Discussant: Gernot Zippe Draft--15/08/92

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

I shall add a few arguments to the papers open for discussion, presented by:

Walter Binner, Nuclear Energy, Public Perception and Policy Decisions
Karel Wagner, An Overview of the Status and the Outlook of Nuclear Power Programs
Jack Hettema, Fear, Trust and the Future of Nuclear Power

Marcelo Alonso, Nuclear Proliferation: Past, Present and Future

As Walter Binner convincingly points out by statistics of the world population rate, one can see that the population growth-rate and the supply of energy per capita are correlated strongly.

High energy consumption correlates with a low excess of birth rate.
Low consumption of energy per capita correlates with a high excess of rates of birth.

In general: increasing consumption of energy correlates with a decreasing groth of population in industrialized countries. Because standard of living and well-beeing as well as adequate supply of food and other things of everydays life, depend on adequate and cheep supply of energy.

Free societies with a high living standard of the average population are in a position to take care of their fellow-citizens who are unable to take care of themselves. In these societies exists a governemental social security contract, enforced by low, between the working and money-earning part of the population on the one side and the other partners who need support, especially the elderly population in retirement and the young ones, the small children and the ones in the state of education.

As a consequence it is not necessary to have many children to be shure of support at the time of retirement or illness. In these societies it is even beneficial for a higher standard of living to limit the number of offsprings and to have only wish-children or no children at all.

In powerty-stricken countries with low living standards the population grows much faster. Especially in the underdeveloped countries such a social contract between young and old people on a governemental basis does not exist or is not reliable enough. Consequently: for a human life free from cares in case of illness or need, it is necessary to have many children for help.

In the past, well beeing and a comfortable life was possible only for a few privileged persons, havig a lot of slaves or serfs or servants working for them, whereas the underlings were kept like animals or even worse.

In modern industrialized societies serfdom is replaced by availability of energy for anybody. Modern technology provides appliancies for almost all pleasantness and comforts of everydays life. Never before our times existed the opportunity for an agreeable life for so many people as in our times.

But all these improvements on available resources and appliances have not been provided by nature itself. They are the result of a long and difficult development of the human race.

Nature itself provides living conditions only for a relatively small number of men, living as hunters and fruit-collectors.

The well-beeing of our times is the result of a long and difficult development of the human species. Power of invention and incuring of the responsibility are nowhere widespread in any country of the world. Experts and a scientific elite are no mass-ware. There are always only a few people who found a direction for their capabilities where improvements of the living standard are possible and who carry out such a project to the end. After a time of development and introduction of such achievements, the general public may use these improvements to improve the well-beeing created by experts.

But such elites cannot exist alone, they need the support of the general public where they come from. They need the supply of knowledge as a basis of improvement and the acceptance of their achievements.

There can be no improvement of the living conditions for a increased number of people, if they do not accept the progress. If the society is rejecting the advancing science and reason, there is no hope and no sensible future.

If we agree on the goal to provide a life in dignity and well-beeing for as many people as possible than we must find a way to keep the number of men in the limits of available resources. We must make use of the advancing science and technology for improving living conditions to an increasing number of persons living on earth.

By invention of suitable tools and later on by technological development, based on the discovery of more and more natural and cosmic laws, the living conditions on earth improved. The number of poeple increased dramatically in our times, regardless of the limited resources. Now we have reached the point that the number of the worlds population must be restricted and the available resources of life must be very carefully used and the wastes must be recycled.

As an experimental physicist I have tried to investigate natural laws by trial and error and then to use these laws in everydays life. First by building a prototype machine and later in industrial application. Nature was the unfailing example to be followed for success.

It was a shock to me to learn that nature provides no example in the animal world, how to restrict the birthrate of any species in line with the available resources. Each species tries to multiply the number of individuals as much and as fast as possible. There is no limit of reproduction. The number of living individuals is than reduced by the environment. The equilibrium is given by the resources of food and by serving as food for other species. It is up to the homo sapiens to find a human way for the necessary limitation of the worlds population. As Walter Binner has demonstrated, increasing the living standard by ample supply of energy seems to be a proven possibility.

Karel Wagner identifies the main cause of the Chernobyl desaster as a lack of "Safety Culture" in the former socialist states. I want to support this opinion on the basis of my own experience in the former Soviet Union.

Karel Wagner quotes the uncredibly careless behaviour by the operating personnel during the fatal experiment, as it was described in details at the International Andrey Sakharov Congress in Moskow, May 1991:

During this crucial experiment, safety rules and operational procedures were neglected by the operating personnel, safety devices were switched off.

Based on my own experience, I agree that this strange beheviour is built in the educational system of the former Soviet Union. The so called "Socialistic Competition" forced the workers to reach preplanned aims by any means, regardless of the consequences.

The risky design of the RBMK-type power station without a strong safety containment, which would never have been licenced in the Western world, is an other example for the reckless legislativ rules by the ommnipotent communist party.

Jack Hettema analyses the rational arguments and irrational fears, nuclear energy is faced: The future of nuclear power depends upon wether or not the public's confidence could be regained. To blame are the mass-media for misinformation of the public, creating fears and mistrust against new technologies.

He comes to the conclusion that nuclear energy production in a sufficient amount for world requirements must wait until the general education of the public has reached a level to be able to understand the problems and make the right judgements.

The evolution of the human brain in general is still not in pace with the tremendeous amount of knowledge and technological progress gained by mankind in the last centuries. We must press for better education in our schools according to the requirements of our times.

Differences of opinion should not divide. A discussion between educated persons exchanging arguments must not necessarily end in consensus. But it helps to sharpen the own ideas or to consider the ideas of the partner if these are the better ones. Regardlessly persist to it's own prejudice does not help.

For my opinion it is not the right way to ask uneducated people whether they accept ore refuse the progressing development achieved by experts. A general vote on everything without proper education to a minimum of knowledge of the problems concerned, leads to rejection of any progress. The number of uneducated people will always outnumber the ones who take the efforts to understand the problems.

To maintain the living standard in modern industrial societies we must have experts and specialists to deal with difficult technical problems, because it is impossible for everybody to be an expert on all things. Not everything possible should be selected for application. The allround view of other experts is required to choose between the technological achievements for the benefit of their citizens.

It is certainly right to ask for the opinion of all people concerned at a certain problem, but the decision what to do, must remain at the leaders selected by democratic general elections. Unfortunately they have to look for votes to be reelected and avoid unpopular decisions. This is a serious disadvantage in almost all western democracies. What would be necessary is an assembly of competent and free economists, scientists, technical experts and managers to make plans and decicions. For future application, they should select the best improvements, without exhausting the available resources and by reycling the wastes to be used again.

There is no good and evil in natural laws. There are proceedings where each cause is followed by certain results. The question about good or evil can only be answered if we also ask: for what or for whom is something good or evil.

Only a limited amount of natural laws is discovered so far. A single person is not in a position to know all of them. But no limit exists for mankind in further discovery. The more basic connection are known the better we can work in accordance with these laws.

If one does not have a target which he wants to attain, his question about causes and results of the events would be useless. If one has no knowledge about the basic connections he is not in a position to persue any aims, no matter how important and suitable these aims might be.

Only mankind is responsible for the scientific and technical development in the past and in the future. It is our duty to steer it in the right direction to improve the living conditions in accordance with the availability of the natural resources. Nobody else is doing it for us. If we do not persue the right way, nature will correct us by catastrophes.

All burning of carbohydrates like fossil fuel, wood, gas or like, is a source of carbondioxide and the global dramatic increase of temperature. A substantial reduction of the output of carbondioxide can be expected only, if nuclear energy is beeing used to meet the increasing need of energy. Until mankind will learn to use the pure solar radiation arriving on earth for energy-supply, only nuclear energy is able to supply the global need in the forseeable future. Whilst nuclear fusion has still a long way to go to be available for power stations, only nuclear fission can do the job without polluting the environment.

I can not agree with the argumentation of some opponents, to accept nuclear power stations for a limited time only. The known reserves of natural uranium would supply the world's energy requirements for about 100 years if solely the uranium isotope U235 will be used as nuclear fuel. Thorium and the technology of turning U238 by fast neutrons into fissile plutonium and to use it again as fuel in power stations, offers a possibility to stretch the time by about 50 fold. This means to be shure of clean supply of energy for about 5000 years.

I want to pass some remarks upon the paper given by Marcelo Alonso on Nuclear Proliferation: Past, Present and Future.

History is, as we all learnd at school, the succession of wars. The victorious population deprived the vanquished one of living space and other resources, to give more room and opportunities to the own population. As consequence, mankind took another direction of the evolution without any danger of extinction. The human race increased, filling all the niches on earth where life is possible. Together with the effectiveness of weaponry, the number of peoples killed in subsequent wars increased.

The availability of weapons for mass-destruction, especially nuclear bombs has changed the former situation. A nuclear war between East and West would probably have destroid almost any human life on earth. Despite of heavy tensions between capitalism and communism the problems between the systems have been endet without war. Each side was aware that a nuclear war would have no victors. Now we should take care to avoid further proliferation of atomic weapons.

But would it be right to destroy these weapons competely ? Is it not inevitable to have first a worldwide peace-keeping authority to prevent outbreaks of new wars which can be won again by one or the other side ? What happens if such an authority does not exist, is horribly demonstrated in former Yougoslavia and in other parts of the world.

Well beeing alone is no warrant for future existence. Many high cultured societies ceased to exist in the past. The Egypts, the Greecs, the Romans and many others were swept away by wild and barbaric folks.

In our times we have the chance to pave the way in the right direction by strenghtening the peace-keeping force of the United Nations. After ending the cold war and the confrontation between East and West, the opportunity to succeed is great and might never come again. As Marcelo Alonso points out in his excellent paper on Nuclear Proliferation: the responsibility for the future of the world is placed in the hands of a few leaders. Let us hope that the world leaders do not miss that chance.

Gas-centrifuges are mentioned as a tool for enriching the isotope U235 in the natural mixture of uranium. For nuclear fuel in power reactors it is enough to have an abundance-ratio of about 3 - 5 %, while about 90% are required for nuclear weapons.

Like almost any tool invented by mankind can be used for improving living conditions or to kill. Also gascentrifuges can be used to save enormous amounts of energy while producing fuel for power stations or to produce high enriched uranium for use in atomic bombs.

As a prisoner of war in the Soviet Union, I was a member of the team developing gascentrifuges for uranium enrichment from scratch. After nine years of development we transfered our laboratory equipment with subcritical and supercritical centrifuges to our excellent soviet coworkers. According to recent publications our centrifuge-design has been further developed und used for production of low and highly enriched uranium.

After a so called "cooling off" time and after the release from imprisonment, I got the consent of the soviet representative for atomic energy, to introduce our centrifuge-design into the Western world.

Compared with the method of gaseous diffusion for uranium-enrichment, these gas-centrifuges use only about 2 - 4 % of the energy, to produce the same amount of separative work.

The enormous amount of the energy saved by the gascentrifuges in Germany, England, the Nederlands, Japan and the former Soviet Union is about the same as the amount which is used by the automobile traffic on all weekends in Europe.

European industry had to work for about 25 years to get commercial enrichment facilities in reliable operation. It is no easy way to produce weapons-grade uranium by gas-centrifuges, especially not for countries without having the necessary industrial and scientific infrastructure.

I have done what I could do to restrict our centrifuge-design in the Western world for peacful use only. But it is clear to me that the strict surveillance of the United Nations International Atomic Energy Organisation is necessary to enforce the Atomic Weapons Non Proliferation Treaty and prevent further spread of nuclear weapons as well as the equipment capable of their production.