The Warwickshire Fusiliers are going to have their dinner. We're going to park the lorry in the square and if you would like to search under the straw, if you find the bomb you can keep it."



V. REMEMBRANCE

OBITUARY

/from The Times/

Lord Marshall of Goring, CBE, FRS, former chairman of the Atomic Energy Authority and the Central Electricity Generating Board, died of cancer on February 20 aged 63. He was born on March 5, 1932.

FOR more than two decades, Walter Marshall was the most eloquent spokesman and principal cheerleader for nuclear power in Britain. A rationalist who fell among politicians and emerged bruised, he never quite understood why his arguments so often fell on deaf ears. But he remained unbowed, the epitome of the scientist-engineer who believes that all things are possible.

He was born in Rumney, Cardiff, the son of a baker, and early showed signs of high intelligence and an appetite for work. On his first day at school he disdained the sandpit and insisted to his teacher that he wanted to do sums.

At seven he identified an error in a maths test book; and at 17 he was the youngest-ever undergraduate at Birmingham University. He graduated with a first in mathematical physics at 20, and took his PhD at 22.

His emergence as a fully-fledged scientist coincided with the innocent optimism of the 1950s, when nuclear power was seen as an endless and inexpensive source of electricity, so it was almost inevitable that he should be drawn to work at the Atomic Energy Research Establishment at Harwell. He spent a year at the University of California, and another at Harvard, before, becoming head of the theoretical physics division at Harwell in 1960, deputy director in 1966, and director in 1968.

He was elected FRS in 1971 and appointed CBE in 1973.

Walter Marshall combined intellectual brilliance with a forthright manner and a bulky presence which some found unnerving. Once satisfied of the technical merits of a case, he was impatient with doubters and prone to nail his colours too firmly to the mast, leaving him little room for retreat.



1970s. Dr Walter Marshall at AERE Harwell reactor site

His accent had a strange Germanic quality which added to the mystique. His energy was formidable.

Marshall's reign at Harwell was successful and he began the process of directing the laboratory away from nuclear physics and into broader areas of research, which continues today. In 1974 he made a fateful step, becoming chief scientist at the Department of Energy, in uneasy harness with the Energy Secretary, Tony Benn.

By this time Benn had emerged from the chrysalis of his early career as a technocrat and metamorphosed into a born-again left-winger with decided views on nuclear power. The relationship with Marshall was bound to be explosive, and so it proved. To Marshall's plaint that there was no lobby for nuclear power in Britain, Benn once replied: "Yes there is, Walter, and you look at it every morning when you're shaving."

While Marshall did his best to promote the building of pressurised water reactors in Britain, Benn did all he could to undermine the whole

concept of the peaceful atom. A parting of the ways was inevitable, and it came when Marshall was sacked from his post in 1977. "It was awful," he later said.

Public rehabilitation came with the election in 1979 of Margaret Thatcher, the only politician ever really on Marshall's wavelength. Mrs Thatcher adored getting her head around complex technical issues like global warming, arms control, or nuclear power, perhaps suspecting this took her into areas where her Cabinet colleagues seldom dared to tread. Marshall proved the perfect foil.

In 1981 he became chairman of the Atomic Energy Authority, staying only a year in the post before inheriting the chairmanship of the Central Electricity Generating Board, a far riskier prominence for one with his combination of qualities. He was knighted in 1982 and earned the undying gratitude of Mrs Thatcher for keeping the lights on during the miners' strike of 1984 and thereby making a major contribution to the outcome.

At the beginning Marshall had to make a tough decision. Would the strike be a long one, justifying the immediate burning of expensive oil in power stations his predecessors had ordered years before? He believed so and did it, promising to resign if he was wrong, and the action cost the CEBG dear. He was right and emerged as a life peer in 1985 on Mrs Thatcher's recommendation. But he could never have done it if the CEBG had not over-ordered plant in the 1970s, building up a huge generating surplus which Marshall deployed so brilliantly to see off Arthur Scargill.

This was Marshall's finest hour, but disappointment lay ahead. The Chernobyl disaster of 1986 shook confidence in nuclear power, though Marshall was quick to identify and publicise the technical flaws of the Soviet reactor responsible, and contrast it with Western designs. In spite of his efforts, however, the nuclear dream was now turning sour.

In 1989 there was a further setback. Once again he had staked his job, this time promising to go if the CEBG was not preserved intact after privatisation. Cecil Parkinson, then Energy Secretary, rightly decided that competition could be achieved only if the company was split. Then, at the very last moment, nuclear power was pulled from the privatisation when its true costs were finally disclosed.

Marshall stalked away from Whitehall once more, never to return. He founded the World Association of Nuclear Operators and was appointed its

first chairman, advised insurance syndicates and represented foreign power companies, but these were jobs below his true merit. Having staked his career from the outset on the promise of nuclear power, he suffered eclipse just as surely as it did.

Lord Marshall won many awards and medals, including the Kelvin Medal, the Maxwell Medal for Theoretical Physics, and – inappropriately, some may feel – the Henry DeWolf Smyth Nuclear Statesman Award. He was never a statesman, but never a trimmer, either. He said what he believed, loudly and dearly, and was happy ‘to be judged by it’. It distressed him that arguments he found so powerful left so many others unmoved.

Lord Marshall lived in Goring-on-Thames, where he cultivated a garden, practised origami, played croquet and kept up an interest in physics. He is survived by his wife Ann and a son and daughter.

OBITUARIES

LORD MARSHALL OF GORING

Lord Marshall of Goring, CBE, FRS, former chairman of the Atomic Energy Authority and the Central Electricity Generating Board, died of cancer on February 20 aged 63. He was born on March 5, 1932.

FOR more than two decades, Walter Marshall was the most eloquent spokesman and principal cheerleader for nuclear power in Britain. A rationalist who fell among politicians and emerged bruised, he never quite understood why his arguments so often fell on deaf ears. But he remained unbowed, the epitome of the scientist-engineer who believes that all things are possible.

He was born in Rumney, Cardiff, the son of a baker, and early showed signs of high intelligence and an appetite for work. On his first day at school he disdained 'the sandpit and insisted to his teacher that he wanted to do sums.

At seven he identified an error in a maths test book; and at 17 he was the youngest-ever undergraduate at Birmingham University. He graduated with a first in mathematical physics at 20, and took his PhD at 22.

His emergence as a fully-fledged scientist coincided with the innocent optimism of the 1950s, when nuclear power was seen as an endless and inexpensive source of electricity, so it was almost inevitable that he should be drawn to work at the Atomic Energy Research Establishment at Harwell. He spent a year at the University of California, and another at Harvard, before becoming head of the theoretical physics division at Harwell in 1960, deputy director in 1966, and director in 1968.

He was elected FRS in 1971 and appointed CBE in 1973.

Walter Marshall combined intellectual brilliance with a forthright manner and a bulky presence which some found unnerving. Once satisfied of the technical merits of a case, he was impatient with doubters and prone to nail his colours too firmly to the mast, leaving him little room for retreat. His accent had a strange Germanic quality which added to the mystique. His energy was formidable.

Marshall's reign at Harwell was successful and he began the process of directing the laboratory away from nuclear physics and into broader areas of research, which continues today. In 1974 he made a fateful step, becoming chief scientist at the Department of Energy, in uneasy harness with the Energy Secretary, Tony Benn.

By **Barthine Benn** had emerged from the **Chrysalis** of his early career as a



technocrat and metamorphosed into a born-again leftwinger with decided views on nuclear power. The relationship with Marshall was bound to be explosive, and so it proved. To Marshall's plaint that there was no lobby for nuclear power in Britain, Benn once replied: "Yes there is, Walter, and you look at it every morning when you're shaving."

While Marshall did his best to promote the building of pressurised water reactors in Britain, Benn did all he could to undermine the whole concept of the peaceful atom. A paring of the ways was inevitable, and it came when Marshall was sacked from his post in 1977. "It was awful," he later said.

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REMEMBERING WALTER MARSHALL

/by John Baker/

Walter Marshall was one of the more colourful technocrats of our age, closely identified with the nuclear industry but in practice an imposing authority on a wide range of scientific issues. Some saw in him (wrongly) no more than a purblind single-minded advocate of nuclear energy, and for the British anti-nuclear movement he occupied the top slot in their demonological lexicon for a decade and a half, as he advocated the virtues of pressurised water reactors and a major construction programme of nuclear power plants in Britain.

His falling out in 1977 with Tony Benn, then Minister for Energy, led to him being sacked from his post as Chief Scientist at the Department, and was one apparent setback in his pursuit of this cause. In reality, that event, which at the time caused him considerable grief but which he came later to realise made him persona grata with the incoming Thatcher administration, shows Marshall in a more intriguing light. For the trigger for his dismissal was not nuclear power, but the Minister's concern about how the poor were to meet their energy bills.

Taxed with this problem, Marshall wryly observed that perhaps the answer might lie in providing the poor with money, or failing that coin-like tokens bearing the profile of Benn's head. A sharp wit and effervescent sense of humour were formidable weapons in Marshall's armoury, and help explain the extraordinary affection he could command among his colleagues, companions and staff despite his ability also to make enemies.

He was a man big enough physically as well as intellectually to be worthy of caricature, and he would happily exploit this in Johnsonian style by poking fun at himself. Thus on public platform and in after-dinner speech, not only was he a lucid and vivid exponent of the abstrusest technical issues, but he could reduce an audience of the dullest engineers, the most pompous businessmen and self-important politicians to helpless laughter with exquisitely timed Hoffnunesque stones. Here he deployed his larger-than-life personality with its unapologetic egocentricity, his tortured vowels born of humble Welsh origins and brilliant university education in Birmingham from central European tutors, and his great sense of theatre.

Indeed, Marshall's whole career was a high-wire act, combining showmanship and skill. A First in Mathematical Physics from Birmingham University at 20 was followed by a PhD at 22 and election as a Fellow of the Royal Society in 1971. He became head of the Theoretical Physics Department at the Atomic Energy Research Establishment at Harwell in 1960 and Chief Scientist at the Ministry of Energy in 1974. In 1981, he was appointed Chairman of the Atomic Energy Authority by Margaret Thatcher and knighted in 1982, shortly after she switched him to become Chairman of the Central Electricity Generating Board (CEGB). A life peerage followed in 1985 on successful completion of his crusade to "keep the lights on" no matter what moves Arthur Scargill's striking miners made against the power stations.



*The Rt. Hon. Margaret Thatcher (Secretary of State for Education and Science)
outside the PLUTO reactor at AERE Harwell, September 1973*

Two episodes whilst at the CEGB showed Marshall at his very best. Anticipating the NUM strike in 1984-85, he took a strategic decision to prepare the CEGB in terms of fuel reserves, people and logistical planning to ensure security of electricity supplies. And when the time came, his communications to the Government of the day were robust, detailed and reliable, whilst in the public arena he played down the CEGB's decisive role so as to avoid dragging the organisation into what would become a highly politicised dispute.

Then when a year later the Chernobyl nuclear power station fire showed the disastrous consequences of getting nuclear power wrong, it was

Marshall who, leading again from the front, identified the design and operating flaws in the Russian reactor type, and bent all his powers of communication to explaining to professional and lay audiences what had gone wrong and what the essential differences were between the Russian and Western concepts of nuclear safety management.

Out of this disaster, and Marshall's prodigious efforts in response, was eventually born the World Association of Nuclear Operators (WANO), of which Marshall became the first Chairman, which for the first time embraced the Soviets in a peer-review group that has since done much to improve safety and operating performance by nuclear plants worldwide. Arguably, this could be his most enduring contribution.

For Marshall himself, however, Chernobyl marked the downward turn in his fortunes. Public confidence in nuclear energy ebbed away. He lost badly when he attempted to resist on technical grounds Cecil Parkinson's politically-driven need to break up the CEGB as a prelude to the privatisation of the electricity industry. And finally he was forced to resign as Chairman of National Power (one of the CEGB successor bodies)—again in great bitterness—when the Government decided, late in the day in 1989, to withdraw the nuclear stations from the planned privatisation. The break point was the treatment of the historic liabilities for reprocessing spent nuclear fuel and decommissioning nuclear power plants. Marshall had argued all along that these would not be financeable and he carried the can for proving to be right. He felt humiliated and betrayed: he was loyal to a fault and naive in expecting reciprocation; and he had put too much faith in purely technical argument and not understood that the rest of the world sees other imperatives.

Flung from office, Marshall continued with his international work where he was hugely respected both for his intellect and as a man, particularly in Japan for which he had a particular affection and love of its food. He also worked in insurance and as a consultant, but he never recovered his previous visibility.

Throughout his life, Marshall was characterised by his relentless energy of mind and curiosity of spirit. He relished intellectual debate, and spent many hours at night and long journeys pursuing the proof of mathematical theorems. He practised origami and laboured to great effect in the garden of his Thames-side house at Goring. In all his doings, his childhood sweetheart and then wife, Ann, was his constant companion and support, at work and play. Their teamwork was legendary, as was their hospitality.

WALTER MARSHALL

*/by Roger Elliot (Brookhaven National Laboratory) and
Martin Blume (University of Oxford)/*

Walter Marshall, who in his early career made many distinguished contributions to the theory of condensed matter and later became a central figure in the British nuclear power industry, died of cancer on 20 February. His years of service to the British government led to knighthood in 1981 and to a life peerage as Lord Marshall of Goring in 1985.

Born in 1932, Marshall was an undergraduate and graduate student at the University of Birmingham under the direction- of Rudolf Peierls. He received his PhD at the age of 22 with a thesis on antiferromagnetism. He then accepted a position in the theoretical physics division at Harwell Laboratory where he initially worked on the theory of shock waves in plasmas. But he soon returned to his initial interest in condensed matter physics, bolstered by visits to the University of California, Berkeley, Lawrence Livermore National Laboratory and Harvard University.

He became especially interested in the new applications of neutron scattering to elucidate the properties of solids, liquids and, in particular, magnetic materials. He lectured extensively and lucidly on these subjects, bringing considerable attention to what was at that time a relatively recondite experimental technique. The lectures culminated in a definitive work, *The Theory of Thermal Neutron Scattering* (Oxford University Press, 1971), which he wrote in collaboration with a former student, Stephen Lovesey. Marshall made important contributions to the theory of magnetism in transition metals, the statistical mechanics of magnetic materials, critical phenomena and molecular orbital bonding in salts. He interacted effectively with experimentalists and became the driving force behind experimental programs that ranged far beyond those of the neutron scattering group at Harwell. He took an early interest in the Mossbauer effect and was instrumental in guiding experimental and theoretical groups into that area as well.

Marshall's leadership qualities were recognized early at Harwell, where he became, at the age of 28, the head of the theoretical physics division in which many prominent theorists worked. Among them were John Bell,

Tony Lane, Tony Skyrme, Bill Thompson, John Hubbard, Alan Lidiard, Mick Lomer and Peter Schofield. In this position, he was able to attract a large number of postdocs and visitors, particularly Americans such as Martin Blume, Raymond Orbach, Richard Watson, Robert Howard, Bernard Cooper, Arthur Bienenstock, Brooks Harris and David Adler. He also maintained a good collaboration with the theoretical physicists at the University of Oxford.

Alas for physics, Marshall's organizational strengths were as great as his scientific abilities and by 1968 he had risen to become the director of Harwell. Although he made regular summer visits to Brookhaven National Laboratory to keep his hand in physics, the world of government increasingly commanded his attention. In 1974, he became the chief scientist at the Department of Energy while the Labour party was in power. The Labour Government strongly supported the coal miners, and Marshall's continued advocacy of pressurized-water nuclear- powered reactors led to his leaving this position and returning to Harwell. In 1981, though, after the Conservatives returned to power. Prime Minister Margaret Thatcher named Marshall chairman of the Atomic Energy Authority and a year later made him chairman of the Central Electricity Generating Board. He was soon at the center of the political stage, playing a crucial role in the Thatcher government's defeat of the miners in a long strike in 1984. While at the CEGB Marshall also began a program of constructing pressurized-water reactors (as opposed to the advanced gas-cooled reactors being built in the UK to that point). He piloted the construction of the first (and only) one, located at Sizewell.



But the benefits of nuclear power and the gratitude of politicians proved ephemeral. The Conservative government was embarked on a program of privatization of the nationalized industries, and the electricity supply industry was high on its list. Marshall argued for a large private organization that would contain the nuclear power stations, but the government eventually decided to withdraw nuclear power from the privatization process and Marshall's role in the industry came to an end. In the remaining years of his life, he played a peripheral role, advising foreign governments and insurance syndicates on nuclear power issues. He founded and initially chaired the World Association of Nuclear Operators, which gave advice on safety to the operators of Soviet-designed reactors in Eastern Europe following the Chernobyl disaster.

To work with Walter Marshall was an unforgettable experience. His intellectual power, tremendous energy and determination to get to the root of any problem made him immensely successful as a scientist. When he applied these talents to the less precise arts of politics, he was not as successful. Some observers saw in him a degree of political innocence; he relied heavily on technical logic to win an argument. Nevertheless, he has left a significant mark on physics and on the history of nuclear power, and he is fondly remembered by many former colleagues.

MEMORIAL SERVICE

Victoria: A recording of Dad's memorial service, including a reading by Mum of his favourite poem – Max Ehrmann's *Desiderata* – and an address by the broadcaster Richard Lindley, 1996.

Max Ehrmann (1872–1945) *Desiderata*

Go placidly amid the noise and haste, and remember what peace there may be in silence.

As far as possible, without surrender, be on good terms with all persons. Speak your truth quietly and clearly; and listen to others, even to the dull and the ignorant, they too have their story. Avoid loud and aggressive persons, they are vexations to the spirit.

If you compare yourself with others, you may become vain and bitter; for always there will be greater and lesser persons than yourself. Enjoy your achievements as well as your plans. Keep interested in your own career, however humble; it is a real possession in the changing fortunes of time.

Exercise caution in your business affairs, for the world is full of trickery. But let this not blind you to what virtue there is; many persons strive for high ideals, and everywhere life is full of heroism. Be yourself. Especially, do not feign affection. Neither be cynical about love, for in the face of all aridity and disenchantment it is perennial as the grass.

Take kindly to the counsel of the years, gracefully surrendering the things of youth. Nurture strength of spirit to shield you in sudden misfortune. But do not distress yourself with dark imaginings. Many fears are born of fatigue and loneliness.

Beyond a wholesome discipline, be gentle with yourself. You are a child of the universe, no less than the trees and the stars; you have a right to be here. And whether or not it is clear to you, no doubt the universe is unfolding as it should.

Therefore be at peace with God, whatever you conceive Him to be, and whatever your labors and aspirations, in the noisy confusion of life, keep peace in your soul.

With all its sham, drudgery and broken dreams, it is still a beautiful world.

Be cheerful. Strive to be happy.

much better than I did. I'm speaking to you now simply because following a television film we made together, Lord Marshall gave me this job. I think he decided that only a journalist would have the necessary effrontery to try to summarize so large a life in this short address.

It must have been clear to others, it certainly was to him, that from his earliest years, Walter Marshall was a remarkable person. He himself remembered throwing a tantrum on his first day at school because he was put in the sandpit instead of being allowed to do sums. At Birmingham University he took a first-class degree in mathematical physics at the age of 20 and got a doctorate for his thesis on neutron scattering just two years later.

It was as a Welshman in Birmingham, surrounded by discordant band of European emigre scientists that Walter acquired the extraordinary accent that was to make him evermore instantly recognizable.

Something more important stuck with him for the rest of his life – his long and happy marriage. He and Ann Shepherd were childhood sweethearts from the same village. As soon as Walter got his first job, they married and stayed together for the next 41 years until his death brought to an end a quite remarkable double act. Without Ann, Walter would never have acted as boldly as he did, nor have returned so effectively to the battle after the professional setbacks he experienced.

And in this last year of his life and supported Walter and his fight against his new antagonist, cancer, in a quite remarkable way. The young Walter Marshall achieved the ambition of every young scientist in the fifties when he was recruited by Brian Flowers to work at Harwell, the Atomic Energy Research establishment. At the age of 28 he was appointed head of the theoretical physics division, heading a team of 40 other brilliant scientists.

In 1969, he became Harwell's director, and in 1971 he was elected a fellow of the Royal Society. At that time, the youngest FRS. As director Dr. Marshall began a process of commercialization, selling Harwell's expertise on contract to industry. At the time, it was a revolutionary concept. Walter was awarded the Glazebrook Medal for his original and effective management of scientific research.

It must have been this ability to mix first class science with entrepreneurial flair that appealed to the conservative politician who met Dr. Marshall on a visit to Harwell. Her name, of course, was Margaret

Thatcher, but in the mid-seventies Labor was in power and it was with Labor ministers that Walter Marshall now had to deal. At Harwell after the most rigorous investigation, he had concluded that Britain was building the wrong kind of nuclear power stations, gas cooled reactors, rather than the light water ones that had been adopted by almost everybody else.

It made him extremely unpopular with most of the nuclear establishment, which, despite the evidence, remained insistent that British reactors were best. This puzzled Walter, he would never quite understand why people did not act rationally, why they did not always base their decisions on the scientific facts, as he did. Seconded to the Department of Energy as its chief scientist, Walter found himself working for Tony Benn.

But the more he argued the merits of the American PWR reactor, the more unpopular he made himself with his minister. After two years, Walter was abruptly sacked. Though it was not unexpected, it still wounded him deeply. But unpopularity with Mr. Benn was the best possible recommendation for Walter Marshall, where Mrs. Thatcher swept to power in 1979. Soon with a knighthood, he'd been made chairman of the Central Electricity Generating Board with a brief to expand nuclear power and keep the lights on. If there were a coal strike. When it came in 1984, he frankly enjoyed himself. "A wonderful year! Like being in a war, just very, very exciting" was how he described it. Though he couldn't be sure he could do it, he promised the Prime Minister that the CGB would keep the lights on. He gambled and won.

Mrs. Thatcher made him appear, and with his characteristic blend of self-confidence and political innocence, Lord Marshall was convinced she'd never desert him. But if there was one person the Prime Minister was fonder of than Dear Walter, it was her Energy Secretary, Cecil Parkinson.

And if there was one policy more important to her than nuclear power, it was privatization. Walter had no objection to privatizing the CGB, but he wanted it to remain a monopoly under his command. Only in that way, he thought, could nuclear power prosper. He was right. Splitting up the industry uncovered the real costs of nuclear power and worse, what the markets thought clearing up after it might cost. Already reduced to running only part of the old CGB, Walter Marshall now found that nuclear power was to be pulled out of privatization altogether. He resigned and left the power game.

He was disarmingly honest about how he felt. What I liked best, he said, was being up there at the top. It was the exhilaration of power. When I parted company, that was the thing I missed most. It's just the not being there.

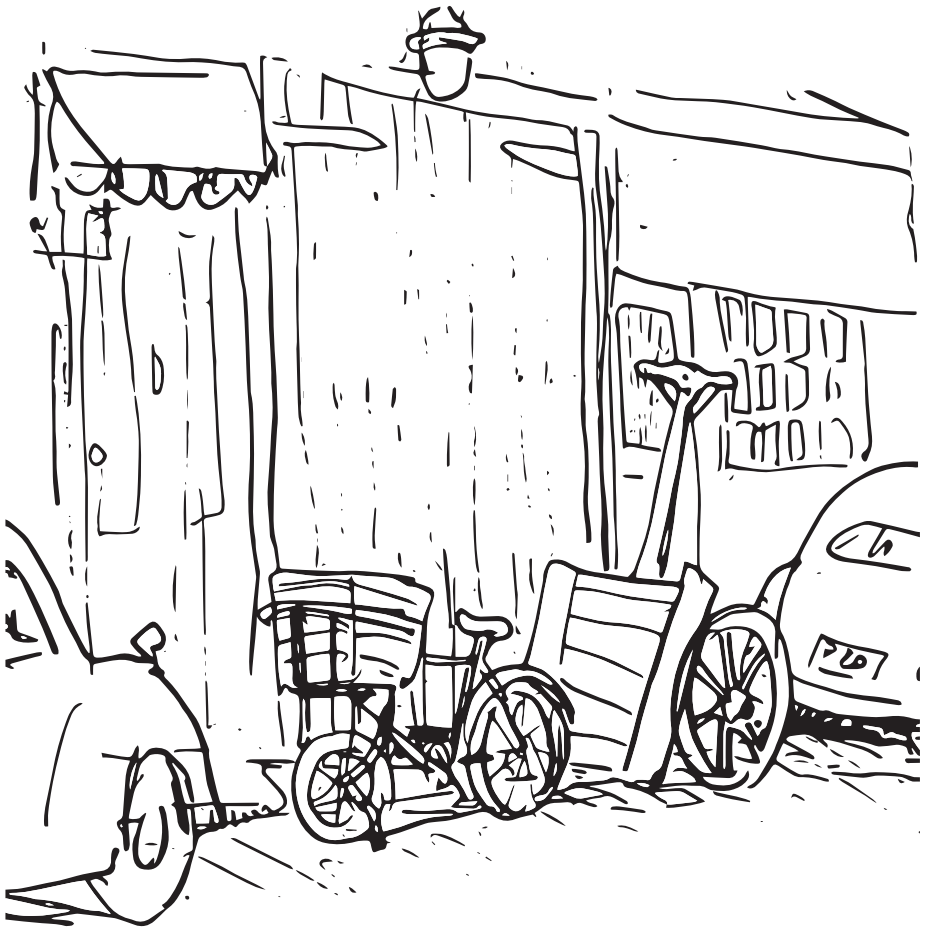
But though his public nuclear career in Britain might be over, Lord Marshall was in great demand abroad. He used his immense prestige and some typically forceful diplomacy to set up WANO the World Association of Nuclear Operators, offering practical help to help improve operating standards in the dangerous nuclear power stations of Eastern Europe. Touring the Kursk reactor, he told us the Russians are going to operate these reactors for another 20 years. If that's what's going to be done, I want to make them as safe as possible.

Back in Britain, Lord Marshall, who missed out on the money made by many of his more junior colleagues from privatization, went into business insuring nuclear risks at Lloyd's. He liked the idea of putting his own money where his mouth had always been and making a profit out of it. It was his answer to those who wouldn't share his nuclear dream.

Some people who worked for Walter Marshall were intimidated by his physical size, formidable intellect, the force, the way in which he expressed himself. Though he was always ready to be challenged, many more of his colleagues recall the fun and excitement of being part of the Marshall Plan. If he was pleased with himself, he had a lot to be pleased about. And no one could tell a story about the curious way that important decisions sometimes come to be taken, more entertainingly than he. I found it warm and human.

And I greatly admired his fortitude in finishing the film, he'd started with us, even though he was already ill and in pain. In every way I found him a big man. For our last film sequence the Marshalls came with us to the new reactor Sizewell in Suffolk. Sussex.. The only one of the family of PWRs Walter planned ever to be built. It's a disappointment, but not a defeat, he said.

And when they decide it's time again for nuclear power, what they will build is an exact replica of this plant, and then they'll build four or five. Now that's the task that I was given, but I didn't get the time to fulfill it. But it will be done. So, I'm not sure whether I'll be alive at that time or not, but at that time they'll say, well, Walter Marshall was right after all. And perhaps they will.



VI. COLLEAGUES SPEAKING

LORD NUCLEAR

/by Nikolay M. Sorokin, 19th WANO President/

I firmly believe that even if Walter Marshall had not been awarded the title of Lord, he would have deserved it for the foundation of WANO.

Looking back over the past facing a tough struggle between the two political systems, we couldn't imagine that such an international organisation like WANO would come to existence.

Three Mile Island and Chernobyl urged nuclear power plants worldwide to move forward together to promote safe operation of the plants. Thanks to such strong personalities as Lord Marshall, Nikolai Lukonin and William S (Bill) Lee, WANO was born.

I was fortunate to meet Lord Marshall in 1989, when accompanied by his wife, Lady Marshall, he visited the Chernobyl nuclear power plant as part of preparations for the WANO foundation.

Serving as chief engineer of the Chernobyl nuclear power plant, I had long-standing and strong bonds of friendship with the then site director Mikhail Umanets.

During our preliminary meeting, Chernobyl NPP design specifics, plant operations under accident mitigation conditions and our vision on the sharing of worldwide operating experience were of particular interest to Lord Marshall.

Escorted by the site director and me during a plant technical tour that followed the meeting, Lord Marshall occasionally stopped to have a talk to the plant personnel with no findings shared.

During a post-tour plant management meeting, Lord Marshall highly appreciated personnel efforts to mitigate the consequences of the accident, wished further successful operation of the plant and responded to questions.

The tone of the meeting was very amicable with no hints of negative emotions.

Then the meeting went into the format of unofficial dinner at Mr Umanets' home. The two excellent interlocutors and storytellers, Mr Umanets and Lord Marshall, found a common ground allowing them to have a smooth conversation, which occasionally touched upon contacts that needed to be established across plants worldwide.

Suddenly Lord Marshall addressed me to proceed with the following dialogue:

Lord: Nikolai, have you ever been to a Western plant?

Myself: No, I have never been to a Western plant or even travelled outside of the country.

Lord: I was impressed with how the plant is running under complicated post-accident conditions, but as far as overall plant housekeeping is concerned, there is still room for improvement. Western plants are so clean and boast such a high level of housekeeping that I can even eat my lunch sitting on the floor of a turbine hall. This is not as yet the case with your plant. You will definitely visit foreign nuclear plants to help your home plant to become even better. All plants around the world and we need to establish mutual communication to become stronger.

It didn't sound insulting at all as he was talking in an amicable and respectful way, meanwhile expressing his confidence that the global partnership plans involving all nuclear plants across the globe would come true.

The creation of WANO, with its Charter signed during the Inaugural Meeting in Moscow on 15 May 1989, opened the worldwide nuclear industry for all WANO members.

During our visits to foreign nuclear plants, we could derive the following conclusions:

- We are inferior to our peers in some areas, e.g. overall plant housekeeping. How could I not recall my conversation with Lord Marshall in that instance?

- We are equal to our peers in emphasising plant operational safety as the overriding priority.

- And we are superior to our peers, as I felt it, in our operators' level of understanding the processes they manage.

While visiting all plants and participating in Peer Reviews, in addition to the areas for improvement, we always identify good practices and strengths that other plants could emulate, which they do, thereby achieving

the WANO goal: putting in place a mechanism that helps ensure continuous improvements in the safety, reliability and efficiency of the nuclear plants worldwide.

WANO has been existing for over 30 years now to prove the appropriateness of the fundamental ways opted by the WANO's founders and, above all, Lord Marshall, who turned out to be the main driving force behind the advent of WANO.

WANO does not stand still, it evolves. WANO's Action for Excellence project outlines its today's main focus areas for WANO to achieve excellent nuclear plant performance and become even stronger.

It is important that we keep the same spirit of partnership that Lord Marshall had set and emphasised as the WANO' fundamental principle when creating the organisation.



*Lord and Lady Marshall and Brian George
(the engineer in charge of the board's programme to build PWRs)
First visit to Chernobyl, June 1988*

A PASSION FOR THE DEVELOPMENT OF SAFE NUCLEAR ENERGY

*/from email message addressed to WANO Moscow Centre by Andrew Clarke,
WANO London Office Director in 1992-1995/*

How nice to hear from you and I hope all is well at WANO Moscow Centre. I have good memories of several visits that I made to your Centre between 1992 and 1995 and also to your VNIIAES Institute before then during discussions about the formation of WANO.

In response to your specific questions about Lord Marshall, please find the following contributions.

1) When and where did you meet with Lord Marshall for the first time? What are your impressions from the first meeting?

I first met Lord Marshall in 1984, shortly after he was appointed Chairman of the UK's Central Electricity Generating Board (CEGB) and I was a senior manager with responsibilities for Nuclear Operations support in the same organisation. He was a very demanding boss requiring the same level of commitment and passion from his staff that he himself showed on a very wide range of topics. If you claimed to be an "expert" on any subject, you had to be able to respond to his wide range of technical questions on your subject. If not, he would ask for a different "expert" next time. I was particularly impressed with his ability to understand a complex technical argument and to repeat it back in terms that a non-technical person could understand.

I began to work more closely with Lord Marshall, on a one to one basis, the morning after the news of the accident at Chernobyl broke in the west. At the time, there was much opposition to the further development of nuclear power in the UK and Lord Marshall was charged by the UK Government to introduce a small family of pressurised water reactors based on the Sizewell B design. He was initially pleased to learn that the Chernobyl reactors were not VVERs, but soon realised that the RBMKs would be perceived by opponents to be similar to his operating fleet of Magnox reactors. He was very successful in the months that followed in motivating the whole of the UK nuclear industry to explain, in simple terms, the differences in the safety characteristics of different reactor types.

2) What are your thoughts about his contribution to the industry development and about his professional qualities?

Lord Marshall had a deserved worldwide reputation as an eminent scientist with a passion for the development of safe nuclear energy for power production. He was renowned as a very good communicator of difficult technical issues to lay audiences and opinion formers. He developed series of lectures on topics such as the storage and health effects of nuclear waste and the distribution of cancer clusters, some of which were found coincidentally in the proximity of some nuclear power stations. He was very good at presenting these topics to lay people in terms that they could relate to the risks of everyday living.

He was dismissive of so called experts who could not communicate their ideas to him on a technical level. Equally, he showed great respect to experts who could communicate with him on an equal level. As an example, he developed an immediate rapport with Armen Abagyan. He and Armen Artavazdovich both valued the power of technical logic in solving the most complex of problems; neither liked the (non-logical) political considerations that sometimes overrode their “correct” answer. In the end, this logical approach led to the end of his term as CEGB Chairman. The British Prime Minister Margaret Thatcher had the highest regard for him as did the Energy Secretary. But when the Government decided to privatise the UK electricity industry, Lord Marshall’s “indisputably right answer” for the way to do this was rejected as this was not politically expedient. He did not see this coming and was devastated at the outcome.

3) Which human attributes can be noted by you if speaking about Lord Marshall? Any interesting episodes or cases?

Lord Marshall always demanded the highest standards of performance from his staff and could be ruthless if individuals fell short of his expectations. Conversely, it was very rewarding to work with him if you could establish his trust. As an example, I well remember providing him with a written brief on a particularly difficult technical subject. His style demanded that you sit in his office saying absolutely nothing while he studied your offering. His initial response was “Andy, this is absolutely dreadful”. He would then ask a series of questions, all of which I was able to answer to his satisfaction. This was followed by another period of silent study after which he declared himself satisfied with my original offering unchanged! The importance of

this example was that it changed our relationship from that day forward and I joined his rewarding group of trusted confidantes.

Lord Marshall relished a challenge, but only if he thought there was a fair chance of success. After the Chernobyl accident, INPO in the US and UNIPED set up an international working group to consider how nuclear Utilities worldwide could better work together to share experience with the aim of avoiding the serious events that had led to the accidents at Three Mile Island and Chernobyl. At the time, I was chairman of INPO's International Programme Advisory Group and was asked to chair this new working group. Our recommendation to hold an international meeting of nuclear power plant operating companies (the 1987 meeting in Paris) was supported by the American Utilities, EdF and the IAEA Director General. We recognised that an internationally acclaimed chairman was essential if we were to achieve a high level of attendance. I was asked to approach Lord Marshall. His initial reaction was to decline on the grounds that there was a high chance of failure. But, when I told him that the Americans and the French had said he was the only man in the world who might succeed with this initiative, his relish for a challenge overcame his fear of failure. Having accepted the challenge, he applied a huge amount of personal effort to make the meeting a success. But, he would be the first to accept, that without the bravery of Nikolai Lukonin in facilitating the attendance of the Operators of all the Soviet designed reactors, the meeting would not have resulted in the formation of the organisation we know as WANO. The obvious rapport between Lukonin and Marshall at the Paris meeting was obvious to all in spite of their very different backgrounds and was undoubtedly a major contribution to the safety of nuclear power plants everywhere.

I hope these reflections are of interest to you. I would like to receive a copy of the book when it is produced. Digital form will be fine.



*Lord Marshall and Armen
Abagyan, June 1988,
VNIIAES Institute*

LORD IN NUCLEAR POWER

/by Oleg M. Saraev, 9th WANO President/

Over time, the World Association of Nuclear Operators (WANO) has been going increasingly conservative in perfecting its ways of influencing activities meant to improve the safe operation of nuclear power plants. An international standard set by this organisation in the early 1990s helped strengthen, within a fairly short timeframe, the positive standing of the global nuclear energy after the accidents of 1979 and 1986. Of course, the WANO creation was a deed of many people, but the implementation of functionalities set by the founders depended not only on the competence, but also on the leadership qualities of the leaders. The WANO was lucky to have Lord Walter Marshall Goring as its first leader.

They say, at least in Russia, that one can't become a nuclear power plant director just because. I think that only an outstanding person like Walter Marshall could become a lord by courtesy rather than lord by right. He got baron title, as a 'pass' to the House of Lords, from the Queen, in recognition of his exceptional administrative capabilities and leadership traits in coping with a fuel crisis.

Lord Marshall's election to be Chairman of the WANO Board of Governors was not totally smooth. The Americans, whose installed nuclear capacity still surpasses that in any other country, were initially sceptical about the idea to establish an association with European leadership in it. This also provoked a reserved attitude towards Chairman's election. However, pretty soon this became insignificant, because the personal leadership qualities and the vast managerial experience of Lord Marshall fostered a quick and effective start of the WANO to provide worldwide cooperation of nuclear operators.

During Lord Marshall's tenure as WANO Chairman, I was the Director of the WANO Moscow Centre. Together with my colleagues, I had numerous meetings with him in and often off office hours (always at the Lord's initiative), and so I had a chance to get an idea of him – obviously, fairly subjective. First and foremost, from the very beginning, the baron showed

a friendly attitude towards Moscow Centre, though with a touch of condescendence. At the same time, he appreciated informal contacts with Moscow Centre representatives at all levels. Why? Western concern about the state of nuclear power and questioning of its safety largely stemmed from considerable distrust in Russian-designed reactors. This mistrust of the world community extended to the entire nuclear industry. In essence, *inter alia*, the WANO led by its Chairman was to get an unbiased picture of the nuclear power state-of-the-art in the countries affiliated with the Moscow Centre, and to outline the ways to reduce this distrust through actual activities. As part of this effort, the Lord had a special focus on human performance and safety culture.

With the commencement of WANO operation, the doors of the world's nuclear power plants opened to Moscow Centre members. A lot of information was received about routine operation of the plants, the challenges faced, and safety culture. At the same time, we became more confident of our own regulations, practices and skills in providing reliable operation of nuclear power plants. The plans to enhance the safety of the Moscow Centre plants were refined considering international experience.

Lord Marshall's authority as a Chairman had also grown amongst WANO community. This showed in what he said, how he was listened to and how the Board of Governors' decisions approved by him were implemented. In fact, the Lord's stature was quite conducive to this: a forceful appearance, convincing phonetics, a feeling of emanated power, the narrative logic inspiring confidence. Whom did he resemble? I would say, Evgeny Ivanovich Ignatenko. Outside of the officialdom, during visits to the Moscow Centre nuclear power plants, the Lord was sociable, inquisitive and simple. Perhaps he was trying to understand what kind of people were operating nuclear power plants with Soviet-designed reactors. He did not hesitate to do this even in a Russian steam bath or when having a drink. Once (it was in London), having invited Moscow Center delegation to dinner at a restaurant, Lord Marshall told us about his childhood and studies. It began when we were served two dishes: one was fish, and the other was what we took for a side dish. We wondered why there was such a division. The Lord made a pause after which he explained that fish was treated reverently in Britain, that not each and every Brit could eat fish every day; that there was time when his family used to eat meat once a week, and only once a month they

could afford fish. The Lord often used to 'enlighten' us on various matters. I don't think that he handled representatives of other WANO centres in the same way.

Once, after a Board of Governors' meeting, the Lord invited us to his estate not far from Oxford, near the River Thames, next to a railway with frequent rattling trains.

We arrived on a bus a little bit ahead of time. We were met at the house entrance by Lady Ann, the Lord's wife, who was in gardening attire. She was nice and welcoming, and it was easy to believe that she was really glad to see us. Some of us had met her before and could speak English, so a conversation began. The Lady said that she had been planting something in the garden and because of our early arrival did not have time to brush up. Some initial tension was relieved by the unexpected ease of communication. The Lord and Lady lived in a small two-storey house, just the two of them. The Lord showed us his accommodation, in which there was nothing unusual, except for a separate room with many Chinese items in it. The Lady treated us to tea with delicious treats that she allegedly made herself. It was fun and childishly joyful.

Lord Walter Marshall, the first WANO Chairman, died of a malignant disease on February 20, 1996, two weeks short of his 64th birthday. In the fall of 1995, at his suggestion, the WANO Board of Governors was held in Scotland, near Edinburgh, in a beautiful and quiet place, which is translated into Russian as 'Pebble'. There was no official information about the critical state of health of our Chairman, but everyone was aware of it. The Board meeting was a success. The Chairman made a wrap-up and expressed good wishes for future work. There was a dinner at which Lord Marshall said that he had chaired his last Board meeting, and wished everyone success in their activities. The Board members departed with a strangely sad feeling (I judge by myself) that they would never see this highly esteemed man alive ever again.

Whatever they say, Lord Walter Marshall personally and with commitment did a lot to improve the safety culture across Russian nuclear fleet and in the countries that had nuclear power plants built to Russian designs. Lord Marshall has remained and must remain in the memory of the nuclear power industry, at least in that of Russia.

ABOUT LORD MARSHALL – A PROFESSIONAL, A PHILOSOPHER, A MAN

*/from interview with Anatoly A. Kontsevoy,
the second Director of WANO Moscow Centre/*

Corr: How did you first happen to meet Lord Marshall?

KAA: In 1991, I was appointed (elected) to be the Director of the WANO Moscow Center. It was in summer. Incidentally, I didn't know anyone then. Meanwhile, the WANO had already been in operation for two years, and at that time there was an INPO event held in Canada – an INPO meeting, not WANO's.

Lord Marshall had arranged for the WANO Moscow Centre people to be invited to this meeting. The bunch that went to Canada included Gennady Nefedov, Armen Abagyan of blessed memory, Mikhail Umanets (he was then the Director of the Chernobyl nuclear power plant), and some entourage.

And there it was – our first meeting with Lord Marshall. A man of imposing stature, he was escorted by his Lady. When we met him, we did not feel in any way intimidated by the presence of this great man. He was so benevolent, he looked at us and listened to us with such attention that from the very first minute we thought that 'that was our man'. That was the way the Lord was – a good sense of humour, always smiling, a man of tremendous wisdom.

We stayed there for about three or four days, and he took care of us, picking us up at the hotel to go to various events and bringing us back. For sure, he had arranged through our Canadian hosts a very good social programme for us, including a boat trip on the Lake Ontario, where Umanets made a performance of playing button accordion. So our first meeting was just super. I would even say that such rapport is possible only inside a really good, warm-hearted, welded family.

Representatives of nearly all centres were there, and Lord Marshall introduced us to everyone, including Stan Anderson, Zack Pate and other WANO participants.

So that was my first impression of Lord Marshall.

Corr: What do you think about Lord Marshall's role in the advancement of nuclear power, about his professional attributes?

KAA: You know, he was a man of big thinking, a man with a philosophical vision of nuclear energy on a whole, and he did a lot to raise the standing, or I would say, to foster further development, of nuclear power, to enhance its safety, just by the virtue of his philosophy, his forceful personality. Being open-minded and forward-looking, he placed the nuclear energy among the imperative technology options at the Earth, from the viewpoint of ecology, economy, culture, and, in the long run, life itself.

He attached great attention to both safety culture and human culture in general. With this, each meeting was followed up by some social event. It was either museum, or good music, or just a good conversation.

To be immersed in this Western environment, the language, the culture... How to work – the system is different; it is a global one. This does not mean that it is bad, by no means, on the contrary. It was a very substantive contribution in the cultural, technical, administrative, etc. growth of our specialists.

The WANO Board of Governors had as its members the major leaders from world companies - American, British and so on; the Japanese, the wisest of all; it was worth a lot. That is, the first leaders paid due attention and valued this organisation, judging by the time they spent on it. Zach Pate (INPO), Cavanaugh, Bill Lee, these were personalities with global vision, not just US or UK-specific.

And the Lord was a philosopher. That was global... That was a safety culture; the tracks that were chosen, they were all to the point. And one of the tracks was to exchange visits. It was such a drive!

These visits, they put a station into a multifaceted focus. Aesthetics, documentation, the dress code, the staff behaviours, housekeeping...I would not claim that Lord Marshall did it all, but that was when he was in charge. This activity was supported by all the centres owing to his authority. That was why WANO was a friendly organisation, with absolutely all regional centres giving a helpful hand and providing support to each other.

WANO was devoid of any politics, any politicking. Everyone was open. The visits usually involved an invitation to a family, in a corporate sense. It did not matter where it was – in America, in Europe, or elsewhere; there was the

feeling of a family. And in a family, the greatest value is trust in each other. This quality was inherent in WANO when Lord Marshall was at the helm.

In fact, first there was the US Three Mile Island in 1979, which basically had a toll on the entire nuclear industry. But essentially that was an internal accident rather than a design-based event. I think it was after this event that an association of all nuclear power plants in Europe, America, and Africa was created. They set up an organisation that similar to WANO shared information, etcetera. And then Chernobyl led to this initiative (which was not ours, by the way -it was initiated by the West - in this particular case, by Lord Marshall and his colleagues, who realized that we were one family and whatever happened at a nuclear power plant could impact the entire nuclear community) to involve Soviet thinking in the analysis in order to prevent all these events. And that was when the term 'World Association' was found to get us involved into this organisation, to pool all nuclear power plants across the world.

Another thing – it was not owing to Lord Marshall directly, but inter alia he insisted that all WANO centre have their representatives, for instance, in the Paris Center. And immediately, all our stations wanted to send there their brainy specialists showing promise and willing to have professional growth.

He visited many nuclear power plants, including those with critical performance. The station visits deserve to be underlined. In particular, he visited the Chernobyl station. Gorbachev did not go to Chernobyl, while Lord Marshall did. Umanets was Chernobyl director at that time, and the town of Slavutych had already been built.

He personally went to Armenia when its nuclear units had been shut down for good after the well-known events. The forest and trees were cut down, and the station was out of operation. Arrangements were made for him to go there together with A.A. Abagyan, and the Lord met with the Prime Minister of Armenia there, and talked to him, and, basically, to a certain extent, he also contributed to the continued operation of the station.

Corr. A question about his human qualities. Of course, you have already mentioned them - about the first meeting, about warm-heartedness. What other human traits of Lord Marshall can you name? Any interesting stories and examples that you can give?

KAA: He was no different from us there. I had met people of his standing before, but he was not bossy; he was wise and clever. His intellect showed in whatever we talked about. He had a great sense of humour. Once when we were at the Kola nuclear plant, they gave him tea but no spoon to stir sugar with. So instead of asking everyone for a spoon he just took his pen and stirred the sugar with it. His positive smile seemed to be there forever, even when he talked about serious things, or maybe it was just his natural look.

Also, he kept a particularly close eye on the Moscow Centre. Well, it was not exactly an oversight; it was more like particular care. And when we had difficulties with paying our fees, he always found a way to make up for them. Well, you have taken me with this question into such pleasant memories.

Corr: I'm very happy. Myself, I am pleased that they gave me this errand, because it is so interesting to go into all this. These are amazing people, their personal qualities and professional attributes. Another paradigm.

KAA: I have met people good through and through, and Lord Marshall is one of them.

Corr: Probably, you can remember some other story about Lord Marshall; something about his wife, did you have a chance to socialize with her?

KAA: Lady Marshall was not with him at official meetings only. At WANO, all Western experts normally came to the events with their spouses. And this, to an extent, translated to our directors who also began travelling with their wives who had special cultural programmes arranged for them. And that was no small feat. I had chances to converse with Lady Marshall because the Lord practically did not go anywhere without her. Amazing couple.

Corr: Tell us more about your visits to London, how Lord Marshall received you at his home, in an informal setting.

KAA: He was very hospitable. There was not a single case that he would not invite us to his house when we came to London. As it were, the atmosphere at his house on the bank of the River Thames was such that one felt at home. He had a study room, on the third floor, I think. And again, simple and plain; a conversation, with good whiskey that he knew a lot about. The feeling was that you were at a kinsman's.

LORD MARSHALL: DEEP INSIGHT AND PERSPECTIVE

/by Boris Yu. Prushinsky, first Director of WANO Moscow Centre/

In the autumn of 1988, I was assigned to organize the Moscow regional centre of the newly created organization - the World Association of Nuclear Operators.

As far as I know, one of the prime movers of the WANO creation was Lord Marshall (Marshall of Goring), a well-known person in Great Britain, a scientist who contributed much including the development of nuclear power in his country, who was once the minister in charge of energy sector.

The first documents I received - the structure of the future association, the draft of the Charter, the dates and the procedure of the inaugural meetings in all four proposed regional centres and the final inaugural meeting of the association as a whole - were signed by Lord Marshall. Thereafter, he provided his guidance or direct involvement in the process of creating the association, consultations and discussions of challenges. He was the real inspiration, the engine of all activities and emerging ideas. One can imagine how challenging it was to create an organization that would embrace representatives of countries from all the continents, with different mentalities and different social systems, uniting them with the same goals and vision of nuclear power. Exceptional friendliness in conversation, profound professionalism, and exuberant personality of this not-so-young and not-so-healthy man, who strongly believed in the prospect of close cooperation based on common approaches in such a complex industry, made it possible in the shortest possible time to create an organization, equivalents of which are still difficult to find in the world. It shouldn't be forgotten that the association was created at a time of deep distrust of the world community towards the nuclear energy after the Chernobyl accident.

Lord Marshall visited all the capitals and cities where regional centres were established, providing support in the solution of organizational, staffing, technical and logistics issues by his authority and positive mindset.

He first visited the Moscow regional centre in the first half of 1989 when it was only being established, with only five people involved. He left a

very good impression on us, the staff of the centre at the time. His questions, advice and expressions were professional and positive. He was friendly and open in conversation, and treated everyone on an equal footing, which was not quite in keeping with our ideas of English lords. I must say that later on, in all my meetings and conversations with him, he behaved as an equal among equals. Along with this, he was no stranger to subtle humour and informal meetings.

Because of the language barrier, we didn't have many detailed discussions, except to discuss matters concerning the association, which were discussed through an interpreter. However, during the discussions, he always exuded positive attitude, friendliness, deep insight into the challenges and the perspective.

To sum up, I always remember him with warmth and respect and retain the kindest of feelings.



*Lord Marshall and Boris Prushinsky at May 1989
WANO Inaugural Meeting in Moscow*

ABOUT LORD

/from a novel by Mikhail V. Chudakov, fourth Director of WANO Moscow Centre/

...Forecasting is always an unrewarding undertaking... A global forecast seldom comes true... So, it may well be that something even cooler than nuclear fission or thermonuclear fusion comes into being in the near future.

Lord Marshall, the founder of the World Association of Nuclear Operators, took advantage of the key attribute of the nuclear fuel – its energy independence and energy security when he got involved in a lengthy dispute with the rebellious trade unions of British coal miners. In fact, he was not a lord then; he was a mere CEGB Chairman under Margaret Thatcher's cabinet. The coal miners' trade union had always been immensely powerful, and for many decades, if not centuries, was able to bring the entire country to its knees just by its strikes. Nearly the entire Albion's energy sector rested upon coal, and all urban houses were heated by coal. Hence the infamous London smog. By the 1980s, another national energy crisis drew to a head in the country. The miners demanded yet again a substantial increase in salary and new social benefits for themselves, threatening otherwise to launch a general strike. However, the Iron Lady – Margaret Thatcher held office at that time, rather than some weaklings who had been at the helm before her. Her appointee CEGB Chairman Marshall suggested an aggressive action plan. It was time to do away with the centuries-old dependence on coal and with the brazenfaced blackmail of mining trade union mafia bosses.

Marshall kind of entered into lengthy negotiations with the rebellious coal miners, but in fact he was only trying to put off the strike for as long as possible to build maximum coal stock to fire coal power plants in the future.

He staked on a rapid development of nuclear energy rather than coal, and on nuclear fuel, its energy security and independence from everything – coal, oil, or gas. By that time, Marshall had found new offshore gas fields near the Albion, which he also began to intensively develop and build gas power plants with all his might. Urban heating also was converted to gas and electricity everywhere within the framework of a governmental programme.

Heart-to-heart conversations were held both with coal station personnel retrained for the new energy option, and with reasonable miners

themselves, by diverting them from anti-government coal movement as strike breakers. And this went on for several years. Time was on the government side. When the coal trade unions, having failed to strike any deal, finally went on strike in the mid-eighties, they did not achieve the expected result. The country had successfully put into operation several nuclear units and several gas-fired stations. Towns finally got rid of the age-old smog because they began to use pure gas for heating.

It was really an energy revolution. The British coal miners stayed on strike for a fairly long time – more than a year, and were actively supported by the Soviet Union. I even remember the slogans in my country: ‘hands off the English miner brethren’. But nothing helped them. And the strikebreaking movement had a hand in that. Conscientious (though completely lacking class conscience from the Soviet point of view) forward-minded miners and workers sided with the government and together with the police managed to defend their few mines from the attacks of aggressive striker champions. Many coal stations continued running successfully using the coal accumulated bit-by-bit during the long period of strike threats.

As a result, the entire centuries-old coal industry collapsed, burying the too intractable British coal mining trade unions under its rubble. The time of coal was gone. The miners underestimated the role and importance of atomic energy in today’s world. Left in the west along the M-4 highway leading to South Wales there are huge waste heaps from the former mining lands. And the CEBG Chairman Walter Marshall, having kept the country from having the lights off during this difficult time, received from Queen Elizabeth, at the request of the Prime Minister Margaret Thatcher, the Lord title, to become a ‘Sir’. That is, he got lifetime peerage practically for the wide deployment of peaceful atom in the British energy mix, proving yet again that no coal was wanted when nuclear fuel was at hand.

Regrettably, in many countries, the traditional coal industry is still a menace to a government, preventing it from taking radical steps to alter national energy balance. In the Republic of South Africa, for example, a few years ago, a powerful coal miners’ trade union even macheted several strike breakers in order to bring the rest of the dissenters back to the union’s mobster track, eventually preventing the country from actively deploying nuclear power. And South Africa is not the only one. There are many such examples across the world. This is precisely why nuclear energy needs committed

support from the government – needs its own Lord Marshalls and ‘Iron’ Thatchers.

I used to know Lord Marshall personally. I had the privilege of meeting and talking with him many times in the early 1990s, both in London and in Moscow that he periodically visited in his capacity as a Chairman of the Board of Governors of the World Association of Nuclear Plant Operators which he had created after the Chernobyl accident. In Moscow, the Lord caused much ado and turmoil among our international department staff responsible for meeting visitors. Until the very last minute, they were trying to figure out who, in fact, was coming to us (whether a lord or a marshal) and how (by what status and title) to address him. Lord Marshall himself was a very modest and very courageous man, as can be seen from his former activities as a senior states manager, as well as how he behaved in the last days of his life, knowing that he was dying from an incurable bone cancer, osteosarcoma.

I saw him a few days before he passed away, at a reception held in London on the occasion of a Japanese generating company opening a representative office. With his ailing right arm in a sling, he cheerfully, with a smile and wit, answered the Japanese chief of the representative office who asked him what was wrong with his arm: ‘I played too much tennis. It’ll be OK soon.’

Soon after that I attended his funeral at the Westminster Cathedral in London.



*Lady
Marshall,
Lord Marshall
and
Mikhail
Chudakov*

A MAN CONSIDERATE OF OTHERS

*/By Gennady A. Zvegintsev (at that time deputy director of Kursk NPP
who was directly involved in Lord Marshall's visit to the plant)/*

In the early 1990s during one of his visits to the WANO Moscow Centre Lord Marshall as the WANO Chairman visited Kursk NPP along with his wife to get familiar with the RBMK units.

One episode that stands out for me is related to our trip to the local apiary which was a part of the social programme.

It was a sunny summer day but despite the very hot weather Lord Marshall and his wife were dressed in a manner appropriate to a gentleman and a lady: classic and business-style clothing. The distinguished guests were travelling by a brand-new coach which contrary to all expectations broke down in the middle of our journey. It would seem that the high-ranking guest could hardly be used to such situations and irritation and even indignation on his part would be quite understandable. What a nuisance! However Lord Marshall took it in good spirits without a hint of displeasure he got off the coach and together with everyone he waited for a substitute vehicle in the shade of the roadside trees. He stayed positive and made a casual conversation and jokes without any focus on what had happened or a rebuke and shortly after that we were picked up by the standby coach.

Finally we arrived at the apiary in one of the villages near Kursk NPP where we were going to have honey tasting and lunch outdoors. There were no red carpets or lawns trimmed specially for this occasion! Vladimir I. Gusarov (the NPP director at that time) wanted to show the natural beauty of our area as it was: tall grass green trees flowers the scent of wild herbs and... the bees buzzing around (it was an apiary after all). Lord Marshall enthusiastically talked to people expressing his appreciation and gratitude tasted the honey and highly praised its quality and the beauty of the Russian countryside. Despite his high rank and title Lord Marshall turned out to be an unpretentious kind and very friendly person.

It is said that later in 1993 when delivering his report at the Tokyo BGM Lord Marshall pointed out the appropriate level of safety and the state of things at Kursk NPP.



Visit to Kursk NPP, Russia

PERSONAL CULTURE AND STRATEGIC VISION

/by Luis Soriano, WANO Paris Centre Director in 2022/

The Trillo nuclear power plant had been in commercial operation for less than two years. The General Manager of our Company called us for dinner at the employees' residence on Wednesday, March 28, 1990. We were about 10 guests, the first young managers of the new nuclear power plant. We were all looking forward, as he told us that he would come to visit us with no less than a lord and his wife. He was the founder of WANO, something still new to us. I can't forget when they walked in through the library door. Elegant is the word! Their appearance and manners were what corresponded to their title, but what struck us was that they treated us as if they had been invited to Buckingham Palace and not to a humble Residence in a village of 500 inhabitants. During dinner, his conversation and treatment was extremely kind and interesting, making us feel thankful for having the experience of meeting them. Lord Marshall of Goring was a person of strong British roots and traditions, coupled with a not-so-common sense of the importance of sharing everything and being united with all countries and cultures to achieve excellence in the safety of nuclear power plants. He made a short speech while we were having dessert, aided by some notes he had prepared. It was a gloss on the Tagus River, a small river that allows four nuclear power plants to be cooled in the centre of Spain. For the world, the best example of how to use the water he had ever known. I am still impressed after so many years by his culture, humanity, vision strategy and respect that day showed us.

ALCARRIA ALTA

NUMERO 91 - MAYO 1990



*El grupo de WANO en el Centro de
Información de la Central*

Delegación de WANO visita la Central de Trillo I

El presidente del Consejo de Administración, Lord Marshall of Goring, y distintos representantes de la Asociación de Explotadores de Centrales Nucleares (WANO) visitaron la Central de Trillo I el pasado 29 de marzo. También efectuaron sendas visitas, personal adscrito a la Dirección General de Aviación Civil y alumnos de sexto curso de la Escuela Superior de Ingenieros Industriales de Madrid.

Dentro del colectivo de visitas provinciales, caben destacar las efectuadas por el Gabinete Provincial del Instituto Nacional de Seguridad e Higiene en el Trabajo (INSALUD), la Asociación de Amas de Casa de Driebes y alumnos de los Colegios Públicos "San José" y "Pedro Sanz Vazquez", ambos de Guadalajara.

GRAVITAS

*/from email message to WANO Moscow Centre by Robert Gambrell,
WANO Atlanta Centre Director in 2022/*

While I never met him of course, I was able to contact several former INPO / WANO-AC staff who had met him but few could remember anything very specific. I was able to piece together the following recollections from those who had met him and remembered him.

They had several interactions with Lord Marshall over the years including during the preps for the Paris organizing meeting in October 1987 and the subsequent working group and steering committee (Lord Marshall chaired) meetings before the 1989 inaugural meeting in Moscow. Of course, there were also the more sporadic interactions during WANO governing board meetings through the 1993 BGM in Japan. By all observations he was an imposing figure, a top-notch scientist, and excellent speaker who brought credibility and gravitas in the early stages of WANO's history.



BGM 1993 in Tokyo



VII. A FEW WORDS ABOUT A LOT

ENTHUSIASM AND STORY-TELLING

*/by Frederic Pain, Information Systems, Security and General Services Director,
WANO Paris Centre, in 2022/*

I met Lord Marshall and his wife in 1995 during the BGM which was held in Paris.

Whoever knows why, being a young inexperienced lad, I was invited at his table during the dinner. What I can recall is that it was an excellent evening. Important to also mention Lady Marshall as they looked to be very close to each other. Lord Marshall was very accessible and both of them were of good company. He was such an enthusiastic person and an excellent story-teller. I remember his narrative on how he survived two plane crashes.

This my memories from 27 years ago.

HE CONVINCED EVERYONE

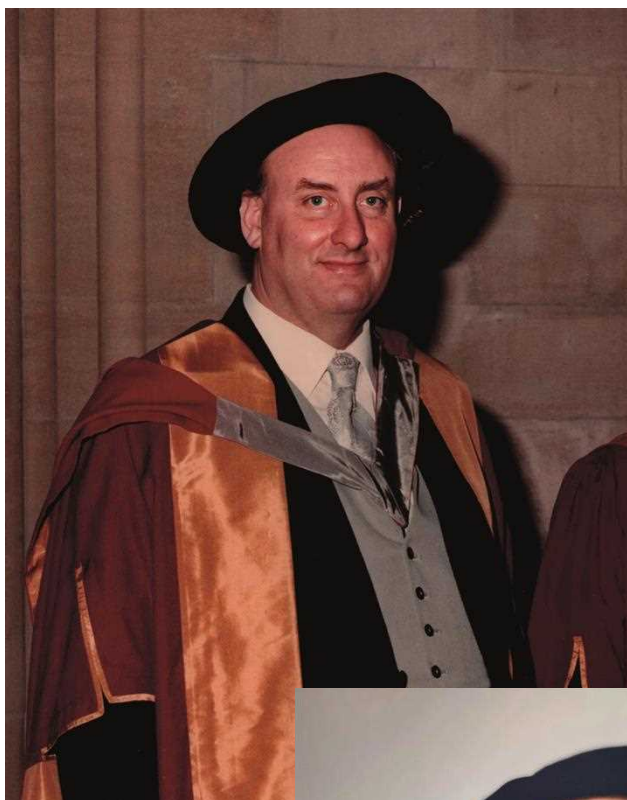
/by Farit Toukhvetov, second Director of WANO Moscow Centre/

Walter Marshall was the man who convinced everyone that nuclear power stations are part of a chain to launch a widespread shift in the use of operating experience across the globe.

At home among strangers, a stranger among his own...



Marshall of Goring at the House of Lords, 1985



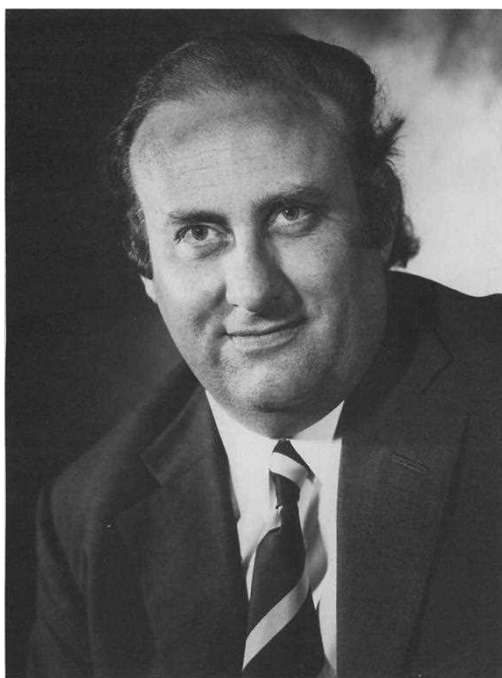
*Honorary DSc
at City University,
1982*



*Honorary DSc
at the University of Salford,
1977*

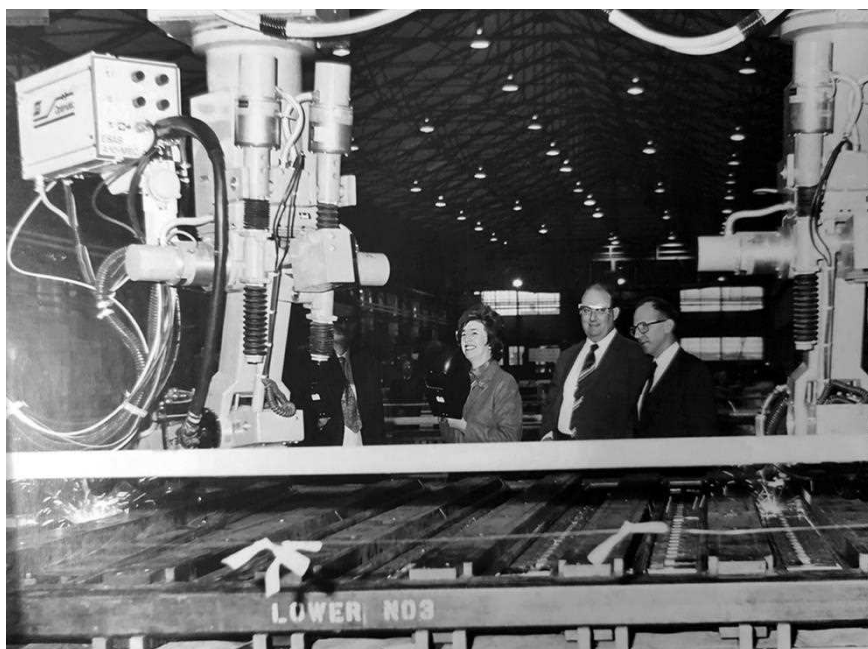


Seebord Electricity Council meeting, May 1984





Lord Marshall at Zaporizhzhya NPP



NEI visit, 1st October 1981, Robots Spacer, Welding, AGR Boiler



The Chairman of the CEBG visiting a coal mine



*Visit to Dinorwic hydroelectric power station under construction.
November, 1982*



*Mr. Gaishi Hiraiwa (TEPCO Chairman and President) and Lord Marshall, CEBG,
Sudbury House, London
18 October 1989*





The new Sir Walter and Lady Marshall at Buckingham Palace, 1982

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*We thank Victoria Marshal, Philip Cantelon, Royal Society and
all colleagues who provided materials for the Issue.*

*Sergey Kushnarev, Tatiana Prokhodtseva, Vera Lukyanova, Alexander Gridchin
worked on the book.*