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

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LESSONS OF CHERNOBYL: PSYCHOLOGICAL AND SOCIAL ASPECTS

by

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Lessons of Chernobyl: Psychological and Social Aspects

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In the aftermath of the Chernobyl nuclear power station disaster most studies are concerned with the technical, radiological, environmental and medical consequences of that tragic event. However significant are these aspects one should also consider the broader social and psychological factors that contributed to the catastrophe. In a fundamental sense it is there that one should seek and study the reasons for this accident. Unfortunately in the vast literature devoted to Chernobyl (see, for example, the latest database on the biological and environmental aspects ChernoLit contains more than 4500 references [1]), these nontechnical issues have received little, if any attention.

In this paper an attempt is made to indicate some of the reasons why these seemingly subjective factors are so important.

In the first place right from the beginning the Soviet nuclear effort, aimed primarily at making the Bomb was carried out with great disregard for human life. Most, if not all of the construction work for the nuclear industry was conducted by slave labor of the GULAG. Often those who were engaged in building the most secret and sensitive "installations" as they were called in the newspeak of the industry were later sent to camps to be isolated for life, as witnessed by Sakharov in his Memoirs [2]. The industry was run by very determined and ruthless managers for whom human life and concern for moral values was not taken into account in so far as they did not serve their immediate task.

The whole system was obsessed with secrecy. Secrecy served two purposes. One, the obvious, was to conceal the effort from the enemy. The

other, the one usually not properly taken into account, was to control that most difficult and on the other hand indispensable element - the scientists and to a lesser extent the engineers that were the brains and hands of the whole project. Finally secrecy served the masters of the industry to safeguard them from all external criticism. Those who built the industry were definitely able, determined, even dedicated managers, real technical empire builders. For the political leader of the Project L.Beria, the head of the vast secret police and a criminally ruthless operator in pursuit of absolute might, the Bomb was the epitome of power he desired to control.

In spite of all this one is amazed at the efficiency and determination with which the first decade of the Soviet nuclear effort was concluded. By 1956 the industry was capable of developing and producing hydrogen bombs - bombs of unlimited power. The ultimate in weaponry was reached. At the same time a new departure was started to use nuclear power for the navy, submarines in the first place. Soon after the development of civilian nuclear power began.

It was then that a major nuclear disaster took place. In 1957 a storage facility for highly radioactive residues of the plutonium producing plant blew up. It was a chemical explosion, not nuclear, but as a result a huge amount of radioactivity was thrown into the atmosphere and a large area near Kyshtym, to the east of the Urals, was contaminated. Although known to many, the whole event was kept secret and only gradually the news spread out. If the consequences and all that happened then was widely known and studied, that experience of environmental contamination, however painful, would have been indispensable for Chernobyl [3].

At the same time following the great and initial success many of those who were instrumental in conceiving and making these weapons started gradually to leave the project. New manpower was invited, a new generation was initiated and indoctrinated, and perhaps it was then that a crucial change happened, for those who came were chosen not so much for their great scientific or technical excellence, but whose political loyalty was beyond doubt. This certainly led to a gradual degradation of the cultural, intellectual and professional level of the industry. Not perceptible in the beginning but on a long term basis, this attitude in the selecting, training and promoting personnel has led to the loss of excellence that characterized the industry in its initial stage [4].

To illustrate this point one of our high medical experts once remarked

that the number of radiation accidents that happened with the coming of this new generation was much greater than in the beginning [5]. The general and technical culture and intelligence, a prerequisite for safety was lacking in spite of all bureaucratic instructions conceivable - this in a nutshell indicates one of the main reasons of Chernobyl.

The safety of any hazardous enterprise, be it mountain climbing or nuclear engineering, driving a car or plane, operating a chemical plant and handling a ship at sea is ultimately determined by the human factor to a much greater extent than we usually think. At all stages we have to deal with the human attitude, right from the concept and design to the construction and running of the enterprise. In all developed technocratic systems it has been observed time and again, and this is not unique for the Soviet experience only, that highly centralized decision making, the removal and isolation of those who make decisions from those who have to carry them out becomes a crucial factor. One may think that in a system obsessed with secrecy, in a technical empire of vast dimensions in spite and perhaps just because of this evolution to stagnation and loss of standards are imminent. Innovation, questioning of authority, alternative routes and exploration of new departures are no longer possible just as competition is but rarely permitted. The masters of the industry, managers of insight and experience did understand these inherent limitations. Thus a new nuclear weapons laboratory now known as Cheliabinsk-70 was established in 1955 as a laboratory to compete with the first and most important research center at Arzamas, where all research that led to the initial success of the military effort was carried out. Characteristically this new center was nicknamed Egypt as opposed to Tel-Aviv as the Arzamas laboratory was colloquially known!

One should also take into account the way in which the next generations of scientists and engineers were trained. Most of them were recruited from the Moscow Institute for Engineering and Physics. Right from the beginning many of dubious ethnic origins were screened out, on a number of occasions just those students who were worrisome for the administration, who questioned all and everyone, lost their scholarships. Those socially precious individuals who by their very character could contribute to and creatively help to develop the industry further in favorable circumstances were ~~determined~~ eliminated

Promotion of trusted but mediocre personnel, right from the beginning "politically correct", more obedient and subservient than challenging and inventive certainly did a disservice to the industry and the country. How

a number of good, even excellent scientists, the most precious of all resources even in a country rich in talent were lost due to political reasons can be demonstrated by numerous case studies as proven by the future careers of these exceptional personalities. However instructive are the many personal cases, the general tendency in selecting and promoting personnel, both scientific and technical, is significant. In spite of all the vast numbers of highly trained and specialized experts in a compartmentalized and centrally controlled system one cannot expect innovation, not only enterprise to flourish. In such a system it is best to fail according to the rules than succeed by breaking them!

In the case of Chernobyl another fateful decision was made - to transfer nearly half of the operating nuclear power stations to the authority of the Electrical Power Ministry. Used to operate fuel burning or hydroelectric power stations this industry was not in any way prepared to handle matters nuclear. Perhaps here the lack not only of experience accumulated through the years in the nuclear industry but any real connections between the nuclear authority in operating reactors on submarines and in producing plutonium was never properly transferred to the civilian sector of the economy. Here the secrecy inherent right from the beginning in the whole system was the reason. For example, such watertight separation did not exist in the aircraft or the shipbuilding industry where expertise of the military and civilian sector did mix.

The oft quoted and well known description of the sequence of events at Chernobyl illustrates how every possible safety rule was broken in that ill conceived experiment. Apart from breaking all instructions and rules of the book a total lack of understanding of nuclear power reactor physics was shown by those concerned. Here again it is not the business of the writer to examine the factual and technical data. What is important is the general level of competence of those responsible, their scientific, technical and cultural background. For that we have to look at the state of educational standards of our engineering schools. Unfortunately, due to a long process of deterioration of intellectual standards the cultural standards of training were lost. The future students were never exposed to a broader intellectual and cultural environment, that really helps to enlarge one's outlook. Probably here the main reason is the separation of higher technical education in the Soviet Union from fundamental science. Basic scientific research was pursued, often with fine results mainly at the Academy of Sciences. But this high level of competence, at the seat of real scientific culture was not transferred not only to the universities and

even to a greater extent to the extensive system of technical institutes, engaged in training engineers.

We have to recognize that basic science is part of culture. This tradition did and still does exist in Russia. The separation of teaching and research, the compartmentalisation of society not only for demands of misguided secrecy, but for reasons of retaining control and preserving the power of the central authority did contribute to the general deterioration of the educational level of engineers, however good was on many occasions the training in their fields of respective specialization. Although it is very difficult to quantify or measure the importance of these factors, they were certainly present and did contribute to Chernobyl.

Next to the deficiencies in education one has to take into account the social prestige of an engineer in Soviet society. Unfortunately over the last decades it was getting lower and lower. Right from the salaries to the housing allocations, to the support of families, medical care and recreation the engineers were usually placed lower than the workers, whom they were meant to manage. For many decades the number of engineers produced in the country was impressively large, but the way they were employed, the overstaffing and loss of manpower and expertise was a permanent feature of our industry. Many engineers were forced to do routine jobs, really meant for technicians. Secretarial assistance and the technical facilities available for the engineering staff were absent or underdeveloped. In fact in the Soviet Union we had not managed to really produce an engineering elite, an upper class of highly placed, well paid and respected engineers, the backbone of any great industrial nation.

To this general state of affairs one has to add the separation of the Soviet system from the world, the lack of extensive and personal contacts with global scientific and technical experience. In spite of extensive training in languages and a well developed system of translating books and technical magazines into Russian the Soviet engineering corps did not have the international experience and level of communication that today is essential for all high technology. In other words Chernobyl may be seen as an inevitable result of the Soviet system, especially as it developed in its later decades of decadence, before its recent collapse and demise.

In describing and analyzing this fateful history of science and technology as practiced in Russia one may think that this experience with the break up of the Soviet Union may become alarming and even dangerous. Recently nuclear arms specialists from Russia were perceived to be a menace to world security without taking into account the personal

and professional issues of integrity involved.[6] With this in mind should new demands of social and professional responsibilities be set forth to be pronounced by a new, perhaps global ethic to whom all those concerned are to abide? To what extent is the modern world really ready for high technology, for the great concentration of power and resources, of which the nuclear industry is perhaps the most advanced? [7,8]

In this case the European experience is probably most important. For Europe culture still has a meaning and the educational standards and the standing of the engineering elite is probably greater than in the United States. It is here that the example of France, where 70% of all electric power is nuclear, becomes important in many ways. Right from the revolutionaly and Napoleonic tradition of Ecole Politechnique, that breeding ground for the high echelons of the French establishment one may see how an elite is set up. Significant is the way the French propagate science, as witnessed by La Villette.

To what extent is the world as a whole ready for nuclear energy? Do we really have to take the nuclear option or are all those who, for economic, environmental or even ethic reasons think otherwise, are right? For them Chernobyl is the ultimate proof. On the other hand this experience, as described above, indicates the broader premises of the whole issue, that goes to the very foundations of our modern civilization and involves factors social and human usually not taken into account in analyzing this problem, still dominated by technocracy.

For Russia and the states of the former Soviet Union the nuclear industry is of great immediate concern. As the result of Chernobyl no nuclear power stations have since been put into operation and many are to be phased out. How with the growing number of emerging sovereign and independent states can we even handle the existing facilities? Some power stations are in areas of regional conflict, as the two 440 MW reactors in Armenia. After Chernobyl and the Spitack earthquake that station was closed down, as it was considered too dangerous to operate in a seismically active area. Now, with an acute energy shortage strong demands are made to reopen it, but in that area an all out armed conflict is now raging. In fact just because of the war the Armenians want to restart the station as they are cut off from the gas and power supplies of Russia. In other areas ethnic strife is rising, rampant nationalism is leading to large scale reemigration of Russians, who are the more educated and technically able personnel of the industry. Can in this case the nuclear industry be transferred to the local operators and authorities or are all stations

to be run centrally? These issues are symptomatic of present conditions and may have in the short run a large and adverse effect of the nuclear power industry as it now stands. We should also note the recent decision that the local authorities will have the final say on building nuclear power stations.

On the other hand we have to look into long term strategic decisions, those that have been discussed in the beginning of the paper. Certainly the advent of glasnost, of a fundamental democratic opening up of all facets of our society, however difficult this dramatic experience may be, is most significant and promising. The country is now open to itself and to the world. This certainly should lead to and is a prerequisite of positive development in the future. But at the same time antitechnological, antiscientific and antiintellectual trends are manifest [9]. Are these trends transient and only symptomatic of the crisis through which the country and society are passing or are they of a more durable nature? Is society really rejecting science and reason? If so there is no hope and no sensible future.

Otherwise, difficult and all important decisions have to be made. From the point of view of the writer a great and fundamental investment and change has to be made in our University and higher technical educational institutions. This should have the greatest national priority. We have to dedicate ourselves to educate and train the next generation in such a way that it will be able to face the imminent problems emerging on our common horizon. A major reorientation of our research facilities has to be made, uniting science and teaching, using all of that fundamental scientific and cultural potential that still exists and is now so thoughtlessly squandered and scattered worldwide. These problems are of great national concern for what is at stake is the security and future of the country and that should be generally understood and appreciated.

Of utmost importance is also the necessity on a greater scale to educate and enlighten the public at large on matters scientific. The gap in understanding that now is widening, be it with the everyman and the legislator, becomes a real menace to progress. Both the public and the government get out of touch with the promise, challenge and demands of modern science and technology. On the other hand the scale of efforts, say, in developing new principles of producing thermonuclear energy demands from governments international cooperation and interdisciplinary cooperation from scientists. Environmental issues of nuclear power in handling hot waste are still not resolved and the public lack the proper

understanding and appreciation of these unavoidable problems.

To a certain extent the experience of the former Soviet Union is instructive for many countries and this experience should be studied by all concerned. Human history is marked by major events, mostly wars and revolutions in the past. In today's world, war the global conflict for which we were recklessly heading and for which the nuclear weaponry was designed is now receding, hopefully forever, but its legacy and connection to nuclear energy is with us.

Chernobyl reminded us what the world could face in an all out nuclear war, an ultimate global disaster. We have to reconsider not only the meaning of modern warfare in general but the limitations of nuclear might. That is why today we have to reexamine and reconsider the nuclear option of mankind. Only reluctantly changes, most necessary changes are happening. Testing is still going on, although nuclear arsenals are to be cut down by the USA and Russia. The proliferation of nuclear weapons has not been stopped or even abated. The nuclear power option is still undecided and huge vested interests dominate the discussion. As it has happened so often in the past our software, the social and psychological prerequisites for progress are far outstripped by the development of technology, of our hardware that tends to dictate, rather than serve us all.

In no field the disparity of social development and that of technical advances are so visible than in the nuclear field. The very magnitude of the nuclear forces, the concentration of vast energy in a small volume, be it that of the Bomb or a power reactor, the sheer scale of all these devices is such that our human experience is taxed to its extreme by this new incarnation of the myth of Prometheus.

In the case of Chernobyl we were heading for disaster with the fateful inevitability of a Greek tragedy, the final outcome of which was predestined to happen. Its roots lie deep in the social and conceptual fabric of our civilization. The message is both painful and instructive, but this signal has to be read by all concerned, for the imminent disparities of our world today are fraught with dangers if not disasters of tomorrow.

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