per kilowatt hour. As Basov pointed out, these projected capital costs were of the same magnitude as those for fission fast breeder reactors.

The LTB-500 is a fusion-fission hybrid reactor. Three hundred tons of natural uranium is put in a blanket around the fusion reaction chamber. The fusion microexplosions produce neutrons which convert the natural uranium to plutonium which eventually undergoes fission reactions and thus greatly multiplies the total reactor energy output. Throughout the lifetime of the LTB-500 power plant, the rate of fusion microexplosions would be decreased as more and more fission fuel, and therefore fission reactions, are generated. Fifty percent of the natural uranium would be burned up after 30 years. The capital costs of the LTB-500 is 200 rubles per kilowatt of electricity, and it has a production cost of .9 kopecks per kilowatt hour.

Dr. Basov noted in conclusion that the cost of energy production could be dramatically decreased, even below present-day energy costs, through utilizing fusion hybrids to produce fuel for fast fission breeder reactors.

Nuclear Energy Essential

While every aspect of energy, from fossil fuels to even solar and geothermal power, was discussed in detail at the Ft. Lauderdale conference by the world's leading experts, the overwhelming conclusion of the participants was that existing nuclear power technology must be immediately increased; plutonium fuel recycling for increasing the amount of available fission fuel must proceed; the fission fast breeder must be brought on line as soon as possible; and fusion, both pure fusion and fusion-fission hybrid reactors, must be developed as rapidly as possible.

The detailed conference proceedings, which will be published in three months, provide a devastating demonstration of the idiocy of the Schlesinger energy plan. Nuclear power is safe, economic, and environmentally clean (in fact the carbon dioxide released from burning fossil fuels may already be laying the basis for a world-wide environmental disaster), the participants concluded. Proliferation of nuclear weapons — the tired saw put forward by the Administration to justify its anti-nuclear export policy — is a *political*, not technological question, the participants said, and the Carter Administration has already done more harm than good in this area. Projected uranium resources are definitely insufficient to meet world needs without the plutonium breeder and plutonium recycling — no other fuel cycle will work. Magnetic and laser fusion can confidently be projected to achieve power reactors. Whatever Carter and Schlesinger do, the participants concluded, Europe and Japan are going ahead with their nuclear power programs in any case.

Several score of leading representatives from U.S. industry were present at the conference (for example, the president of Jersey Central Power and Light, Phillips Petroleum, Exxon Nuclear Corp.), a half dozen congressmen, and many Nobel laureates. Organized by Dr. Behram Kursunoglu, director of the Center for Theoretical Studies, the conference was apparently, primarily, directed at long term organizing for a U.S. pro-nuclear energy policy.

A special scientific committee of the conference participants will shortly be issuing a major statement on the conference's findings. The members of the committee are Academican Nikolai G. Basov, Prof. Hans A. Bethe, Dr. Robert Hofstadter (chief scientist, KMS Fusion), Dr. Behram Kursunoglu, Ted Taylor, Edward Teller, Alvin Weinberg (former director of Oak Ridge Nat. Lab.), Eugene P. Wigner, W.B. Lewis (inventor of the Canadian Candu fission reactor), Pierre Zaleski (French nuclear energy attaché to the U.S. and former director of the French breeder program), E.L. Zebroski of the Electric Power Research Institute, and a Japanese representative.

Miami Conference: Fission-Fusion Technology Feasible, Necessary

The following is the text of the communiqué released by the International Scientific Forum on an Acceptable Nuclear Future on Nov. 11.

On the occasion of the International Scientific Forum on an Acceptable Nuclear Energy Future of the World, held at Fort Lauderdale, Florida From Nov. 7 through 11, 1977, and sponsored by the University of Miami's Center for Theoretical Studies, the undersigned have considered global energy requirements for the future and also world development to meet this demand. It was generally agreed that:

1. World demand for energy will increase strongly as the standard of living and the size of presently disadvantaged populations increase over the next several decades.

2. Failure to meet this demand will result in extensive social evil such as poverty, starvation, unrest, epidemics, riots, and wars.

3. No single technology can meet the world future demand. It is likely that all technologies, such as conventional fossil, nuclear fission, nuclear fusion, geothermal and solar technology will be required to meet the qualitative and quantitative aspects of this demand, just as today no single technology meets all demand.

4. Nuclear fission must play a significant role in meeting world demand over the next several decades, and over this period full exploitation cannot be foregone without excessive risk.

5. An assured nuclear fuel supply of utmost importance to many nations cannot be guaranteed by uranium mining alone. Although the urgency will vary from

country to country, in the application of nuclear fission energy fuel reprocessing is essential. Further, the best way to handle spent fuel and to take care of nuclear waste is to reprocess the spent fuel.

6. There are many candidate systems which may be called upon to supplement or eventually replace our presently largely light water reactor technology. These include fast breeder reactors, high temperature gas reactors, heavy water reactors and homogeneous reactors. Development of these systems should be pursued vigorously on an international basis, although not necessarily all systems in all countries.

7. Practical consideration of the ability to produce and deploy reactors in the numbers necessary dictates that currently successful systems be sustained and their installation encouraged by governments until and unless advanced systems are fully available and acceptable, technically, economically and industrially.

8. The plutonium-uranium fuel cycle has particular advantages in fast spectrum reactors and the uranium-233 thorium fuel cycle in thermal reactors. Both will need to be developed, including all necessary steps for full implementation.

9. Impressive progress has been achieved towards proving the scientific feasibility of fusion systems based on the principles of magnetic and inertial confinement. Progress has been made also in hybrid systems which suggest, on a longer timescale, economic feasibility. Development of these systems, already involving a considerable degree of international cooperation, should be pursued vigorously on this basis, again, not all systems in all countries. However, the possible successful development of fusion technology should not delay the prudent and necessary deployment of fission technology. It is possible that the first application of fusion technology will be in a hybrid fission-fusion complex.

10. It is recognized that the deployment of fission power or hybrid fusion-fission on a large scale poses problems of safeguard of material against potential diversion and, thus, proliferation of nuclear weapons. We are confident that the international community can and should take the political, institutional and technical measures which will be effective in diminishing the risk of proliferation while retaining the economic advantages of nuclear power. Therefore, we do not believe the risk of proliferation should deter the use of nuclear energy.

11. The probability that accidents in existing reactors will cause harm is acceptably small and we believe, with proper use of experience, that this will diminish even as the number of reactors increases.

12. Solar energy may have a part in the mixed energy system of the future. The extent of its penetration will depend largely on economic considerations. It is difficult to determine finally what these economic parameters will be without practical experience on a substantial scale; at present, the parameters appear to be adverse.

13. Meeting the energy demand of the still rapidly rising world population with legitimate expectations of a higher standard of living calls for largescale mobilization of labor, materials, capital, and technical and managerial skills. It should be governments' constant preoccupation to accomplish this economically and effectively to avoid overtaking the world's productive capabilities and resources of these necessities.

14. There is an urgency to the world energy problem which, especially in view of the long lead-times, brooks no delay in determining and executing national programs and in seeking international cooperation to take up the tasks and share the benefits equally.

Signatories

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Eugene P. Wigner, Princeton University
Pierre Zaleski, nuclear attache, French Embassy, Washington, D.C.
Edwin Zebroski, Electric Power Research Institute, Palo Alto, Calif.

Soviet Scientist: If We Coordinate Efforts, Fusion Can Be Achieved

Following are excerpts from the presentation of Nikolai G. Basov, of the P.N. Lebedev Physical Institute, USSR Academy of Sciences, Moscow, to the Nov. 7 to 11 meeting of nuclear scientists and industry representatives organized by the University of Miami Center for Theoretical Studies and held in Fort Lauderdale, Fla.

It is a great pleasure for me to give a talk at such a representative forum of scientists. I would like to speak about physical investigations which have been underway at the Lebedev Physical Institute since 1962. This direction in laser physics is developing at the present time in many laboratories, and it has now become one of the most popular and active fields of physics, which can be considered as one of the serious directions in solving the energy problem. I am speaking about laser induced fusion. We consider the task of this talk solved, if the participants of the present meeting could see not only our results and conclusions and one of the possible ways of solving the energy problem, but at the same time the vital necessity to concentrate the efforts of scientists and to coordinate the investigations in this field on a larger scale than we have now.

The principle of energy production in laser induced fusion is as follows. The pellet containing thermonuclear fuel is irradiated spherically by the laser light. Laser radiation absorbed by the pellet heats the target, and the outer part of the target, a so-called "corona," expands in the direction of the laser beams. Due to the law of con-