Committee I
The Nuclear Option in the Past,
Present and in the Future

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DISCUSSANT RESPONSE

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to **S. P. Kapitza's**

LESSONS OF CHERNOBYL: PSYCHOLOGIOCAL AND SOCIAL ASPECTS

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Discussion By Edwin L. Zebroski

Lessons of Chernobyl - Psychological and Social Aspects
by S. P. Kapitza

First we must congratulate S. P. Kapitza for the unflinching directness of the important insights he gives to the most basic causes of the Chernobyl accident. The remarks on the value of the lessons of the accident for other countries are also very apt. There is a further implication that can be made make explicit - the lessons are not restricted to nuclear industry. Great disasters from other technologies have had roots that are remarkably similar to those of Chernobyl, even in very different societies. For example the advent of following generations of engineers, operators, and directors, commonly lower in skills and experience than the groups that pioneered the technologies, was a common feature of the accidents at Bhopal, the Challenger space shuttle accident, and the one at Three Mile Island (1), and in three further large catastrophes that have since been studied.

These accidents also shared the situation of gaps in communications -due to large organizational distances between decision-makers and those who had the most knowledge of the technology and the status of the operations. Prior to the accident. A number of other common attributes can easily be observed as preconditions to these and other major accidents. These observations give great force to the comment in S. Kapitza's paper; that given the human and cultural factors present, the Chernobyl accident was predestined- " with the fateful inevitability of a Greek tragedy."

I believe that the lesson of the crucial role of human factors, so clearly expressed by S. Kapitza, is an especially valuable insight for the CIS countries at this time. It offers the key to how to preserve at least part of the needed energy

resource of their remaining nuclear reactors. The dilemma of reactor safety versus energy needs was highlighted by the recent indecisive discussions of the group of seven western countries. To modernize CIS reactors to present Western safety standards would cost well over ten billion dollars in equipment changes, sums that are not forthcoming, or at least not soon. Yet the evaluation of risk calculations for the 26 seriously substandard and uncontained reactors - about five percent of the world's nuclear capacity in operation - is that their operation represents over 90% of the whole world's risk of another major nuclear accident. Some of these machines clearly should be shut down as soon as possible. Yet, where the shutting down of many of these reactors will result in intolerable local hardships, they are likely to remain operating for many years.

The key to the dilemma was was also expressed in a review of the situation made last year in connection with the Congress in honor of Andrei Sakharov, namely; the importance, the practicality, and the urgency for improving the human factor.(2) One of the very rich resources available in the former Soviet Union is large - and now underemployed - reservoir of highly educated and highly skilled technical manpower. Much of this human resource is in former military laboratories and institutes, now with marginal budgets. A determined action is needed by national leaders such as Boris Yeltsin to provide the conditions that would attract the most competent and dedicated people to manage and operate each reactor . This can make a greater and more immediate improvement in reducing the risk of major accidents than nearly all of the plausible hardware changes possible with limited financial resources.

The west has already contributed in making available the training, safety analysis and safety management methods. These are highly developed and documented, and already available in major institutes in most CIS countries that

have reactors. With proper leadership and motivation, I believe the CIS could rapidly create a technical elite and a viable safety culture for the support of civilian nuclear power that could soon be on a par with other major countries, including France. Many technical people served at Chernobyl as "liquidators" -the teams that helped in the initial cleanup and sarcaphagous-building work. They have been given priveledges as heros of the country. The mobilization of skilled technical people to supplement and strengthen the safety of CIS reactor operations also can be honored as heroic, since it helps to preserve the economic base of the CIS countries, while helping to protect against the threat of another disaster.

The stakes for this improvement are very high. Another major accident would very likely result in the further economic blows and the severe deprivation from the shutting down many more reactors in the CIS, including the more modern one that have full containments. Another major accident would also be another painful step to the inhibition or abandonment of nuclear power as an energy resource in other countries. This would raise the pressures on supply and prices of fossil fuel supplies, especially oil and gas.

Another unrecognized major asset is now available on the CIS countries. As S. Kapitza observes, the decline in the Soviet nuclear enterprise was in large part a by-product of the obsession for secrecy. With the Baruch plan, and the Eisenhower-backed "Atoms for Peace" initiative, western countries threw off most of the yoke of secrecy. After the accident at Three Mile ISland, another layer of secrecy, that is commercial secrecy, was stripped from most matters directly affecting safety. The current progress in Russia and the CIS countries of openness of discussion and publication, *glasnost,* is a vital resource for improvements in itself. Without exposure, irresponsible or merely incompetent management and

operation cannot be replaced or improved. Ideally the exposure arrives through regular audits by safety agencies. A free press, though always uncomfortable for the government, also can be an essential social force to help correct such situations. The advantages accruing from better education of journalists, and from giving them better access to all aspects of government and industry, is perhaps one of the greatest unrealized benefits still available to most countries. It is one important way to address the common complaint of the lack of understanding in the public, and the misinformation that is still common.

I hope to be permitted a somewhat personal comment. Soon after the Chernobyl accident I was asked to prepare a summary of the root causes of the accident - for possible lessons to be learned beyond those learned from our intense analyses of the accident at Three Mile Island. In addition to analysis of the technical factors, we had to derive the human and organizational factors largely from circumstantial evidence. The conclusions were later published (3), and were closely in accord with those in the paper under discussion. However, until now, many of these conclusions have been avoided or denied or avoided in the volume of publications from the former Soviet Union.

An important inference from S. Kapitza's paper is that an organization based on openness and meritocracy is essential for managing, designing, and operating large technical facilities safely, efficiently, and responsibly. I believe this is also a major part of the answer to the questions posed by the last page of S. Kapitza's paper -whether the social and psychological "software" can be made to keep up with the rapid pace of hardware developments. It is surely an essential part of the equation if any high technology is to serve faithfully -rather than to dictate to mankind. # # #

References

(1) Zebroski, E. "Sources of Common Cause Failures in Decision Making Involved in Man-Made Catastrophes;" *Advances in Risk Analysis,* Plenum Press, 1989.

(2) Birkhofer, A, Wilson R. , and Janouch, F. "Global Implications of the Chernobyl Disaster and the Future of Nuclear Power" ; *Report of the Andrey Sakharov Memorial Congress on "Peace, Progress, and Human Rights,* Moscow, May 1991.

(3) Zebroski, E. "The Chernobyl Accident (Technical and Institutional Features)" *Yearbook of Science and Technology,* McGraw Hill, 1988.