



DISCUSSANT RESPONSE

by

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to Karel Wagner's

NUCLEAR POWER AND THE WORLD IN TRANSITION

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Comment on "Nuclear Power And The World In Transition"

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Carefully going through the paper by Dr. Karel Wagner, titled "Nuclear Power And the World In Transition", I am of the opinion that the material quoted in the paper is realistic and of practical importance; the analyses are substantially persuasive. First of all, I should like to say that I fully agree with the most essential points of Pro. Wagner, and support the premise of the article. Meanwhile I would like to give some additional arguments in support of that premise.

Potential Role of Nuclear Power from the Viewpoint of Economy:

Up to the end of the year 1991, about 25 countries the world over had 422 nuclear power units with a total capacity of 327.5 GWe in operation. This means that one sixth of the world's total electricity was generated by nuclear plants. Meanwhile, 75 nuclear power units with a total capacity of 59 GWe were under construction in 17 countries.

However, the nuclear share in electricity generation varies greatly from country to country. In some countries nuclear power plants contribute 50% or even more of the total electricity generation. France always holds the top position, so far, with a nuclear share of even 70% or even higher.

It is obvious by now that nuclear power has won an indisputably important position especially in the regions where there is a shortage of other energy sources. It is proved that the world can never manage without nuclear power even now, to say nothing of the future.

First of all, nuclear power has its economic advantage of low cost. The cost of electricity either for nuclear power or for fossil-fuelled power plants depends on many factors and there is no univerrally acknowledged standard of determining the cost for nuclear or any other modes of electricity generation. However, according to the estimation by Agency of IACA, nuclear plants larger than 600 MWe in capacity are estimated to have substantially lower generation costs than oil-fired plants and to be economically competitive with coal-fired plants except in the

case of low coal prices, such as in areas of the USA and Canada where cheap coal is available to plants situated at the mouth of the pit. Many national and international studies of nuclear power cost have been made in addition to those of the Agency. Included in the studies made on the basis of sensitivity analyses is that in most parts of Europe, Japan, North America, China and India far away from coals mines, nuclear plants are much cheaper to run than coal-fired plants and the economic advantage of nuclear power there could still hold, even with the pessimistic assumptions of a 50% increase in nuclear capital costs, a two-to-three fold increase in nuclear fuel cycle costs, or operation of nuclear stations at or below a 50% load factor.

Recently published data from Japan show nuclear power generation to be far cheaper than any of the alternative.

In the United States, nuclear power does have a cost advantage in the South Atlantic regions where coal must be transported from far away places, while coal fired generation has an advantage in the central and north-central regions where large reserves of cheap minable coal exist.

It is estimated that the overall cost of the nuclear fuel cycle will remain relatively steady or increase very slowly over the long term, assuming the constant monetary values, while the cost of coal is expected to increase in real terms, owing primarily to market actions and also to the costs in opening new mines and handling more facilities to meet increased demands. Hence there is a strong probability of an increasing cost disadvantage of coal over nuclear fuel. Considering that the fuel accounts for more of the total generation cost of coal-fired plants than that of nuclear plants, the competitiveness of nuclear power is expected to improve as a result.

Acceptability And Necessity of Nuclear Power from the Viewpoint of Air Pollution

Another clear superiority is that nuclear power plants do not produce any CO₂ or other harmful gases in contrast with the coal-fired or oil-fired plants, which cause serious environmental pollution and green-house effect. Dr. Blix Hans, director general of IAEA said at an international conference not long ago in Lyons that the green house effect all over the world would lead to the revival of the nuclear power industry. That is why he firmly

believes that the world can not manage without nuclear power. He pointed out that in the United Kingdom, 70% of the total electricity generated came from coal-fired plants; while in France 70% of the total was generated by nuclear power plants. However, the carbon dioxide per KW.h exhausted to the air by Britain was ten times higher in quantity than that by France. Even in this case people would never forget the Chernobyl accident; but if international nuclear safety keeps a continuous good record, they would regard the accident as an exceptional incident.

Ethical and Sociological Context Of Nuclear Power from the Point of Safety and the Role of the IAEA

Dr. Karel Wagner stated in his article: The process of substitution of one energy source by another is typical and it repeats itself. At the early stage of nuclear power development, he pointed out, the advance of nuclear power was much quicker and what is more, due the concentrated efforts of scientists and engineers together with a strong desire for safety of the public, it proceeded with much smaller number of accidents and disaster than did any other types of energy. During the time of its development nuclear power was widely regarded as a "new, apparently non-exhaustible source of cheap energy." "..... the role of nuclear power in getting over the first oil crisis (1973-1974) was generally recognized. However, a similar response to the second oil crisis (1979-1980) did not come, certainly as a result of the Three Mile Island accident in March 1978."

This accident caused a number of responses contradictory in nature, such as: the public holding a negative attitude toward nuclear power; an urgent demand for an extensive revision of the approaches to nuclear power plant safety by professionals; these contributed to the enhancement of nuclear safety in conceptual designs, in quality in manufacture as well as in operational supervision, with a corresponding rise in price of nuclear electricity.

The Chernobyl accident in the fall 1986 caused some serious impact on the development of nuclear power. It reminded us for the first time that risks of even peaceful uses of nuclear energy are not only theoretical but also real ones. The important thing is why the Chernobyl accident happened in the former USSR, and can such kind of accident ever be avoided? Mr. Karel Wagner pointed

that the accident happened not because the Soviet scientists or designers were incompetent, but because of the influence of a non-democratic regime on the issues of reactor safety in the former Soviet Union and because of the lack of "safety culture" as a result of the general political and technological isolation policy imposed by the former regime.

Meanwhile, we can look at the fact that in several developed countries like France, Japan, the Republic of Korea, the UK, Canada, Belgium,....., they have strong and well established nuclear power and at the same time enough high availability factors and good records of nuclear power. These countries fully utilize their scientific and industrial potential to overcome the shortage of natural energy resources, taking also good care of the nuclear safety to win the support of the general public. France, taking the top position in the share of nuclear electricity generation, which has become a pride of the nation, has combined its scientific achievements with the open information policy and succeeded in winning broad public support. Japan, with a high population density and seismic activity, managed to build even more nuclear power plants. It is remarkable that the ratio of people accepting the utilization of nuclear power increased from 73% in 1989 to 79% in 1991, in spite of the fact that 60% of population understand the possible occurrence of serious accidents in nuclear power plants. In a word, experience and statistics of operating nuclear power plants show that the main factors influencing good performance are the following factors:

- the degree of standardization in plant design and construction
- the quality assurance standards used
- the regulatory climate
- the competence in operating organization

As we know, one objective of IAEA is to collect and disseminate information about how the good performance was achieved. As an inter-governmental organization, the Agency is empowered to recommend to national authorities steps which can be taken to improve the situation without sacrificing safety. At the same time, the IAEA plays a major role in promoting international cooperation and supervision and in providing expert advice on development programmes and research activities, training, documents and data.

China is a developing country; the Chinese people have the experience of getting help from IAEA and they have ambitious plans to build China into a scientifically and technologically modernized country. Now we have a policy of opening to all the countries worldwide and are always ready to learn all the advanced scientific and technological achievements from other countries. China is also a country which started on nuclear power with a certain delay and now is trying hard to reach an average level. By the end of 1991, the first home designed nuclear power plant with generation capacity of 300 MWe was put into operation in Zhejiang Province. Some of the key equipment like press containers are imported.

In the process of designing and constructing the plant China got much help from IAEA, and the authorities concerned took great care at the very start for the benefit of the vast majority of the people and paid great attention to the safety problem, putting the reactor under the supervision of IAEA. As a result of these efforts the specialists of IAEA gave a very good appraisal of the safety quality of the first Chinese-made nuclear power plant. The construction of the second 300 MWe nuclear power plant with an improved safety system will start building soon. Besides, another nuclear power plant with two sets of 900 MWe nuclear equipment imported from France is being constructed and will be put into operation one in 1992 and the other in 1993.

My supplementary conclusion is that in developing countries, if the authorities really take good care of the interests of the people and pay enough attention to the safety issue, they would definitely be able to ensure a favourable conditions for nuclear development.