FUSION ENERGY FOUNDATION

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INDIA 1985-1995:

STRATEGY FOR ECONOMIC BREAK-OUT

Sponsored by Fusion Asia

April 9-10, 1985

India International Centre
Lodi Estate
New Delhi, India

April 9

Welcoming Address by K.K. Modi, chairman, Modi Industries

I. Development of the Ganges River Valley

A program for turning this great river valley into a breadbasket that could feed all of Asia, a project to be carried out in cooperation with Nepal and Bangladesh.

Speakers:
J. T. Paniker, head of the Civil Engineering Department of Indian Institute for Technology, Bombay
Ramtanu Maitra, editor Fusion Asia
Dr. Mahfuzul Haq, former energy consultant to President Zia Rahman, Bangladesh

II. India's Trade: Look East

With its traditional orientation toward the Middle East and the West, there is a great potential for India trade with Asia yet to be realized. This panel focuses on India's potential role in the East, especially in conjunction with the construction of the Kra Canal in Thailand.

Speakers:
Panel chairman: Zimay Barat-Ram, Barat-Ram Industries
S. A. Dave, executive director of the Industrial Development Bank of India, Bombay
R. K. Hazari, former deputy governor, India Reserve Bank
Uwe Henke v. Parpart, director of research, Fusion Energy Foundation
K. L. Dalal, ambassador of India, retired
Dr. Norio Yamamoto, executive director, Mitsubishi Research Institute
Pongpol Adireksarn, member of Parliament, Chat Thai party Bangkok

April 10

III. High-Technology Requirements: Lasers and Nuclear Power

To realize the government's goal of bringing India into the 21st century requires a concentration on nuclear power plant production and the use of lasers for creating a modern machine-tool industry.

Speakers:
D. K. Ghosh, head of laser division, Indian Institute for Technology, Bombay
Dr. N. Tata Rao, chairman, Andhra Pradesh State Electricity Board
Mr. S. G. Ramachandra, consultant, Bangalore

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Fusion Energy Foundation

Biological Sciences Seminars

ALL SEMINARS 8 PM, 15th FLOOR, 231 WEST 29th STREET

April 1	Biogeochemistry: The Evolution of the Earth Eric Lerner
April 8	The Origin of Life: Order and the Macrocolecules Carol Cleary
April 15	Evolution: Darwin vs Negentropy Dr. Richard Pollack
April 22	Genetics: Development vs Mutation Dr. Eugene Inch
April 29	Neurophysiology: The Transfinite in Biology Dr. Ned Rosinsky
May 6	Neurophysiology: The Chemistry of Mind Paul Schwartz
May 13	The History of Medicine: Avicenna to Harvey Richard Welch
May 20	Agricultural Science for Development Ruth Plant

FOUNDING CONFERENCE
Biological Sciences Section of the
FUSION ENERGY FOUNDATION
May 14

FOR FURTHER INFORMATION CALL: 563-8648 or 563-8645

FUSION ENERGY FOUNDATION EVENTS

JANUARY TO MARCH, 1977

Jan. 11 Harley Schlanger (U.S. Labor Party)
"The Need for a 20% Annual Growth Rate for the United States"
Testimony before the North Carolina State Utilities Commission.
Prepared by F.E.F.; testimony covered by the Charlotte Observer and the Ashville Citizen.

Jan. 23 New Jersey Fusion Energy Foundation Conference
Speakers: Dr. Steven Bardwell (F.E.F.); Jon Gilbertson (F.E.F.); and Eric Lerner (F.E.F.)
Attended by 50 people including a representative from a fusion company and an official of the State Employees Association.

Feb. 1 Patricia Dolbeare (U.S. Labor Party)
Testimony before the State Energy Commission on U.S. Labor Party-proposed fusion legislation
Sacramento, California
Testimony prepared by F.E.F.

Feb. 2 Cal Larson (agricultural engineer - F.E.F.)
Jon Pike (U.S. Labor Party Oakland Mayoral candidate)
Testimony before the East Bay Municipal Utilities District; prepared by F.E.F.
"Solutions to the Drought"

Feb. 8 Dr. Steven Bardwell (F.E.F.)
"Energy Policy for the United States"
Pennsylvania State University
Sponsored by the Department of Nuclear Engineering; attended by 70 students and faculty members.

Feb. 9 Dr. Morris Levitt (Director of F.E.F.)
"Energy Development Policy"
Occidental College, Los Angeles, California
Sponsored by the physics department.

Three Rivers Coalition for Science and Industry
Speakers: Dr. Steven Bardwell (F.E.F.); John Bradley (former Republican candidate for Congress, Allegnany County); Scott Brody (U.S. Labor Party)
Attended by 45 workers, students and professionals.

Dr. Steven Bardwell (F.E.F.)
Plasma Physics Seminar
University of Pittsburgh
Sponsored by the Plasma Physics Department

Feb. 9 Jon Gilbertson (F.E.F.)
"The Great Plutonium Hoax"
Yale University, Hartford, Connecticut
Sponsored by F.E.F. and the U.S. Labor Party; attended by 35 students.

Feb. 10 Jon Gilbertson (F.E.F.)
"The Great Plutonium Hoax"
University of Hartford
Sponsored by the Department of Mechanical Engineering

Dr. Morris Levitt (F.E.F.)
"Fusion Energy Development"
Cal Poly-Technical School
Pomona, California
Sponsored by the Plasma Physics Department; attended by 200 students.

Dr. Steven Bardwell (F.E.F.)
"An Energy Policy for the United States"
Case Western Reserve, Cleveland, Ohio
Sponsored by the Physics Department; attended by 15 students and faculty and by representatives from General Electric and Westinghouse.

Paul Gallagher (F.E.F.)
Rockland Town Meeting
"Energy Policy"
Rockland Power Company Auditorium, Rockland, N.Y.

Feb. 11 Dr. Steven Bardwell (F.E.F.)
"Energy Policy for the United States"
University of Michigan, Ann Arbor, Michigan
Sponsored by the U.S. Labor Party and the University Activities Committee; attended by 30 students.

Feb. 12 Dr. Steven Bardwell
Forum on Fusion Energy
Toledo, Ohio
Attended by representatives from Toledo Edison and Owens-Illinois, and a dozen others.

Feb. 13 Dr. Steven Bardwell (F.E.F.)
Forum sponsored by the U.S. Labor Party
Detroit, Michigan
Attended by 100 including a representative from Detroit Edison.

Dr. Morris Levitt (F.E.F.)
Reception, Santa Clara, California
Sponsored by the U.S. Labor Party; attended by 35 people.

Feb. 14 Dr. Steven Bardwell (F.E.F.)
"U.S. Energy Policy"
Grand Valley State College, Grand Rapids, Michigan
Sponsored by the Grand Valley Student Senate and the U.S. Labor Party; attended by 20 students.

Feb. 14 Dr. Steven Bardwell (F.E.F.)
"An Energy Policy for the United States"
Michigan State University, Lansing, Michigan
Sponsored by Dr. Bruce Wilkinson of the Chemistry Department and by F.E.F.; attended by 110 students and faculty, and by lobbyists for the Michigan Farm Bureau and the Michigan Bankers Association.

Dr. Morris Levitt (F.E.F.)
"Fusion Energy Development"
Featured Speaker, The Comstock Club
Sacramento, California
Attended by 400 businessmen and others.

Feb. 15 Dr. Steven Bardwell (F.E.F.)
"Energy Policy for North America"
Carleton University, Ottowa, Canada
Sponsored by the Physics Department; attended by 40 people, mainly faculty.

Feb. 16 Dr. Steven Bardwell (F.E.F.)
Speaker, Vanier College, Montreal, Canada
Attended by 50 students.

Dr. Robert Moon (Professor-at-Large, University of Chicago, and F.E.F.), debating the Solar Energy Club
"Fusion or Solar: Which Way for the Future?"
Circle Campus, University of Illinois, Chicago, Illinois
Sponsored by the F.E.F. and the Solar Club; attended by 60 people.

Dr. Steven Bardwell (F.E.F.)
"An Energy Policy for North America"
Varennes Institute, Montreal, Canada

Elijah Boyd, on behalf of the F.E.F.
Laser demonstration for five classes.
Syosset High School, Long Island, N.Y.

Feb. 17 Uwe Parpart (F.E.F.)
"An Energy Policy for North America", Colloqium
University of Montreal
Attended by 20 students and faculty.

Jon Gilbertson (F.E.F.)
"The Plutonium Economy"
Sponsored by Vanier College, Montreal, Canada; attended by 20 people.

Jon Gilbertson (F.E.F.)
"The Plutonium Economy"
John Abbott College, Montreal vicinity, Canada
Sponsored by the Science Department; attended by 40 people.

Jon Gilbertson (F.E.F.)
"Nuclear Power and the Environment"
McGill University, Montreal, Canada
Sponsored by the Physics Department; attended by 20 people.

Feb. 18 Dr. Steven Bardwell (F.E.F.)
"Nonlinear Behavior of Plasmas"
University of Montreal, Montreal, Canada
Sponsored by the Plasma Physics Department

Jon Gilbertson (F.E.F.)
"High Technology: The Real Solution to Environmental Problems"
Sponsored by Dawson College, Montreal, Canada

Dr. Morris Levitt (F.E.F.)
Speaker, Annual State Convention of California Municipal Utilities Association
California

Feb. 19 Canadian Conference on Fusion Energy and World Development
University of Montreal, Montreal, Canada
Speakers: Dr. Steven Bardwell (F.E.F.); Uwe Parpart (F.E.F.); Jon Gilbertson (F.E.F.); Kushro Ghandi (U.S. Labor Party)
Co-sponsored by F.E.F. and the University of Montreal; attended by 50 people.

Linda Bankes (F.E.F.
"New Energy Sources"
Testimony before the House-Senate Joint Committee on Energy
Massachusetts State Legislature

Feb. 21 Dr. Morris Levitt (F.E.F.)
"A New Energy Policy for the United States"
College of Energy, University of Colorado, Boulder, Colorado
Sponsored by the Association of Engineering Students; attended by 15 students.

Feb. 23 Dr. Gene Inch (F.E.F.) debating Prof. Bettelheim
"The Real Solution to Environmental Problems"
Adelphi University, Long Island, N.Y.
Attended by 18 people.

Feb. 24 Ned Rosinsky (F.E.F.)
Speaker, Swarthmore College, Swarthmore Pennsylvania
Attended by 14 science students and faculty.

Nick Benton, for the U.S. Labor Party and F.E.F.
Spokesman on Panel on "The International Politics of Nuclear Energy"
American Association of Science Convention
Denver, Colorado

Feb. 26 Graham Lowery (U.S. Labor Party)
Testimony before the House-Senate Joint Committee on Energy
Massachusetts State Legislature
Testimony prepared by the F.E.F.

Feb. 28 Buffalo Conference on Energy Development
Speakers: George Vossler (Vice-Chairman of the Erie County Conservative Party) on "The Use of Coal in Expansion of Economic Growth"
Charles Stevens (F.E.F.) on "Fusion Energy Development"
Attended by representatives from corporations including a coal company and a nuclear waste systems processing company, the head of the N.Y. State N.AA.C.P., the Army Corps of Engineers, and others.

March 1 Lawrence Sherman (U.S. Labor Party)
Testimony before the House-Senate Joint Committee on Energy
Massachusetts State Legislature
Testimony prepared by F.E.F.

March 2 Baltimore Fusion Energy Foundation Conference
Speakers: Dr. Steven Bardwell (F.E.F); Dr. Robert Mason (Energy Research and Development Agency-E.R.D.A.); Jon Gilbertson (F.E.F.) Uwe Parpart (F.E.F.)
Co-sponsored by the F.E.F. and by Harrison Associates, an architectural firm; attended by 60 people including representatives from the I.E.E.E., Baltimore Gas and Electric, the Japanese Embassy, several Engineering firms, the Greater Salisbury Committee, a computer firm, students, and professors.
Covered in major news media.

March 4 Bergen County Town Meeting
Charles Stevens (F.E.F.)
Hackensack, N.J.
Attended by 20 people including the aide of a U.S. Congressman on the Science and Technology Committee, students, workers and others.

March 6 Morris County Town Meeting
Speakers: N.J. State Senator James Vreeland (Rep. - Morris County); and Jon Gilbertson (F.E.F.)
Parsippany, N.J.
Attended by 40 people, including engineers, workers and the aide to a Congresswoman; covered in the Morristown Record.

March 8 Dr. Steven Bardwell (F.E.F.)
Speaker, Hudson Valley Community College, N.Y.
Sponsored by the Hudson Valley College Community Center; attended by 120 people.

George Gelier
Testimony prepared by F.E.F. given before the House-Senate Joint Committee on Energy
Massachusetts State Legislature

Bruce Wood
Testimony prepared by F.E.F. given before the Nuclear Regulatory Agency at hearings on the Marble Hills Nuclear Plant
Madison, Indiana

March 8 Eric Lerner (F.E.F.)
Speaker, Adelphi University, Long Island, N.Y.
Physics Department Colloquium

Jon Gilbertson (F.E.F.)
"High Technology: The Real Solution to Environmental Problems"
Colloquium on Nuclear Energy
Stoneybrook, State University of New York

March 9 Fusion Energy Foundation Conference
Rennselear Polytechnical Institute
Troy, New York
Speakers: Charles Stevens (F.E.F.); Eric Lerner (F.E.F.);
Elijan Boyd (U.S. Labor Party)
Sponsored by F.E.F. and the Plasma Physics Department

Jon Gilbertson (F.E.F.)
Briefing to the Committee on Mines and Energy for the
State Legislature of Pennsylvania

March 10 Dr. Morris Levitt (F.E.F.)
"A New Energy Policy for the United States"
University of Miami, Oxford, Ohio
Co-sponsored by F.E.F. and the University of Miami Marxist
Forum; attended by 150 students and faculty.

Dr. Morris Levitt (F.E.F.)
Forum, Ohio State University
Attended by a dozen people including a representative from
the Southwestern Ohio American Nuclear Society

Dr. Morris Levitt (F.E.F.)
Legislative briefing
House of Representatives, Columbus, Ohio
Sponsored by Ohio State Rep. Robert Netzley; attended by
six representatives, and an Ohio gas company and manufacturers
association.

March 11 Town Meeting, Cincinatti, Ohio
Speakers: Dr. Morris Levitt (F.E.F.); Bob Carter (Greater
Hamilton County Republican Club); and a nuclear engineer
from Cincinatti Gas and Electric
Attended by 20 workers, engineers, and members of the
Republican and Labor Parties.

Richard Lebove
"Proposals for Nuclear and Coal Energy Development"
Testimony prepared by F.E.F. given before the Illinois Energy
Resources Commission

March 14 Jon Gilbertson (F.E.F.)
Testimony on behalf of L.I.T.E. (Laborers, Ironworkers,
Teamsters and Operating Engineers)
"High Technology as the Real Solution to Air Pollution"
State of Connecticut Hearing on the Clean Air Act
Hartford, Connecticut

March 15 Scott Elliott
Testimony prepared by F.E.F. given before the House Economic Development Committee
Michigan State Legislature
Lansing, Michigan
"Fusion Legislation"

March 16 Charles Stevens (F.E.F.)
"Fusion Energy", Seminar
Amherst College, Amherst, Massachusetts
Sponsored by the Physics Department

Charles Stevens (F.E.F.)
"Fusion Energy" , Seminar
Mt. Holyoke College, Mt. Holyoke, Massachusetts

March 17 Charles Stevens (F.E.F.)
Testimony on Fusion Energy
Environmental Matters Committee, Maryland State Legislature
Annapolis, Maryland

Harley Schlanger, speaking for the U.S. Labor Party and F.E.F.
"Energy and the Environment: The Future" - panel discussion
Duke University
Durham, North Carolina

March 19 Robert Bowen (F.E.F.)
"Why Fusion Energy is the Solution to the Energy Crisis"
Democratic Club of Edison, New Jersey
Attended by 30 Democrats, businessmen and others.

FUSION
MAGAZINE OF THE FUSION ENERGY FOUNDATION
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FUSION ENERGY FOUNDATION: NEWS RELEASE
FOR RELEASE: FEBRUARY 22, 1980

F.E.F. RECEIVES FREEDOMS FOUNDATION AWARD FOR "HARRISBURG HOAX" SERIES DEFENDING NUCLEAR POWER

The Fusion Energy Foundation and Fusion magazine received today the George Washington Honor Medal of the Freedoms Foundation of Valley Forge, in recognition of Fusion's 1979 "Harrisburg Hoax" series exposing the national hoax perpetrated by anti-nuclear agencies and the press after the Three-Mile-Island incident, and the probable sabotage of the plant on which it was based, as a politically motivated attempt to rob the nation of the core of its scientific and economic strength.

This landmark award for rallying forces in defense of nuclear science in America was one of two recent developments establishing Fusion as America's most authoritative source of scientific journalism on the crucial issue of nuclear power. The other is the wide acceptance of Fusion's January 1980 "Energy Scorecard for the 1980 Presidential Candidates" as the only complete and accurate survey of the major Republican and Democratic candidates' stands on the energy policy issue. Twelve candidates responded to the survey, and three--Lyndon LaRouche, John Connally, and Robert Dole--have recommended it to their campaign staffs as a reference source for voters, as have several technology magazines and regional newspapers.

Accepting the Freedoms Foundation award, F.E.F. Director Dr. Morris Levitt stated, "We are proud of this recognition of the principle of scientific journalism--that of creating a constituency for the truth, no matter who is claiming a "consensus" for fear and backwardness. Since Three Mile Island Fusion's uncompromising pro-nuclear stand has brought it a four-fold increase in circulation to over 100,000. The United States citizenry is becoming more actively pro-nuclear even as the nation's nuclear power and scientific capacities are threatened with politically motivated destruction by an anti-progress minority. We offer our capabilities as the best weapon for the forces who want to defend the nation and the progress of science."

Dr. Levitt announced that the April 1980 issue of Fusion will feature the hardhitting "Three Mile Island One Year Later" by nuclear engineer Jon Gilbertson, chief investigator for the Independent Commission of Inquiry on Three Mile Island and primary author of the "Harrisburg Hoax" series.

Reprints Available

The Fusion Energy Foundation is making reprints in bulk of the "Harrisburg Hoax" series and the "Energy Scorecard" to pro-nuclear and scientific groups and publications. For details and costs, contact F.E.F. at (212)265-3749.

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PRESS RELEASE

FEF HOLDS SEMINAR ON PROGRAM FOR MEXICAN DEVELOPMENT

MEXICO CITY, Feb. 23-- The Fusion Energy Foundation and the Mexican Association of Fusion Energy presented a 20-year integrated program for the development of Mexico's industry, energy, and agriculture at a two-day seminar here Feb. 19-20 attended by 120 government officials, economists from the public and private sectors, and university and industry representatives. Titled "Energy and the Economy: Mexico in the Year 2000," the seminar featured the application of the LaRouche-Riemann econometric model, developed by the FEF, to the Mexican economy.

"Mexico can and must grow at rates several points higher even than the current 7 to 8 percent growth, and to do this it must export oil beyond the recently set ceiling of 1.5 million barrels a day," concluded Fusion Energy Foundation research director Uwe Parpart. Parpart and the FEF's Dr. Steven Bardwell, who have led the development of the econometric model, opened the first day's program with a detailed explanation of the LaRouche-Riemann model and its applications to the Mexican economy.

Without an enhanced "oil for technology" trade outlook, the country would not be able to import sufficient capital goods for nuclear energy, transport, mechanized agriculture, and heavy industry to overcome severe economic bottlenecks, Parpart and Bardwell showed.

Also speaking the first day was Dr. Fernando Rozensweig, director of industrial port development of the Office of Special Development Projects of the Presidency, who outlined Mexico's city-building program for a series of giant industrial ports

MORE

built over the next 20 years, and Ing. Narciso Lozano of the Industry Ministry (Sepafin), who reported on the progress of industrial development in the first two years of Mexico's National Industrial Development Plan.

On the second day of the seminar, three senior staff members of the Mexican Association of Fusion Energy, Cecilia Soto de Estevez, Patricio Estevez, and Dr. Luis Abreu presented in detail the joint FEF-AMEF program for Mexican development.

Attending the seminar were representatives of eight government ministries, three state agencies, several government and private think tanks, and banks and industries. The seminar was held at the Mexican Petroleum Institute, which sent a large delegation to the meeting.

Parpart, who called the seminar "the most successful of this kind in my experience," was widely quoted in the Mexican press, which highlighted his call for a major nuclear energy program as the vital next step after Mexico's successful oil development project.

The FEF-AMEF program for Mexico will be available in the June issue of the Spanish-language magazine Fusion as well as in a separate special report. Also available are articles on how the LaRouche-Riemann model works and an FEF 40-year program for industrializing India that uses the LaRouche-Riemann model.

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PRESS RELEASE

350 Pay Tribute to Fusion Program Leader

Three hundred and fifty fusion supporters paid tribute to Dr. Melvin Gottlieb's leadership of the U.S. fusion program at a banquet sponsored by the Fusion Energy Foundation Feb. 6 at New York's Hotel Biltmore. Dr. Gottlieb recently retired as the director of the Princeton Plasma Physics Laboratory in New Jersey, the nation's pace-setting tokamak fusion program. The TFTR tokamak, now in construction at the Princeton laboratory, is expected to go well beyond breakeven in achieving fusion energy conditions.

In a wide-ranging discussion with the press preceding the banquet, Dr. Gottlieb assessed the U.S. fusion program and the international fusion effort and talked about his 25 years in fusion research. "Fusion is achievable. I feel sure that it is achievable," Dr. Gottlieb said. "Ten or fifteen years ago, fusion energy seemed almost impossible. We were frustrated. But then everything started to work, probably because of better control of the technology, at the same time that we got better control over the physical ideas."

On hand at the banquet to recount Dr. Gottlieb's pioneer role in the history of the fusion program were three generations of fusion scientists--including Dr. Gottlieb's college physics teacher, Dr. Robert Moon, professor emeritus of physics at the University of Chicago, and one of Dr. Gottlieb's former graduate students, Dr. William Ellis, director of the Mirror Systems Division at the Department of Energy Office of Fusion Energy.

Other speakers were Leonard F.C. Reichle, executive vice president of Ebasco Services, Inc., the

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engineering firm that is constructing the TFTR tokamak at Princeton, and Boris Kouvshinnikov, the representative in New York of the director general of the International Atomic Energy Agency. Reichle made the surprise announcement that Ebasco had just established a $10,000 scholarship in Dr. Gottlieb's name at the Polytechnic Institute of New York.

Dr. Morris Levitt, executive director of the Fusion Energy Foundation and master of ceremonies at the banquet, also read several messages from well-wishers who were unable to attend-- New Jersey congressmen and legislators, former representative Mike McCormack, and several leading scientists, including the heads of three fusion programs at national laboratories.

Speaking at the event, Dr. Gottlieb called the Magnetic Fusion Energy Engineering Act of 1980 "the turning point in the history of fusion. At last fusion is recognized as something with real promise-- an energy option instead of just a research program." Dr. Gottlieb also noted that "the FEF did a simply magnificent job providing support to get Congress to act to pass the fusion legislation. The Fusion Energy Foundation has provided real leadership in educating the public, Congress, and scientists in other disciplines about fusion," Dr. Gottlieb said.

-30-

Transcripts of Dr. Gottlieb's press conference remarks are available upon request.

Fusion Energy Foundation

Testimony on Nuclear Siting and Licensing Bill

Testimony before the House of Representatives, Committee on the Interior and Insular Affairs, of the United States Congress on the "Nuclear Siting and Licensing Act of 1978" on June 13, 1978 by the Fusion Energy Foundation, New York, N.Y.

We would like to begin by pointing out that any competent discussion of this bill necessarily requires a consideration of United States energy policy. Therefore, we are introducing a brief discussion of energy policy at the beginning of our testimony, and this will be followed by a specific discussion of the proposed legislation in terms of how it either meets or fails to meet the requirements for U.S. energy development.

The only way that the proposed "Nuclear Siting and Licensing Act" can be competently judged is to determine how well it supports and assists in the rapid implementation of a progrowth U.S. energy policy. Assuming that we all agree that energy growth and economic growth are interdependent and that we won't have a growing economy unless our production of energy is growing, the question becomes, "What defines a growth-oriented energy policy?"

This can be determined by considering three criteria which enable us to define in detail the inter-relation between economics and energy: quantity of energy, energy density, and the capability for developing superseding energy technologies. If these three criteria are not simultaneously met when comparing different energy resources or combinations of energy resources, the United States will not have an adequate energy program.

First of all, the quantity of energy resource must be large enough so the cost is low and so that we are not in immediate danger of exhausting supplies. Secondly, the density of that energy resource when converted to useful energy, that is, heat or electricity, must be high in order to keep it concentrated, thus minimizing the capital cost of conversion equipment. Finally, in satisfying the third criteria, supersession of technologies, the current energy resource technologies must allow the progress to some new technology and mode of production of energy that makes the finitude of the former resource irrelevant. If you have an energy policy that does not address the question of its own supersession, you do *not* have an energy policy.

As the Fusion Energy Foundation has thoroughly documented elsewhere, nuclear energy is the only source that meets all three criteria. Now and for the near term, fission energy is the most abundant and dense source and provides us with the technological basis for advancing to fusion-fission hybrid reactors and eventually to pure fusion energy systems. Current light water reactors produce power cheaper than any other source and have already paved the way for the development of more advanced fission systems such as the more efficient and economic fast breeder reactors and high temperature gas-cooled reactors. The future new nuclear energy sources of fusion energy and a combination of fusion-fission energy will begin to satisfy these three basic criteria by the turn of the century.

No other energy sources or combinations of energy sources will work. Granted, fossil fuel in the form of coal, gas, and oil will be very important for the next quarter century or so, but they are now limited in quantity, not as dense as nuclear power and are already becoming very expensive. Furthermore, they should be preserved for more productive and efficient uses in petrochemicals, synthetics, and steel.

The much touted solar energy does not even begin to meet the last two criteria and therefore is not capable of playing a significant role in U.S. or world energy production. Energy densities of solar power are so low that the capital cost of collector and conversion systems are prohibitive for most applications. Compared to solar power, energy densities of fossil and nuclear power are 100,000 to 1,000,000 times greater, therefore, greatly reducing capital costs. Secondly, solar power does not provide a technological basis for advancing to a future energy resource. The remainder of the soft technology alternatives of wind, tides, geothermal, biomass, etc. do not meet *any* of the three criteria and therefore are insignificant energy resources in *any* overall energy program.

Nuclear energy is therefore the only policy that makes any economic sense for the nation and is the only way out of the economic disaster we are now facing. This proposed legislation must be judged on how well it promotes and assists this energy policy. In that light, there are several positive features of the bill that tend towards *decreasing* nuclear plant construction time. However, other sections of the bill introduce clauses which will negate any of these positive features with the probable result that the bill will do more harm than good.

Addressing those positive features first, we find the early site selection and site "banking" features of the bill admirable provisions and believe they will in fact reduce construction time. Furthermore, the emphasis on standardized plant design, which has been the established design philosophy of all reactor vendors for several years now, is a good feature. This means once the standardized plant has been licensed somewhere in the United States, it only has to go through "relicensing" for design changes or specific site differences. A complete license procedure is not necessary again. This again should save construction time. Also, the combined construction permit and operating license is a positive feature of the bill and should lead to shortened times between beginning of construction and plant operation.

Along with these positive features, the Fusion Energy Foundation would also like to see introduced in this bill an emphasis on the mass production of nuclear power plants and their major components. The floating nuclear power plant concept goes a long way towards meeting these goals and reactor vendors should be encouraged to proceed along these lines. Such mass production techniques can reduce construction times by one to three years.

Now, on the negative side, there are four major features that will make all of the above gains *impossible* to achieve. These are 1) the transfer of environmental statement approval from the federal agencies to states; 2) the requirement for consideration of alternative energy sources including conservation; 3) the subsidizing of intervenors in nuclear licensing and rule-making hearing and 4) making the public hearings and decision making process even more open to harassment and delays by intervenors. All of these "new" features will, without exception, cause further delays in nuclear plant construction and allow the intervenors to continue the obstruction of new plant construction.

Most, if not all of the above four features, have been recently judged by the United States Supreme Court to be in contradiction with the correct interpretation of the National Environmental Policy Act (NEPA) and should be taken out of this proposed legislation on that basis alone. In that decision, the Supreme Court in the *Consumers Power* case made clear that NEPA was meant to *uphold a pro-growth energy policy for the United States* rather than prevent it. The legal and constitutional issues involved will not be discussed in this testimony since we know they are going to be addressed by other concerned groups during these hearings.

However, the four cited features to this bill should be thus removed because they will prevent the U.S. from attaining its essential and necessary energy and economic growth. Forcing a consideration of conservation and other soft technology energy alternatives in lieu of fossil or nuclear power is incompetent and contrary to the necessary U.S. energy policy defined earlier.

Increasing states' authority in nuclear matters is a dangerous abdication of the Federal Government's responsibility for determining and carrying out U.S. energy policy. Finally, doing anything to further assist irresponsible intervenors and fringe groups in achieving their goals of sabotaging nuclear power and other pro-growth U.S. policies is simply intolerable. Far too much destruction has already been waged by such groups. It's now time to *stop* it rather than to *promote more* of it.

In closing, it is important to point out that contrary to popular belief, the environmentalists' no-growth position has very little support in this country or in any other country. Remember that each time an anti-nuclear referendum was put on the ballot in states throughout the United States, it was thoroughly and soundly defeated. This was not just a vote for nuclear power, it was a vote *for* a policy of energy and economic growth — a policy which has historically formed the basis of this country. Making sure that this proposed legislation is changed so it will support such "American" energy policies will not only get plants built here, but it will also help our nuclear exports. Plant standardization, reduced construction time, and mass production techniques will certainly improve our international sales and trade prospects.

In a republic such as the United States, a small minority does not have the right to jeopardize the well-being of the United States as a viable nation. The economic and strategic consequences of the United States *not* having a growth-oriented energy policy are already only too obvious. It is the responsibility of Congress to see that this *is not* the case. A good place to start is with this bill, modified to include the changes recommended here by the Fusion Energy Foundation.

Continuing to give credibility to zero growth advocates and policies which should have *no credibility* will, at best, result in legislation such as this proposed bill which represents a dangerous compromise between zero growth and pro-growth policies. What is needed is a bill that supports the laudible pro-growth features and strikes out the bad compromises. Such a revised bill will start us on the way to developing and producing adequate energy resources for our future with highly efficient, mass production techniques associated with the integrated agri-industrial processes — the Nuplex Process — already on the drawing boards. Such a bill will initiate the process of letting us pass into the next century with the unlimited resource of fusion energy a reality.

FUSION ENERGY FOUNDATION

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TESTIMONY OF DR. MORRIS LEVITT

EXECUTIVE DIRECTOR
FUSION ENERGY FOUNDATION

Democratic Party Platform Hearings on
Energy Policy

Columbus, Ohio
May 8, 1980

AN ENERGY POLICY TO RESTORE AMERICAN PROSPERITY

I will present today a summary of a study of U.S. energy policy completed recently by the staff of the Fusion Energy Foundation. Some of the more technical results from recent studies are also appended to this summary report.

Despite widespread and growing confusion and misinformation on the subject of energy policy, it is now possible and indeed, necessary, to scientifically specify the parameters of an energy policy that would restore American prosperity. An energy policy that works properly must consider a number of important criteria at the same time, including these considerations:

(1) How much energy does the world need over the next several decades to overcome political instability and to avoid economic stagnation or collapse?

(2) What rate of energy growth and what mix of energy sources in the U.S. can meet these needs, and at the same time optimize the growth of the nation's standard of living and the economy's productivity over this period?

(3) What are the capital and manpower requirements to implement the optimal policy?

(4) Will the wrong type of energy policy contribute to a devastating economic depression and loss of U.S. military strategic capabilities?

We answer these questions in the order they were posed.

(1) World energy needs. The present rate of world population growth indicates that today's population of 4 billion will grow to 6 billion by the end of the century. There is a well demonstrated relationship between per capita energy use and the standard of living (Figure 1). In order to break the cycle of underdevelopment and create growing export markets for U.S. technology, world energy use must be increased by a factor of about 3.3 between now and the turn of the century. This would bring living standards globally up to the present level of semiskilled workers in Western Europe.

Contrary to the zero-growth policies of the Club of Rome, the various United Nations agencies, and our domestic Malthusians, unless we do this we will not get the U.S. economy and that of the world moving out of depression conditions. Moreover, as many world statesmen have warned, we will be creating more Khomeinis, as well as the serious dangers of depopulation, pandemics, and war. As Pope Paul VI put it in his famous 1967 encyclical Populorum Progressio, the "new name for peace is development." And development can occur only by significantly increasing energy use. Any claim to the contrary, as we show, is either totally incompetent or a deliberate fraud.

(2) How much and what kind of energy? With a steady policy commitment and several years of hardwork, we can produce the energy we will need. In overall terms, we need a world growth rate of about 6% a year, consisting of a 10% growth rate in the developing sector and a rather modest 4% yearly growth rate in the U.S. and other advanced sector nations (Figures 2 and 3).

To do this economically and efficiently, there must be a small growth in oil and gas use, a modest increase in coal, and the highest rate of increase in nuclear power production. This means building hundreds of new nuclear plants by the year 2000. Coal use, it should be stressed, must involve the development of two advanced technologies, magnetohydrodynamic (MHD) conversion to electricity and gasification through nuclear heat, both of which will vastly increase the efficiency of our coal resources without producing unwanted effluents. The net result, in addition to the required growth of energy, will be a reduction of the fossil fuel component of the total energy production from its present value of 90% down to 50%, and an increase in the size of the nuclear component from several percent to about 35%. This is perfectly feasible with existing reserves and currently existing technologies. It is also consistent with the present policies of such industrial nations as France, West Germany and the Soviet Union.

This policy would have two other dramatic benefits in addition to meeting our gross energy needs. First, the U.S. could, within a few years, export $100 billion a year in nuclear technology. This would boost all productive sectors of the economy, turning critical Third World areas such as India into growing markets for our agricultural and industrial technology.

Second, the development of advanced nuclear technology - including fuel reprocessing and waste storage, breeder reactors, high-temperature gas reactors, and fusion power - all of which must be pursued with the most aggressive possible research and development program, will solve all our energy needs for the foreseeable future. All these technologies are under rapid development in Western Europe, the Soviet Union, and Japan. We must remove all obstacles to restoring U.S. leadership in all these programs and reverse the present policy of phasing out breeder and high-temperature gas reactor (HTGR) development.

Most important, the Democratic Party should wholeheartedly endorse and support the legislation introduced by Democratic Congressman Mike McCormack (HR 6308) for an Apollo-style research and development program to build a demonstration fusion reactor within this century. The push now to commercialize advanced technologies is essential to create new energy resources. It is only with high-temperature nuclear reactors, fission and fusion, that we can open the door to economical production of hydrogen as a gaseous and liquid fuel to free remaining gas and oil for use as petrochemical feedstocks. (This policy objective, by the way, was reemphasized by the French government after a recent tour of U.S. laboratories by president Giscard's personal representative.) Furthermore, the development of fusion will lead to the "plasma torch" method of cheaply extracting all needed raw materials from any type of ore. For example, one cubic mile of the earth's crust contains more than a year's supply of all presently used elements. Best of all, hydrogen production and fusion power will both use as their primary raw material our most unlimited resource - water.

(3) Capital and manpower. This energy program requires modern industries, and millions of new scientists, engineers, and skilled workers - exactly what the country needs to get out of the present combination of inflation and unemployment. Hundreds of billions of Eurodollars and petrodollars could become available for investment in the U.S. if such a program is undertaken in collaboration with our allies in Western Europe and Japan, as well as the forces in OPEC that want to industrialize the developing sector.

(4) What's the alternative? The various proposed low growth and zero-growth alternatives - in any combination - won't work. Reliance on conservation (a nice word for austerity), synthetic fuels, solar,

and biomass will lead to further economic deterioration and then collapse. How fast such a collapse would occur can be seen in Figure 3, which is derived from the world's most advanced economic computer model, the Riemann-LaRouche model. The graphs show how the relative amount of reinvestible surplus in the economy changes with time. Under the FEF's proposed program, that critical variable - surplus - takes off into an economic boom situation within a few years. The alternative leads to collapse. The reason for the difference is basically that conservation, synfuels, and "soft" technology are too costly and inefficient to permit capital formation sufficient to increase the productivity and profitability in basic industries.

The notion promoted by the Joint Economic Committee of Congress and certain thinktanks at universities like Harvard and Princeton that the economy can grow while energy is cut back is a lie. It totally ignores the fact that in such an economy - like the U.S. economy today - not even the replacement costs are being met; in other words, when energy use is cut back plant and equipment are becoming obsolete, capital formation and skilled labor are diminishing, productivity is declining, the standard of living is plummeting, and so on.

The Riemann-LaRouche model shows clearly that these combined effects quickly gut the economy. To avoid this gutting an increase in the energy flux density and the free energy in the economy to create growing values of surplus and productivity is required. For this reason we can demonstrate that a nuclear-based energy policy leads to prosperity, security, and assured resources (within the context of associated policies of creating a gold-backed monetary system and providing ample, cheap credit to industry and agriculture). The nonnuclear option leads to economic collapse.

If the Democratic Party wishes to represent the national interest - in behalf of technology-proud farmers, labor, minorities, entrepreneurial businessmen, scientists, professionals, engineers, and, indeed, the nation's posterity as a whole - then it must reject the austerity schemes of the zero-growthers and anti-nuclear Malthusians. Instead, the Democratic Party must come out squarely for progress through nuclear based energy and economic growth.

Figure 1
GNP and Energy Consumption
Per Capita Comparisons

	GNP per capita (U.S. dollars)	Energy (kg coal equivalent/capita
United States	4040	10,331
France	2340	3,282
Federal Republic of Germany	2085	4,484
Japan	1155	2,515
Soviet Union	970	4,058
Mexico	528	1,064
Brazil	309	450
Korea	162	579
Egypt	160	301
India	90	183

Computed from 1968 figures.

Figure 2A
Energy Growth for American Prosperity

	1978	1990	2000
Nuclear	3.0	33.9	64.8
Coal	14.9	24.0	29.6
Natural Gas	20.0	20.4	21.3 ~~29.6~~
Petroleum	36.1	45.6	40.7
Synthetic Fuels	0.0	2.4	18.5
Other	3.0	6.0	9.2
Total	77.0	120.0	185.0

Energy Consumption, Current and Projected by Energy Source. Amounts are in Quads.

Figure 2B
Energy Consumption, Current and Projected
by Major Sector

	1978	1990	2000
Electricity Production	21.6	48 ~~120~~.0	92.5 ~~185~~.0
Residential & Commercial	14.8	17.0	18.5
Industrial*	14.6	27.0	42.3
Transportation	20.5	28.0	31.7

*An additional 5.5 Quads of energy used in 1978 appears as fuels consumed primarily for feedstocks. In projections for later years, this category is absorbed as industrial energy use.

Figure 3
Projected World Energy Usage

	1980		2000		
	Gross	Per Capita	Gross	Per Capita	% Growth
Developed	9.5	9.0	21.0	18.0	4.0
Underdeveloped	2.0	0.7	17.0	4.7	10.7
Total	11.5	3.0	38.0		6.0

Gross figures in billions of tons of coal equivalent.
Per capita figures in tons of coal equivalent.

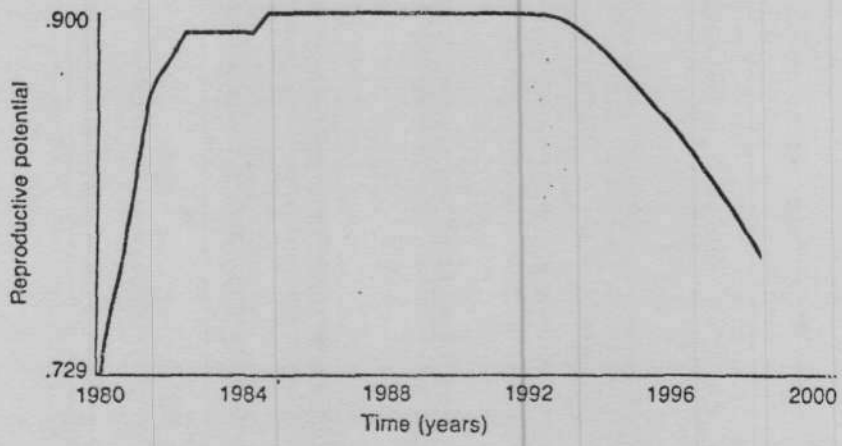

Figure 4A
THE REPRODUCTIVE POTENTIAL FOR THE U.S. ECONOMY UNDER A TYPICAL SOFT ENERGY PLAN (SOLAR)
This model used an optimistic set of figures for availability and cost of solar energy for centralized power production.

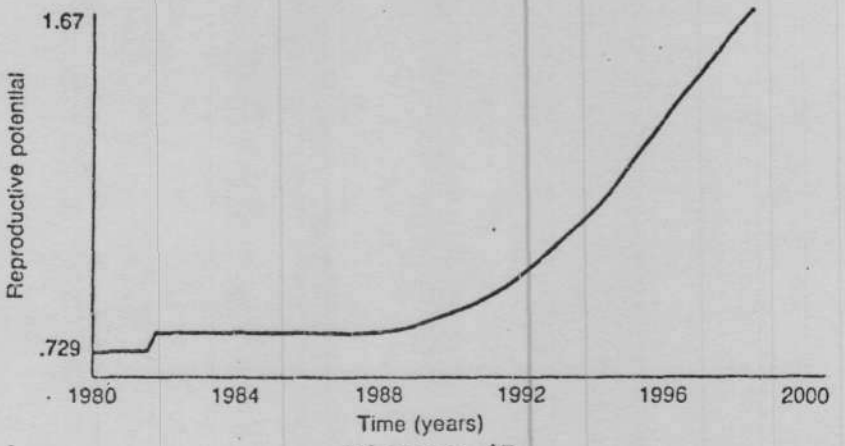

Figure 4B
THE REPRODUCTIVE POTENTIAL FOR THE U.S. ECONOMY UNDER AN AGGRESSIVE NUCLEAR ENERGY PLAN

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Statement of

Dr. Morris Levitt

Executive Director

Fusion Energy Foundation

for the

Buchsbaum Committee Review of the

Magnetic Fusion Program

May 23, 1980

Fusion research is one of the most amazing success stories of the 1970s. It has been our privilege in the Fusion Energy Foundation to help report and promote that story. Our latest reviews of the status of the program are attached for your reference.

The question before us today is what policy will best achieve the goal of the most rapid possible development of economical fusion power.

Our objective is twofold: first, to achieve the maximum possible gains with the present program; and second, to create the conditions for the expanded program we will need later in the 1980s. As committee members are well aware, there are two problems in achieving such a policy: the present budgetary restrictions and the existence of some uncertainties about ultimate reactor parameters and economics. Concretely, these problems translate into the specific question of whether or not to go ahead now with the planning and construction of an engineering test facility (ETF). For reasons I shall develop here, we at the Fusion Energy Foundation answer this question with a resounding "Yes, the ETF should be built now!"

First, a word on the FEF. We are the largest organization in the U.S. concerned with fusion power and its scientific, technological, and economic dimensions. The FEF itself has more that 5,000 members, and our monthly publication, Fusion magazine, has a circulation of 137,000. We have close to 60,000 subscribers, with a growth rate of several thousand per month. Our members and readers are mostly executives and engineers, from every industry and section of the country. It is a constituency committed to progress and committed to restoring U.S. scientific and technological leadership.

The Fusion Program

What do we ultimately want from our fusion program? It is well known that fusion will extend our nuclear electrical capacities by a combination of pure fusion reactors and the fusion-fission hybrid breeder. But the ultimate payoff will come from the fusion-based production of new resources of all kinds. Among the most important applications will be hydrogen production using high-temperature electrolysis and the refining of various ores using the plasma torch. In short, fusion is the key to the continued increase of the world's reducing power by increased energy flux density and efficiency.

The development of all these fusion applications requires a fusion program that is strong in every area: theory, technology, and industrial integration. The fusion program must also be the concrete expression of a national energy policy geared to meeting the needs of world economic development. Even a conservative estimate of world energy use going into the next century is that we will need approximately a tripling of energy production to meet the basic needs of a population of 6 billion at that point. Although fission power can provide about 35% of that total, it will be imperative to begin phasing in the various forms of fusion reactors, breeders, and materials processors to meet the energy and materials needs.

The alternative to a policy of advanced technology is the energy austerity and scarcity the zero-growthers warn about. To escape from these evils we must have a fusion program geared to completing fusion reactor prototypes in the 1990s, at the latest. It has been argued by those who feel no urgency about the fusion program that we do not know how to design a reactor that will have the combination of beta value, burn time, and density-confinement characteristics as well as materials and serviceability to stand up as a reactor. Aside from ignoring the remarkable progress made during the past decade, this uninformed outlook would easily stretch the program out to the 23rd century in a series of tiny and inconclusive steps. By contrast, the Manhattan Project and the space program have demonstrated the type of successful leaps that can be achieved when a number of interrelated problems are tested all at the same time.

There is, moreover, a definite way to resolve the dispute. We should pose the concrete challenge to the fusion program to come up with a design for a test reactor. If such a design can be developed in a relatively short period (on the order of a year) and if it gets the OK from the U.S. and international fusion scientific communities in terms of providing a well-designed test of crucial operating characteristics, then the machine should be built. The best answers and guideposts for the future will come from this effort.

To guarantee that this program is carried out, $100 million should be added to the present DOE request of $400 million and the McCormack bill calling for an Apollo-style program with a funding commitment of $20 billion should be heartily supported.

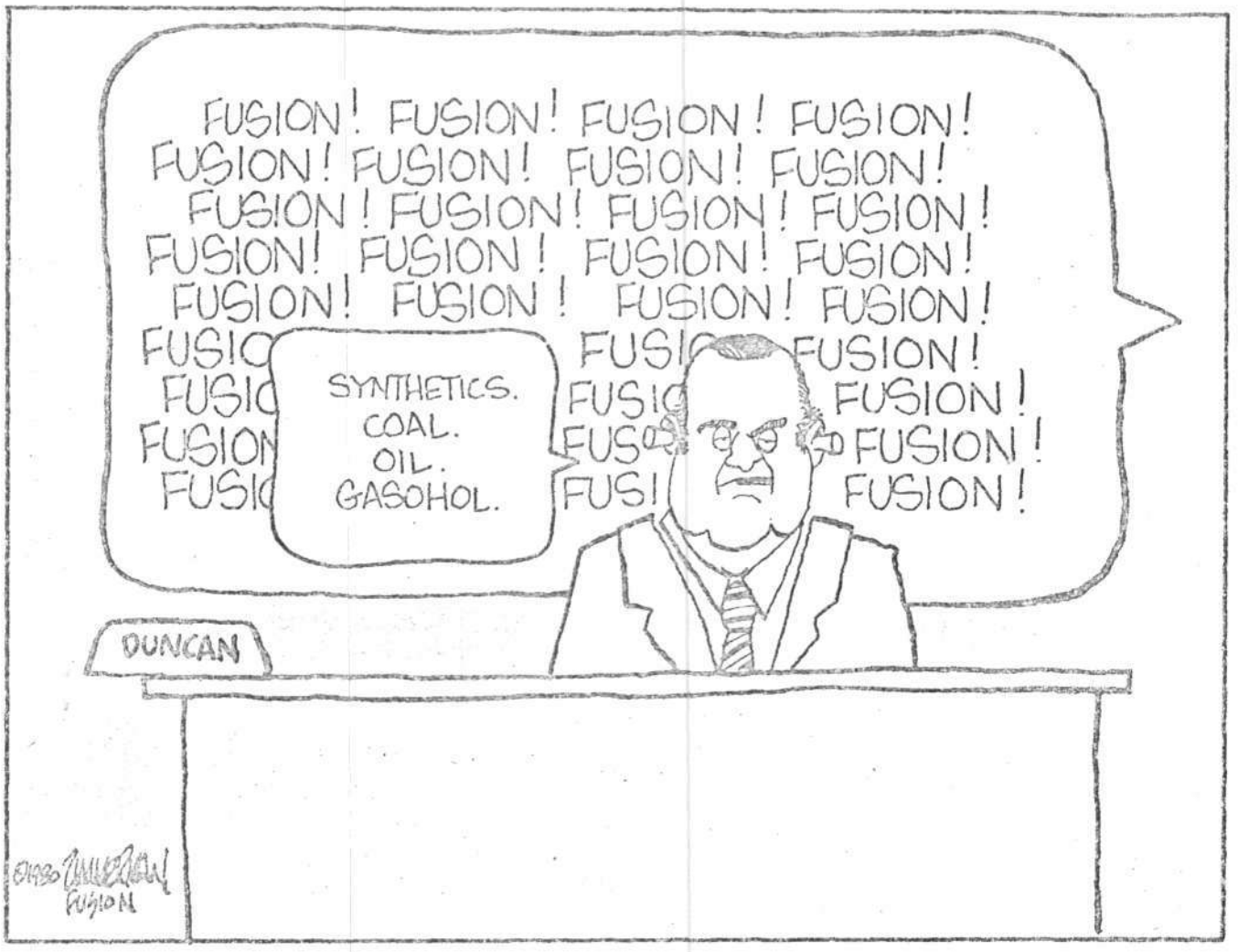
Especially under the present conditions of incoherent energy and economic policies, it is imperative to establish a mission orientation and proper priorities. The decision to commit the U.S. fusion program to an ETF now is indispensable in meeting these vital objectives. An ETF project will also help to generate the momentum behind the fusion program that will provide the resources and manpower to pursue all other promising lines of research and fusion technology applications. These will generate the scientific advances that will be required should an alternative concept prove desirable for increased reactor efficiency. In the meantime, we will have laid the engineering and industrial base for a viable fusion industry.

It should be stressed that there is no known scientific barrier to preclude a successful tokamak ETF. Rather, there are some significant unknown factors, such as whether a combination of scaled-up heating schemes, field configurations, and so forth will function in a large-scale integrated system. Preliminary studies on this problem are quite promising, however. The point, once again, is not to have all the answers beforehand - which is impossible in any case - but rather to solve the basic engineering problems that are common to all the magnetic confinement concepts. The alternative approach of adding more small, intermediate steps is inferior methodologically as well as economically.

Finally, to the question of whether we can afford a large-scale experiment, the answer is straightforward and affirmative. If we gear up our economy's industrial and technological base, for example, by exporting advanced nuclear fission technology, we can most certainly afford many such projects. Even under present circumstances, the budget amount involved is very small compared with the potential payoff - or with the amounts being allocated for research on far less economical and less productive forms of energy.

The final argument for the ETF is more general, but also more fundamental. This nation will never solve any of its basic problems without a renewed commitment to scientific and technological progress in research and education. The intellectual and industrial decay of the nation since the space and nuclear energy programs have been largely aborted is plain to see for anyone with eyes. Fusion is not simply the key to a sound energy policy; as a national priority it can become the focal point for a renewed commitment to progress and sense of moral purpose in the nation. That is an even more precious gift to our posterity than the boundless energy of fusion power.

We are fortunate in having in your committee, Mr. Chairman, a group of individuals with the experience and responsibility to take full advantage of the unique opportunity the fusion program can provide. Along with the initiatives provided by Congressman Mike McCormack, your recommendations can help to point the way to a bright future.



The McCormack Bill And the Energy War

Now that Congressman Mike McCormack has introduced his bill, HR 6308, calling for an Apollo-style program to build a demonstration commercial fusion plant by the year 2000—if not much sooner—the United States has a crucial opportunity at last to begin to reverse the Carter administraiion's war on energy production.

There is no doubt that the McCormack legislation is the right bill at the right time. Congressman McCormack has pinpointed the important issues facing the nation in the bill itself as well as in the congressional hearings and the press conference he organized to motivate the bill. The most important issue is that of national peace and security. As McCormack put it in Section 2 of his bill:

The early development and export of fusion energy systems consistent with the established preeminence of the United States in the field of high technology products, will improve the economic posture of the United States and ultimately reduce the pressures for international strife by providing access to energy abundance for all nations.

The testimony from leading scientists, lab directors, and industrial managers at McCormack's committee hearings and press conference made it clear that the main obstacle to commercializing fusion in this century is a lack of funding, not any basic problems with science or technology. And, as the McCormack proposal stresses, developed fusion power will not just be a domestic energy source but a vital ingredient among America's high technology exports.

A Predictable 'Deaf Ear'

Predictably, the Carter administration in the person of Energy Secretary Charles Duncan has already promised to turn a "deaf ear" to the McCormack proposal. We say predictably, because ever since President Carter called the energy situation the "moral equivalent of war," his administration has been waging all-out war on energy production.

It is not simply that the nation's energy supplies have become less reliable because of concerted DOE policy. Even more indicative of the administration's real policy intentions has been the DOE attempts to gut the research budget for every single technology that could have produced more energy more safely, more efficiently, more cheaply, and more productively.

Taken as a whole, the DOE record is truly astonishing. To name just a few items: Instead of closing the nuclear fuel cycle and implementing any of the sound nuclear waste storage options, the administration has scuttled spent-fuel reprocessing, killed the Clinch River breeder project, and stonewalled on setting up waste storage facilities. For good measure it has recently recommended even the elimination of breeder design studies along with the cutting out of the high temperature gas-cooled reactor and the gas-cooled breeder.

And, of course, MHD, which could be used for cleaner, twice as efficient coal combustion, has had its budget kept flat, while the administration cranks up the grossly inefficient solar program.

With this track record, it should not be surprising that the administration's fusion policy is to keep the magnetic confinement budget flat, preventing fusion engineering tests until the mid-1980s and recommending the gutting of the advanced laser fusion program.

But then again, this is the same administration that boasts numerous veterans of the New York Council on Foreign Relation's *1980s Project*. The *1980s Project* forthrightly called for destroying the world's oil supply infrastructure and getting rid of nuclear power—all in the course of putting the world economy through what the *1980s Project* calls "controlled disintegration" and International Monetary Fund financial dictatorship.

Congress's Duty

For this reason, the fight for the McCormack bill is inseparable from the fight to restore the nation's economy as the principal means of war avoidance. This time Congress must do its duty. Congress—which has made so many noble noises on behalf of energy production and capitulated so many times to "lesser evil" versions of administration energy policy—cannot be allowed to punt on this one.

Congressman McCormack has called for 200 cosponsors for his fusion bill. *Fusion* readers who have already armed him with thousands of postcards supporting the fusion acceleration effort can now help in mobilizing their congressmen, senators, and local representatives to create the visible support required.

The Fusion Energy Foundation, of course, will be in the middle of the national fight for fusion. As this issue goes to press, we are mobilizing all our forces nationwide to get out the facts on the McCormack bill. You can help to win the fight by letting us know what you are doing to organize in your area and by sending in your contributions now to the FEF.

LAROUCHE SUPPORTED

To the Editor:

... I personally do not believe that a scientist should commit himself in this way [joining Scientists for LaRouche] to any candidate. I also would refuse to join such a group even for the president because though I like the president as a person I think that his present energy policy leaves much to be desired. Any such commitment would also greatly reduce my own credibility to speak on the issues because it could be always said that my opinion is actually not my own but rather the opinion of the candidate.

However, after learning more about Mr. LaRouche's position on the energy question in the January 1980 issue of *Fusion*, there is little doubt that of all the different candidates his proposed program is the most scientifically founded. The next best position I could find was that of Governor Connally. Totally unrealistic is the position of Governor Brown. These observations, of course, may change as the positions of the candidates may change.

In regard to Mr. LaRouche's position I have little doubt that any really scientifically informed person, who is able to put aside prejudicial bias created from negative publicity Mr. LaRouche has received in the media, would share my observations. My observations, of course, shall not imply an endorsement of other stands on the issues by Mr. LaRouche or any other presidential candidate.

Dr. Friedwardt Winterberg
Reno, Nevada

(Dr. Winterberg, professor of physics at the Desert Research Institute of the University of Nevada System in Reno, is the recipient of the 1979 Hermann Oberth gold medal for his pioneering work in thermonuclear propulsion)

Continued on page 4

Washington

Postcard Campaign: 'Overwhelming' Response

The response of *Fusion* readers to the postcard campaign initiated in the December issue has been "overwhelming," according to Dr. John Bagley, administrative assistant to Congressman Mike McCormack. Bagley reported that in the two days after Christmas alone, McCormack's office received more than 500 cards.

The postcard urges the Washington Democrat "to introduce legislation that would make a demonstration fusion power reactor by 1995 a national priority and that would increase the 1981 fusion budget to $860 million." The message to McCormack begins: "I am one of the majority of Americans in favor of developing nuclear power and advanced technology to keep our country growing and prosperous."

Fusion magazine selected McCormack as the recipient of the postcards because, as the chairman of the House Subcommittee on Energy Use and Production, he is leading the congressional fight for nuclear power and fusion.

McCormack's staff reports that about 95 percent of the incoming postcards include the return addresses of the senders, and that the congressman is drafting a letter to thank each *Fusion* reader for his or her support of the fusion program.

Postcards are available from the Fusion Energy Foundation and readers are encouraged to have organizations distribute the cards to members.

A news article on the fusion program appears on page 18.

Administration in About Face on MHD

In a surprising move the Department of Energy has decided to submit to Congress a plan for accelerating the U.S. magnetohydrodynamics effort.

According to spokesmen at the DOE in Washington and at the Component Development Integration Facility under construction in Butte, Montana, the accelerated program could produce a commercial MHD demonstration test generator in the 1990s.

The new MHD program plan would double the thermal input for energy conversion for the Butte facility, which is now 80 percent completed as well as for the next-step Engineering Test Facility. If the two test generators are built at 100 megawatts thermal and 500 megawatts thermal, respectively, there would be no need for an additional commercial demonstration facility after the Engineering Test Facility.

The accelerated program would require an additional $20 million for the Butte facility between now and 1984, and an additional $100 million for the test facility which would begin construction in the late 1980s. By the mid-1990s, the new DOE plan estimates that first-generation MHD technology would be available to the utilities. That would place the U.S. MHD effort less than a decade behind the Soviet program, instead of the 20 years it is behind on the current timetable.

The MHD program has gone through a process similar to that of the fusion program in the past five years. In the mid-1970s, top scientists and researchers in the MHD program laid out a timetable for commercial MHD development by 1985. With the establishment of the DOE in 1977, the MHD program (and the fusion program) underwent reviews by Energy Research Director John Deutch, the result of which was that the MHD development timetable was dragged out past the year 2000.

This delay was accomplished both in fusion and in MHD, by adding to the timetable additional experimental machines, even though experts in the field thought the additions would unnecessarily delay the programs.

Under pressure from Congress, both programs have been undergoing second reviews with support from the scientists in the DOE program offices who have insisted that neither advanced energy technology should be put off into the next century.

Congressional Line-up

House Reasserts Nuclear Stand

The House of Representatives defeated a proposed six-month moratorium on granting new nuclear plant construction permits by a near two-to-one margin Nov. 29. Sponsored by Massachusetts Democrat Edward Markey, the proposal was an amendment to the authorization bill for the Nuclear Regulatory Commission's 1980 fiscal year budget.

Although House Interior Committee chairman Morris Udall, an Arizona Democrat, denied it, the amendment was seen as Congress's response to the report of the President's Commission on Three Mile Island as well as an overall House policy vote on nuclear power. The House Interior Committee had approved the amendment, but the leadership of the House Science and Technology Committee led the successful floor fight to defeat the amendment.

Congressman Mike McCormack,

Starfire
Toward a Commercial Tokamak Reactor

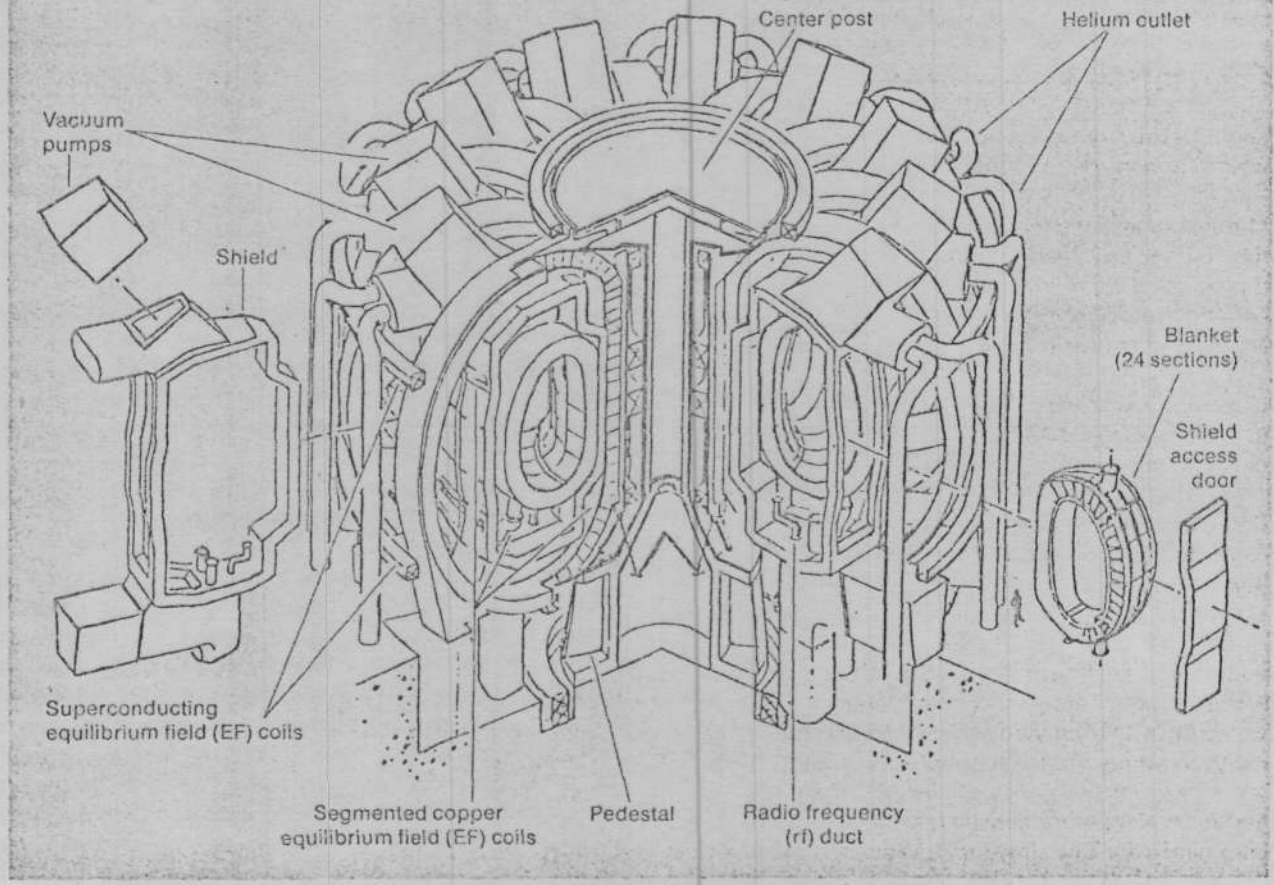


Figure 1
STARFIRE DESIGN POWER REACTOR CROSS-SECTION

The center post provides mechanical support for the inside portions of the toroidal magnetic field coils. The helium coolant outlets lead to a steam generator and provide the primary heat transport in this version of the Starfire.

A first wall/blanket segment is shown in detail and could be further broken down into 24 modular components. A shield access door, to permit access to the blanket segments without disassembly, is also shown in detail. Helium coolant inlets are located on the bottom of the reactor. The elbow shape of the radio frequency (rf) duct prevents fusion neutrons from gaining access to the rf generator itself.

Segmented copper equilibrium field magnetic coils are located inside the main superconducting toroidal magnetic coils, and the superconducting equilibrium field coils are located on the outside.

by Charles B. Stevens

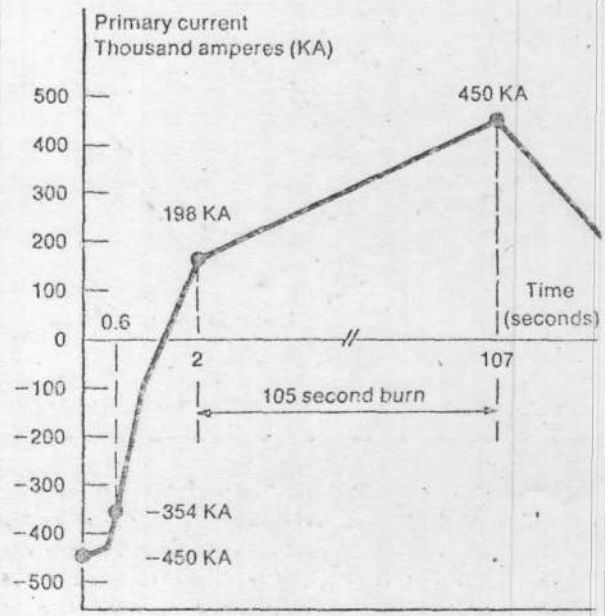


Figure 2
ELECTRIC CURRENT IN AN ORDINARY TOKAMAK
Depicted here is a typical plot of current versus time in an ordinary pulsed tokamak. The current shown in the primary loop induces the secondary current in the plasma itself, which confines and heats the plasma. Two important features are to be noted. First, current induced in the plasma is proportional to the rate of change in the primary current.

(This is because the plasma current is proportional to the electromotive force created around the circumference of the plasma, which being proportional to the change in magnetic flux through the plasma is, in turn, proportional to the rate of change of the magnetic-field-generating current in the primary loop.)

Second, when the direction of the rate of change of current in the primary loop itself changes (indicated here at the 450 thousand ampere level), the current in the plasma reverses and it becomes unstable, extinguishing the burn. Thus the plasma burn time is directly related to the transformer cycle time. In practice, the basic reason that this cycle time is limited is the materials limitation in handling the extremely high primary currents that would be involved in attempting to increase the burn time by extending the range of the primary current increase (or decrease).

A NEW REACTOR DESIGN called Starfire, now under development at Argonne National Laboratory in Illinois, promises some original solutions to a variety of technical problems associated with the tokamak approach to fusion energy and promises to lead to a more economical and workable design for future fusion power plants.

As the tokamak magnetic bottle approach has gained experimental success over the past few years, increasing numbers of designs for actual electrical power plants based on the tokamak system have been developed. Many of these conceptual designs have been carried through in great detail, with scores of engineering man-years invested. Until now, however, all of these reactor plans have been primarily concerned with extensions of ongoing experimental work or have been broadly based scoping studies to determine the key scientific and technological bottlenecks to the development of commercial tokamaks.

Although very important, these initial conceptual designs do not reflect the full commercial and technological viability of fusion. Now, a new generation of reactor designs is underway that has the primary objective of producing commercially viable, safe, and practical power plants. Argonne's Starfire Project—under Dr. Charles Baker and Dr. Mohamed Abdou and with major input from McDonnell Douglas, General Atomic, and the Ralph M. Parsons Company—is the first effort of this new generation.

The preliminary results of the Starfire Project were reported this winter at several scientific conferences, and the full details of the design are scheduled to be completed by fall 1980. This article is a preview of what a commercial tokamak fusion power plant based on the initial Starfire design might look like.

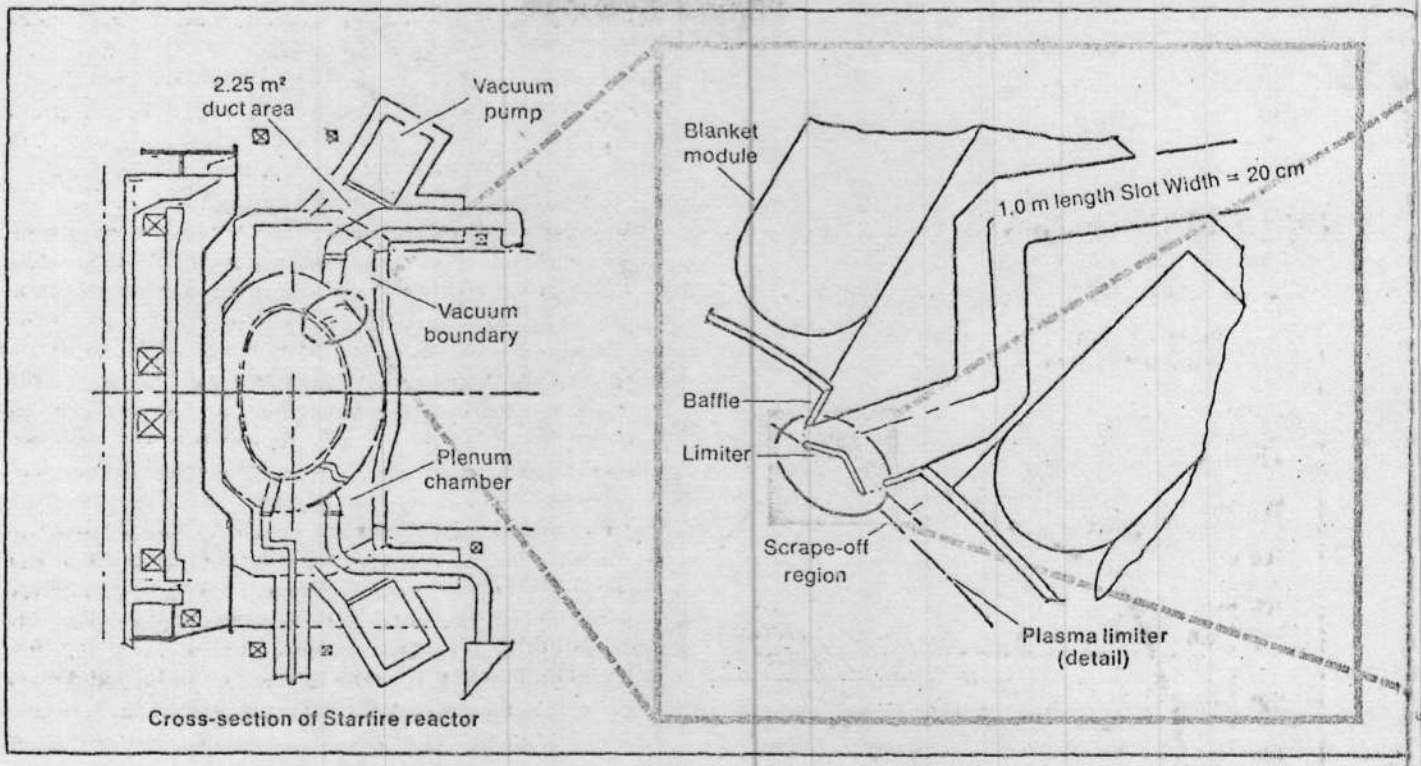
Major Parameters

The primary goal of the Starfire study is to select the most attractive set of design parameters and concepts that make tokamaks economically competitive and environmentally acceptable. Results and experience gained from previous fusion reactor designs have provided the starting point for Starfire.

The reactor is based on a tokamak magnetic bottle system using the deuterium-tritium-lithium fuel cycle. The major difference between Starfire and other tokamak reactor designs is that it is a steady-state reactor driven by radio frequency. Otherwise, Starfire takes the best options from previous reactor designs in terms of materials, blanket design, magnets, refrigeration, heat transfer, and so forth.

A cross-section of the Starfire reactor is shown in Figure 1, and a summary of the major reactor parameters and design features is given in Table 1. The reactor's thermal power is about 3,800 megwatts with net electrical power of 1,150 megawatts—about the same level of power output of current nuclear fission and fossil electric power stations.

The basic distinguishing feature of the Starfire is that it would operate in a steady-state mode instead of the pulsed operation on which previous tokamak reactor designs have been based. This major change in design leads to a very considerable easing of the technological problems encountered in previous designs and is a direct result of the rapid



Cross-section of Starfire reactor

scientific and experimental progress in current tokamak research and in plasma physics in general.

All experimental tokamaks involve a donut-shaped plasma in which a transitory electric current is induced. (The name tokamak is a Russian acronym that stands for the words torus with current.) This induced electrical current generates the essential poloidal field component of the magnetic bottle that confines and insulates the tokamak plasma, permitting the efficient attainment of hundred-million degree temperatures. The second and major component is that of the toroidal magnetic field, which is generated by the external magnetic field coils that surround the donut-shaped vacuum chamber.

The length of time that the tokamak plasma can be sustained is limited by the duration of the plasma current. In today's tokamaks this current is induced by means of ordinary transformer technology—the tokamak is a one-turn transformer of sorts. The pulse length of the transformer determines the outer limit for the timespan that a tokamak plasma can be maintained.

In previous reactor designs, transformers were designed to maintain tokamak plasmas for a few minutes up to an hour, then shut down for a short time and restart. This pulsed mode of operation caused a number of major engineering difficulties; for example, mechanical and thermal stresses as a result of between-pulse changes in temperatures and mechanical forces. Particularly when combined with the effects of fusion neutrons hitting the first wall of the reactor chamber, these stresses lead to significant degradation of the physical properties of the materials out of which the reactor is made. The degradation of the reactor chamber wall means that it has to be replaced every few years, a major capital cost. In addition, a large and costly energy storage system would be needed to maintain a constant power output from the power plant between cycles. And a second, very intense and reliable energy storage system would be needed to provide the power necessary to reignite the fusion plasma. In previous reactor designs, these additional systems lead to further, major increases in the capital costs of power plants.

Radio Frequency

The Starfire overcomes the difficulties of pulsed operation by projecting a steady-state tokamak reactor based on a continuous plasma electric current driven by radio-frequency electromagnetic radiation, or rf. In this new approach, which is based on recent theoretical and experimental studies, an rf generator will direct 100 megawatts (8MW/m² power density at the plasma surface) of electromagnetic energy into the plasma. The radio waves interact with the plasma to produce heating and an 11 million ampere electric current. Rf provides a convenient means to control the particular parameters of the fusion plasma such as temperature and density profiles, and may also provide a means of helping to purge the plasma of impurity elements (nonfuel elements).

Radio frequency heating works as follows: a plasma is made up of charged particles, electrons and ions. Electromagnetic radiation, in the form of radio-frequency waves, will interact with the charged particles of a plasma. This interaction can be quite complex, leading to heating of the plasma, to generation of various types of waves in the plasma, or to reflection of the incident rf wave.

The current theory is that rf waves acting on a tokamak plasma could directly transfer momentum to the plasma electrons, causing them to move in one direction in relation to the plasma ions. This, by definition, is an electrical current. Other

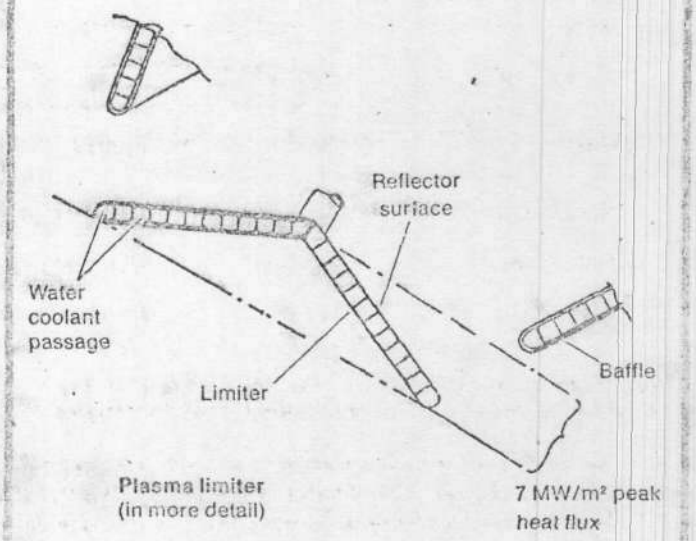


Figure 3
LIMITER/VACUUM DUCT IMPURITY REMOVAL SYSTEM

Shown above is a cross-section of the reactor donut and detailed blowups of the 60-meter toroidal plasma limiters, which pass circumferentially around the outer edge of the plasma region.

The limiter deflects ions from the scrape-off zone in the plasma into adjacent slots in the first wall. It is cooled by water passing through interior tubes and receives a peak heat flux of 7 MW/m². Baffles on either side of the slots leading off from the limiter help prevent the fusion-generated neutrons from migrating up the slot (shown in detail in the larger blow-up).

These slots, 60 meters long and 20 centimeters wide, penetrate the first wall and blanket. The location and configuration of the limiter are designed to maximize the probability of a molecule entering the slot after striking the limiter. Each slot contains a step to reduce neutron streaming.

more complex mechanisms are also possible, depending on the configuration of the plasma and the rf and the particular frequency of rf used. For example, the incident rf wave could induce asymmetric trapping of electrons in the toroidal magnetic field. This generates an electric field that induces an electrical current in the plasma.

Experiments to test these various proposed rf-induced currents in tokamaks are now coming on line. Other continuous-current drive approaches under consideration by the Starfire design team include relativistic electron beams and magnetosonic waves.

Plasma Properties

The Starfire plasma has a major radius of 7 meters and a "D"-shaped cross section to permit higher plasma betas. The width of the plasma column is 2.88 meters and its height is 4.6 meters. The ion temperature and density are, respectively, 17 keV (187,000,000 C) and 100 trillion per cubic centimeter; for the plasma electrons, temperature and density are 22 KeV (242,000,000 C) and 1.3 hundred-trillion per cubic centimeter.

The projected average toroidal plasma beta (a measure of the efficiency with which the magnetic field confines the plasma) is a relatively modest .067. This leads to a fusion neutron power density at the wall of the reactor chamber of 3.5 megawatts per square meter.

All these plasma parameters, in particular the 3.5 megawatts per square meter power wall loading, are consonant with other recent tokamak reactor design parameters. The plasma density, though, is slightly lower, because a lower density is needed to permit penetration of the radio waves into the plasma. This is also why the plasma beta is kept at a relatively low value.

Table 1
STARFIRE MAJOR DESIGN FEATURES

Net electrical power	1,150 MW
Gross electrical power	1,600 MW
Fusion power	3,200 MW
Thermal power (nominal)	3,800 MW
Thermodynamic efficiency	41%
Overall availability	75%
Average neutron wall load	3.5 MW/m²
Major radius	7.0 m
Plasma half-width	1.94 m
Plasma elongation (b/a)	1.6
Maximum toroidal field (nominal)	11.0 T
Number of TF coils	12
Plasma burn mode	Continuous
Current drive method	rf
Plasma heating method	rf
TF coils material	Nb_3Sn/NbTi/Cu/SS
Wall structural material	Ferritic steel
Blanket structural material	Ferritic steel
Wall coolant	D_2O
Tritium breeding medium	Li_2O
Blanket coolant	Helium
Plasma impurity control	Low-Z coating + limiter and vacuum system + enhanced radiation + field margin
Primary vacuum boundary	At inner edge of shield

MW stands for megawatts; m stands for meter; b is the height of the plasma column, a is its width. T stands for tesla and is equal to 10,000 gauss. TF refers to toroidal field; rf refers to radio frequency. Nb_3Sn, NbTi, Cu, SS, D_2O, Li_2O are respectively niobium tin, niobium titanium, copper, stainless steel, heavy water, lithium oxide. Low-Z refers to low atomic number.

Table 2
SELECTED FIRST-WALL/BLANKET MATERIALS OPTION

	Coolant			Structure**	
Coolant	First wall	Blanket	Breeder*	First wall	Blanket
Reference	Heavy water	Helium	Lithium oxide	Ferritic steel	Ferritic steel
Alternate	Heavy water	Heavy water	Lithium oxide	Ferritic steel	Ferritic steel
Backup	Lithium	Lithium	Lithium	Vanadium	Vanadium

* Alternate options for the solid breeder include Li_2SiO_3 and $LiAlO_2$; a neutron multiplier will be necessary with these options.
** Austenitic stainless steel is an alternative selection for the first wall structure and both austenitic stainless steel and titanium alloys are possible alternatives for the blanket structure.

Among the factors important in selecting first wall/blanket materials and coolants are the need to breed tritium fusion fuel in the nuclear reaction between the fusion generated neutron and lithium; materials safety and compatibility (for example, using lithium as a coolant can be a potential fire hazard); the durability of the materials in the fusion nuclear and heat environment; and the engineering feasibility of the heat transport system.

Table 3
COMMERCIAL FUSION POWER REACTOR DESIGN PARAMETERS

	Culham, England MK-I	U. of Wisconsin UWMAK-I	Princeton Plasma Physics Laboratory MATT-1050	U. of Wisconsin UWMAK-II	U. of Wisconsin UWMAK-III	U. of Wisconsin JASER-II	Oak Ridge National Laboratory Demo	Culham, England MK-III	General Atomic Demo	Julich W. Germany CTR	Mass. Institute of Technology HFCTR	U. of Wisconsin NUWMAK
Design year	1972	1973	1974	1975	1976	1976	1976	1976	1976	1977	1978	1979
Thermal power (MW) (average continuous)	5,830	4,665	5,146	4,712	4,735	2,000	2,150	5,830	1,676	5,000	2,470	2,097
Total electric power (MWe)	—	1,889	2,405	1,807	2,050	—	750	—	754	—	870	725
Duty cycle (%)	—	93.3	97	94.2	94.7	—	95	—	94.7	—	96	92
Net electric power (MWe)	2,500	1,473	2,030	1,709	1,985	—	Not given	2,500	611	—	775	660
Auxiliary heating power (MW)	—	15	None	200	200	—	100	—	100	—	100	80
Burn time (seconds)	—	5,400	6,000	5,400	1,800	—	1,200	—	800	—	500	225
Major radius (M)	12.5	13	10.5	13	8.1	10.5	6	7.4	7	6.93	6	5.13
Minor radius (M)	2.5	5	3.25	5	2.7	2.7	1.5	2.1	1.8	1.82	1.2	1.13
Plasma beta (%)	1.5	5.2	4	6.4	8.3	3.3	15	9.3	10	15	4	6.5
Toroidal field (T) (on plasma axis)	9.5	3.3	6	3.6	4	6	3.6	4.1	3.9	3.7	7.4	6
Plasma current (MA)	9.7	25.7	14.6	14.9	15.8	10.4	4	11.6	18.6	8.8	6.7	7.2

This table was taken from a recent U.S. Office of Fusion Energy report on fusion technology development. MW stands for million watts, M for meters, T for tesla units of magnetic field (1 tesla equals 10,000 gauss), and MA for million amperes of electric current. The neutron power densities on the first wall of the fusion reaction chamber in the early designs ranged from 1 to 2 MW/m², while those found in recent designs range from 2 to 7 MW/m2.

The chief portion of the Starfire magnetic coil system consists of 12 superconducting niobium tin, 11 tesla toroidal field coils. Other coils (equilibrium field coils) which are used to maintain the position of the plasma and give marginal trim and smoothing to the main magnetic field, consist of ordinary copper coils and niobium titanium field coils. The main toroidal magnetic field at the center of the plasma is 5.62 tesla. The need for this relatively difficult, high-field magnet system is also primarily due to the low-density, low-beta plasma.

The initial design for the Starfire heat transport system calls for a combination of helium and heavy water coolants, which both drive a secondary steam-turbine loop. An all-water coolant system is being investigated.

Plasma Impurity Removal System

The problem of removing tokamak-plasma impurities, such as the helium fusion reaction product and nonhydrogen elements originating from the reaction chamber wall and vacuum system, was recently identified by both U.S. and international design teams as the most difficult and potentially costly problem now confronting tokamak fusion development.

The Starfire project is developing several innovative schemes for resolving the impurity removal problem. One candidate under investigation is shown in Figure 3. This is a limiter/vacuum impurity collection system, which concentrates and pumps out an outer layer of the plasma column. (Limiters are used in tokamak experiments to protect the vacuum chamber wall from contact with the fusion plasma; it is simply a material barrier placed so that the plasma comes into contact with it before touching the chamber wall.) In this way, some of the impurities are removed from the plasma.

In addition, the toroidal field coils are being designed with sufficient strength to contain the excess plasma pressure of the helium fusion products. Other features of impurity control under investigation are the use of low atomic-number coatings and operation of the plasma so as to maximize the heat radiated from it, while minimizing the transported heat.

Major questions under thorough review include high heat fluxes, neutron radiation damage, and erosion caused by sputtering of plasma particles on the limiter/vacuum impurity control system.

First Wall and Breeding Blanket

At one time, the question of whether it was possible to find materials to withstand the fusion-generated neutron environment for the initial wall (the first wall) of the reactor chamber was thought to be the most difficult problem confronting tokamak plant design. Although this is still a significant problem, the question has been resolved to some extent in the light of actual simulation tests that indicate that standard stainless steel alloys could hold for at least five years in the fusion environment. At the same time, the prospects for developing new composite materials and alloys that can stand up for the full 30-year life of a power plant are greatly improving.

The steady-state mode of operation of the Starfire will provide an important means for obtaining these long lifetimes for reactor chamber materials.

Because of the importance of the design of the first wall and breeding blanket to the economics and safety of a fusion power plant and the close relationship of specific design to material lifetimes, the Starfire design team is taking a broad-based approach to the design of this particular subsystem, leaving open as many options as possible before completion of the overall plant design.

Table 2 shows three alternatives for the choice of the first wall/blanket materials, coolants, and breeding materials. A fourth alternative is being developed that utilizes an advanced austenitic stainless steel alloy. This is the first tokamak reactor design in which magnetic ferritic metal alloys are being seriously considered.

These alloys, relatively cheap and practical from the standpoint of fabrication, appear particularly resistant to thermal stress and radiation damage. But given Starfire's steady-state mode of operation, which dramatically minimizes materials damage from these mechanisms, utilization of stainless steel is also being thoroughly analyzed.

The chief goal of the Starfire first wall/blanket concept is to maximize safety and environmental acceptability. The primary guidelines are to keep tritium inventories low and to minimize long-lived activation products and stored chemical energy.

Conclusion

Starfire represents a totally new trend toward increasingly more economical and workable power plants. What this means specifically can be seen by comparing the Starfire parameters to those in Table 3, which gives the chief parameters of previous tokamak reactor power plant designs. As the table shows, the trend is toward physically smaller power plants with lower total electric power outputs—leading to much more economical electric power costs. For example, the cost projections for the 1979 Wisconsin University NUMAK design come in very close to current electrical costs at between 40 to 50 mills per kilowatt hour of electricity.

Once again, what the Starfire design shows is that the barriers to developing commercial fusion are not scientific but are a question of government policy and funding.

Charles B. Stevens, the director of fusion engineering for the Fusion Energy Foundation, is a frequent contributor to Fusion.

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FUSION ENERGY FOUNDATION

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January 12, 1981

Statement of Dr. Morris Levitt for The Fusion Energy Foundation on the Nomination of James Edwards for the Secretary of the Department of Energy

The Fusion Energy Foundation is a not-for profit scientific organization with 15,000 members. The Foundation publishes the monthly scientific magazine, FUSION, which is the second largest science magazine in America.

The Foundation is pleased to express its support for the confirmation of Governor James Edwards for Secretary of the Department of Energy. Mr. Edwards has demonstrated his committment to develop the energy resources of America in order to foster economic growth for the Nation.

It is often said that America has ample resources to meet its energy needs for the future, and that there must be end to the obstructions to development that have characterized the last few years. While this is ture, it too simple a view.

There have to be scientifically rigerous criteria in terms of what forms of energy development our government should invest in and support. There is no question that the keystone to the future, in terms of overall economic impact of an energy technology, dictates the multiple uses of nuclear power for both domestic use and export.

Domestic economic health for the United States requires an overall energy growth rate of 3-4 per cent per annum and an electric growth rate of 6-7 per cent. In addition, if we are to make a dent in the energy needs globally of six to seven billion people by the end of this century, to help create reliable allies and stable markets for American goods, the U.S. will have to be prepared to export thousands of nuclear power plants.

This aggressive nuclear development program will require very important components.

The first is the closing of the nuclear fuel cycle and the commerical deployment of advanced nuclear technologies. The current controversey in the scientific community and in government in terms of which nuclear breeder option should be pursued should be resolved through the convening of a blue-ribbon scientific panel which will determine the most effective course for breeder development. There is no doubt that an aggressive nuclear export program will allow the nation to afford

a more expensive and extensive breeder program.

The nation must resume a research and development effort to develop the technologies for spent fuel reprocessing and storage leading to commercial deployment at the earliest possible date. The full range of advanced nuclear technologies, such as the high temperature gas cooled reactor which can be used for multiple industrial processes, must be reinstituted.

The second research and engineering program that must be pursued with immediate vigor is the full implementation of the so-called McCormack fusion bill. The Magnetic Fusion Energy Engineering Act of 1980, passed out of this committee and signed into law by President Carter on October 7, 1980 commits the nation to demonstrate the engineering feasibility of fusion power by the end of the present decade, and the commercial viability of fusion before the turn of the century.

The promise of fusion is not simply as an inexhaustible, safe form of electrical power, but as a multipl0use energy source which will be extremely important. With fusion power the Nation will be able to produce the ultimiate synthetic fuel--hydrogen--in an economic manner. The heat and radiative energy from the fusion process will be available for materials extraction and processing. Currently uneconomical reserves of precious raw materials and minerals will become economically exploitable with fusion energy, through the use of the fusion torch.

For the present, we must continue to develop the sources of energy which have been the backbone of our economy--our oil, gas and coal. High technology is the key to the exploration, mapping and exploitation of these resources, with the proper economic policies, such as depletion allowances.

More efficent and less polluting technologies for the conversion of the energy in these fuels to useful energy such as electric power, are on the horizon but have had little support from the previous leadership of the Department of Energy. One such example is the use of magnetohydrodynamics to turn coal into electric power with no environmental pollution and a doubling of the efficiency in the conversion process. There are many other examples.

At the same time that we make use of the many economically viable energy resources in the United States, the Department of Energy must vigerously pursue oil-for-technology agreements with other oil producing nations of the world. The export of nuclear technology in exchange for an assured supply of oil would restore our foreign policy in regard to energy to a cooperative rather than adversary one.

If these steps outlined are taken by Mr. Edwards and the new leadership of this most vital government agency, the United States will be assured abundant energy supplies now and in the future.

We must restore the confidence in the American people that this Nation can meet its needs by developing its science and technology and trading with its partners. This will require a productive, working relationship between the government, business, our national laboratories andthe scientific community.

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STATEMENT OF CHARLES B STEVENS, DIRECTOR OF FUSION RESEARCH FOR THE FUSION ENERGY FOUNDATION BEFORE THE SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

My name is Charles B. Stevens and I am the director of Fusion Research with the New York City based Fusion Energy Foundation. It is with great pleasure that I am testifying today in favor of the nomination of Donald Hodel as Secretary of Energy by President Ronald Reagan. It is my hope and the hope of the foundation which I represent that Mr. Hodel will continue to improve on the political, technical and management skills which he has demonstrated in his past positions of responsibility in both government and the private sector. As Secretary of Energy he will surely need them.

Today, the United States is faced with the gravest crisis in its history. Because of the growing hegemony of the anti-nuclear, anti-science Malthusian post-industrial societal policies best represented by the Carter Administration's Global 2000 report and the Project 1980s of the New York Council on Foreign Relations, the United States and other Western economies are presently plunging into a depression far worse than that of the 1920s and 30s. Under such conditions, even the threat of total destruction will not prevent one or both of the superpowers from going to war. The prospects for the U.S. in this situation has been greatly diminished by the rapid decline of its scientific and military capabilities since the downturn of NASA and other high technology efforts in the late 1960s.

As Secretary of Energy, Mr. Hodel will be uniquely positioned to reverse these dire circumstances. The Department of Energy is charged with the research and development of energy--the key to all other natural resources--and the maintenance of U.S. nuclear weapon and technology defense capabilities. Both of these functions depend on maintaining and improving a broader science and technology base, and in particular fusion and plasma physics research. Because of this the Secretary of Energy has the primary responsibility for seeing to it that the implications and potentials of these advanced technologies are made known to the U.S. government and people, and fully realized in practice.

In 1977 I testified before the United States Senate on the rapid progress of Soviet research in fusion and plasma physics. In particular I reviewed the work of Leonid Rudakov and its potential for realizing directed energy weapons capable of destroying nuclear tipped missiles in mid-flight. Since that time the well known political economist and member of the board of directors of the Fusion Energy Foundation, Lyndon H. LaRouche has detailed in numerous presentations and publications how a crash program to develop high-energy beam weapons, capable of knocking down hostile ICBMs, is the only way to end the age of mutual thermonuclear terror; and that such a policy can create a "period of rationality" in international relations during which U.S.-Soviet agreements to cooperate in Third World development and scientific research can create the basis for a lasting peace.

More recently, Dr. Edward Teller has endorsed this same policy outlook. I offer as an appendix to this testimony a transcript of the Oct. 26 National Press Club speech of Dr. Teller. In this speech Dr. Teller alluded to the fact that a whole, new family of directed energy weapons has

been scientifically demonstrated based on U.S. fusion and plasma physics research. But as he stated, Dr. Teller is prevented from informing the U.S. people about these significant developments because of the existing security classification policies. Dr. Teller in calling for reform of these policies said: "not the details, but the very ideas are classified. We call it not only secrecy, but 'security.' It isn't, because the Soviet leaders know; the American people have a need to know. But they are not told."

(At this point I offer as a second appendix a recent report on the x-ray laser prepared by myself and Dr. Steven Bardwell. The x-ray laser is a leading member of the family of directed energy weapons to which Dr. Teller alluded.)

In an article detailing his plea for relaxing U.S. security classification constraints, in the most recent issue of Reason magazine, Dr. Teller refers to the famous Rudakov case. In 1976 Soviet fusion scientist Leonid Rudakov made a series of presentations while visiting the United States. The U.S. government classified Dr. Rudakov's talks as top secret. Within a few months of this action, the Fusion Energy Foundation staff was able to reconstruct the essential contents of Dr. Rudakov's presentations through utilizing articles in the open scientific literature.

Reforming the current U.S. security classification policy is one of the most important and pressing issues facing Mr. Hodel when he becomes Secretary of Energy. Such a change is crucial for: 1) immediately giving the U.S. government and people the essential facts and information needed for determining a competent defense policy; 2) immediately mobilizing the U.S. scientific capabilities to fully realize the military and economic applications of these systems.

The greatest irony of the world's current nuclear dilemma is that the perfection of a defense against nuclear weapons not merely would break the balance of nuclear terror, but also would begin a process of economic and technological progress sufficient to remove the most deeply rooted causes of war and economic depression today.

The technologies required for the development of a beam weapon for ballistic missile defense are the same required for the development of fusion energy--mankind's ultimate energy source, which has unlimited, cheap fuel, little wast, and very high energy densities.

As has often happened historically, military research on the most advanced technologies would have a revolutionary impact on civilian industrial and energy technologies. Much like the role of the military in the perfection of nuclear energy for propulsion, the development of directed energy weapons will open up a new chapter in man's history: the age of thermonuclear plasma technologies. These new technologies used for energy production, materials processing, propulsion, and industry in the form of plasma furnaces and magnetic separation will have a more revolutionary impact on society than the introduction of electricity had 100 years ago.

In the more near term, clean and cheap thermonuclear explosives, derived from a crash beam weapon development effort, can find immediate application in a revived Peaceful Nuclear Explosives (PNE) program. Since 1975 the U.S. has abandoned research and development along these lines while the Soviet Union has gone full steam ahead.

Without any limits to the energy and raw materials freed by plasma technologies, the age-old problems of starvation, plague, drought, and inadequate housing and ehalth care can be realistically be scheduled for solution; no material barriers to their solution would remain. There would be no limits to mankind's potential for growth.

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Statement of Marsha Freeman

Fusion Energy Foundation
New York City

before the
Subcommittee on Energy Research and Production
of the
House Science and Technology Committee

February 29, 1984

Fusion Energy Foundation

Madam Chairman and Members of the Subcommittee:

Thank you for this opportunity to present the views of the Fusion Energy Foundation on the FY85 budget request for the Department of Energy Magnetic Fusion Energy program.

The testimony that was presented before this subcommittee last week by the Department of Energy proposed a go-slow fusion program that is scientifically incompetant compared to what the fusion program must accomplish.

The frontiers of plasma physics research are of immediate importance for the solution to the world's severe energy deficit; they directly overlap with the most crucial questions of directed energy beam weapon defense and with the frontiers of astrophysics and bioengineering research. The pace and level of fusion funding must be considered within this framework of moving the nation foward in the frontiers of science, for economic growth and national defense.

In the three years since the passage of the Magnetic Fusion Energy Engineering Act of 1980, the Reagan Administration has refused to fulfill the mandate of that law with regard to both the proposed funding profile for fusion and a program plan to meet the milestones laid out by the Congress.

In his testimony representing the view of the Administration before this Subcommittee on February 23, Dr. Alvin Trivelpiece stated that because of the "current climate" where the prices of oil and yellow cake are going down, "it is difficult to make a rational case for accelerating the [fusion] program." Under questioning, Dr. Trivelpiece agreed that the goal of demonstrating the commercial viability of fusion could be accelerated with increased funding, but that high budget deficits make funding increases difficult.

The Administration has continued to try to convince the American people that the so-far invisible economic "recovery" depends upon decreasing the budget deficit. First, it is important to understand that there is no economic recovery. All real production indicators show that basic industry, farming, and manufacturing have been contracting, and that the number of real productive jobs in the economy is shrinking. Only the made-up figures of the Federal Reserve indicate that there is a "recovery."

Second, the simple amount of the federal budget deficit has nothing to do with the state of the economy. The only determining factor is the mix of activities the government is engaging in which are causing the deficit. If the government were using this credit to expand industry, develop new energy and industrial technologies, expand the civilian space program and push forward the laser, particle beam, and plasma technologies required for new defensive antimissile systems, there would be economic growth as a result of the budget deficit. If the millions of currently unemployed Americans were working and paying taxes, budget balancers would not even have a budget deficit to worry about.

Third, the only basis for a real economic recovery is the priority investment in the frontiers of science and technology --fusion and directed energy defensive weapons--for this will ensure a continuing increase in productivity by the introduction of new technology.

Cutting crucial R&D programs, using the excuse that there must be a cutback in government spending, ensures there will be a slowdown in the rate of introduction of new technology into the economy, which is, after all, the driving force of increased productivity and economic growth.

The relationship between the rate of introduction of new technology into basic industry and economic growth was demonstrated in a study done last year by the economic staff of the weekly magazine Executive Intelligence Review and the technical staff of the Fusion Energy Foundation. This groundbreaking study, using the LaRouche-Riemann economic model, showed that a crash program for directed energy beam defense development could add millions of new highly skilled jobs to the U.S. economy, raise per capita income by 5 percent per year, eliminate the trade deficit within two years by gearing up exports, and produce a 25 percent per annum rate of growth in the economy. This effect would be caused by the transfer of technologies developed for the military into the industrial economy.

The potential economic impact from advanced energy technologies such as fusion, is even greater. Fusion research should be seen as a national laboratory for the new industries of the economy. Plasma-based steelmaking, chemistry, materials processing, and even space travel will revolutionize the U.S. economy. The nation's fusion scientists should have the resources to begin now to prepare the technologies of the plasma age.

Regardless of how depressed the electric utility industry may be at the present time, if there were even a modest upturn in economic activity, there would be shortages of on-line electric generating capacity in less than five years. According to the National Electric Reliability Council, certain regions of the country could experience brownouts by 1985. To plan for the future on the basis of the fall in electricity demand for the last two years, is to state categorically that we will be in a depression for years into the future.

The Administration has stressed in its statements on science and technology policy that international cooperation must bail the United States out of tight R&D budgets. It has even been suggested that national sovereignty might have to be compromised as other nations are encourgaed to build the fusion facilities and perhaps other facilities that the U.S. niggardly refuses to spend the money on.

Rather than taking on the responsibility that the United States has, as the world leader in science and technology, to lead the international effort in fusion, Administration officials are questioning whether or not to relinquish that role.

Little consideration has been given to the fact that the frontier scientific questions in fusion are also crucial for national defense. The defensive technology thrust announced by President Reagan last March 23 will require the creative input from fusion scientists. As Dr. Edward Teller has stated, it is time for the fission and fusion communities to reunite to tackle and solve these challenging problems, to protect this nation and allies from nuclear attack. We cannot slow down fusion research and development without effecting national defense.

For these economic and military reasons, the U.S. fusion effort must be "technology limited" and not "funding limited." The funding profile that was the foundation for the Fusion Act four years ago, has still not be achieved today. The FY85 budget request from the Department of Energy is still below the $500 million mark that was deemed necessary at the beginning of 1980.

The funding level for the magnetic fusion program should be determined by how quickly money could be absorbed for the design, construction, and operation of the Tokamak Fusion Core Experiment; the continued use and upgrade of other facilities and experiments; and the expansion of physics research which will provide new ideas on better fusion machines in the future.

There must be room in the budget to investigate the possibility of using polarized fuels to relax the classicial parameters for fusion ignition. Promising concepts, such as the plasma focus, which have had to rely on other government agencies for support, should be brought directly into the fusion program. And serious attention should be given to the role that our fusion program must play in the directed energy beam defense effort.

Any society which develops policies based on the notion that science and technology programs are a luxury which the country may not be able to "afford," or that these programs will bring to fruition a technology that "we do not need right now" has lost any sense of history and certainly any vision for the future.

I would be pleased to answer any questions. Thank you.

The Fusion Energy Foundation is a non-profit organization with over 15,000 members in the United States, and is the publisher of FUSION Magazine. FUSION Magazine, which is published in six languages, has a circulation of over 250,000, and has played an important role in helping to forumlate fusion policy for the past decade.

Marsha Freeman is the Washington editor of FUSION magazine, and the Director of Industrial Research for the Fusion Energy Foundation.

The federal energy budget proposal: crash program for environmentalism

by Marsha Freeman

The fiscal year 1985 budget request for the Department of Energy (DOE) released on Feb. 1 by the Reagan administration mirrors the worst Carter-era budget submission. Rather than following through on the President's stated commitment to nuclear and advanced energy development, the budget includes massive increases for conservation and "alternate" technologies while decreasing the nuclear fission and fusion budgets.

While Energy Secretary Donald Hodel remarked in his budget briefing that the political instability in the Middle East could jeopardize U.S. oil supplies, the very real threat to national security of a complete collapse of the nation's nuclear industry was ignored.

The DOE budget reflects an election-year capitulation of the administration to the solar energy zero-growthers in the Congress, a capitulation rationalized as promoting a "balanced and mixed energy resource system." This is paralleled by the fact that the largest increase in the proposed federal budget is for the Environmental Protection Agency.

For the first three years of the Reagan administration, the annual DOE budget request represented a necessary turnaround from the four years of sabotage of development of advanced-energy sources during the Carter years. The DOE budget ceased to be a subsidy for the anti-nuclear activities of the Parson Malthus Democrats, but huge increases in these anti-energy programs are now proposed.

Conservation, and both solar and renewable energy programs are slated for a 308% increase over FY84 requests. Conservation grants for low-income housing weatherization efforts are proposed to increase from $3 million in FY84 to $252 million, an 8,300% jump from what the administration proposed last year. Under close scrutiny, many of these programs, emphasized while James Schlesinger ran the Department of Energy in the Carter administration, have been found to be not only expensive and wasteful but also destructive to the environment.

Advanced fossil-fuel programs, such as magnetohydrodynamics (MHD), which could eliminate all pollution from burning coal to produce electric power, were eliminated from previous Reagan budgets. This year a small amount of money will be proposed for MHD to redirect the program "to a multiyear advanced research program consisting of scientific research and an integrated system test, which could lead to an 80-megawatt combined-cycle system to be cost-shared with the private sector." The alleged success of proposing cost-sharing with the private sector contributed to congressional cancellation of the Clinch River Breeder Reactor program last year.

The Soviets are now building a 500-megawatt MHD combined-cycle power plant which will be operational before the end of this decade.

Destroying fission and fusion

The Reagan administration has made no attempt to stop the hideous destruction of nuclear power in this country. A national defense mobilization means that power-plant construction must be taken out of the hands of the Wall Street bond houses and placed under federal credit and financial policies.

When the current economic collapse is reversed, the United States will find it has a *shortage of on-line electric generating capacity in less than five years*. If we do not

U.S. Department of Energy budget

(Millions of dollars)

Program	FY84 request	FY84 actual	FY85 request	% change
Conservation	71	151	148	+ 108
Conservation grants	3	280	252	+8,300
Solar and renewable	102	215	191	+ 87
Fission	848	675	618	− 27
Magnetic fusion	467	471	483	+ 3

Note: The budget requests are submitted by the administration. The actual FY figures are the amounts appropriated by the Congress.

reverse the current shut-down of nuclear plant construction now, we will not be able to catch up at that point. This situation is a threat to the national security of the nation.

The DOE budget for advanced nuclear technology development in FY85 represents a reduction of 27% from the previous year's request. It is a statement by the administration that there is no future for nuclear energy.

The nuclear fusion allocations, which fund the only energy and industrial alternative to using finite resources until such are exhausted, continues to decline. The budget for inertial-confinement fusion, using lasers and other directed energy beams, is slated for a $30 million cut. This is part of the election-year mentality which prompted the White House to "move money around" in the defense budget—which includes inertial fusion—so that the beam-weapons defense program would not "look so big." The result will be to cripple promising avenues of fusion research.

The magnetic-fusion program, mandated by Congress in 1980 to receive substantial increases to develop commercial fusion energy by the turn of the century, continues to fall behind. The DOE request adds $12 million to the $471 million authorized by Congress last year, which does not even keep up with inflation.

This level of funding carries out the policy of science adviser George Keyworth which states that fusion should remain a "scientific" program not able to develop commercially viable technology for another 50 years. At the present time, the inertial-confinement fusion program in Japan has outrun the U.S. program by using the largest fusion laser in the world. The Japanese magnetic-fusion program will likely surpass the United States in level of effort this year.

Space budget kept level

Although the President announced in his State of the Union address that the National Aeronautics and Space Administration (NASA) had his go-ahead for a manned space station, budget considerations and not technical readiness are determining the schedule of deployment of the station.

The FY85 NASA request contains an insignificant increase of 4% over FY84. The space-station program will be stretched out over nearly a decade so the total space budget can be kept nearly level. The peak funding for the station of approximately $2 billion per year will be delayed until NASA can bring the money spent on the Space Shuttle down as the remaining orbiters are brought on line.

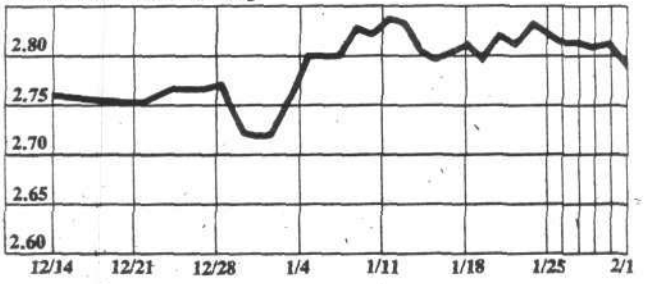
A new start for the Mars Geoscience/Climatology Orbiter is part of the NASA design to begin a new planetary effort each fiscal year, but funding for concommitant space-science programs will have to be increased if the nation is to make use of the information our new planetary probes provide.

Overall, major science and technology decisions, as reflected in the budget requests, have been sabotaged by election-year political considerations which dictate that the President should propose nothing over which he will have to fight with Congress.

Currency Rates

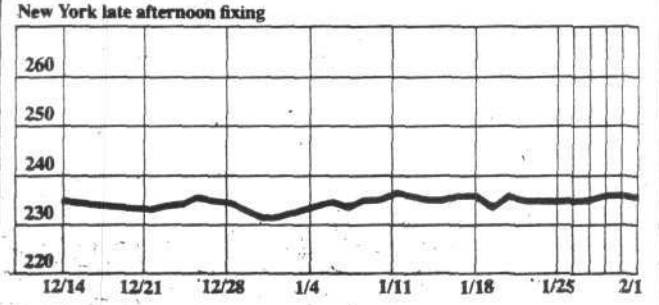
The dollar in deutschemarks

New York late afternoon fixing



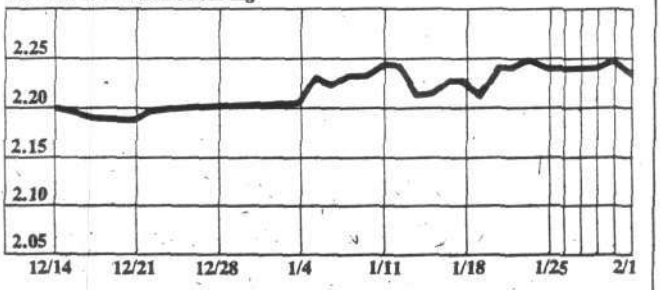
The dollar in yen

New York late afternoon fixing



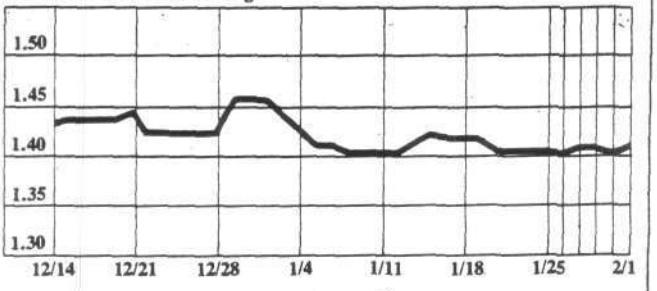
The dollar in Swiss francs

New York late afternoon fixing



The British pound in dollars

New York late afternoon fixing



FUSION ENERGY FOUNDATION

Suite 205 • 15 B South Catocktin Circle S.E. • Leesburg, Va. 22075 • (703) 777-6057

Testimony by
Marsha Freeman
Fusion Energy Foundation

Senate Committee on Appropriations
HUD-Independent Agencies Subcommittee

NASA FY86 Budget Request

May 2, 1985

Mr. Chairman and members of the Subcommittee, thank you for this opportunity for the Fusion Energy Foundation to present its views and concerns regarding the fiscal year 1986 budget request for the National Aeronautics and Space Administration.

The Foundation is a not-for-profit organization with 20,000 members nationwide. Its magazine, FUSION, has led a fight for advancements in all fields of science and technology, with continued emphasis on the importance of our space programs.

In deliberating on the NASA budget, few have raised any objections to funding the space program, per se. The action by the House Budget Committee and the request by the administration, have been shaped almost entirely by fears related to the budget deficit.

Although the growing deficit does indicate that there is something fundamentally wrong with the state of the U.S. economy, it is a symptom, not a cause. The actual cause of the deficit is the accelerating collapse of the productive industrial and agricultural foundation of the economy, combined with nothing less than usurious interest rates. The solution to this problem is precisely an increase in the kind of research and development work that will create more productive technologies for our economy, not cutbacks that seem expediant.

The only way to return the United States to a period of real economic growth is to accelerate the rate at which new technologies are developed and to create the environment, and credit conditions, where these new technologies can quickly be absorbed by industry.

Unlike many other expenditures in the federal budget, the amount of money NASA spends that leads to breakthroughs in science and development in technology is directly related to the rate at which new, more productive technologies are available. These increases in productivity lead to job creation and profit in basic industry.

The foundations in science and engineering developed during the Apollo period in the 1960s are still providing the nation with revolutionary new breakthroughs, such as the aritifical heart.

Studies done by Chase Econometrics and others of the economic impact of NASA spending in the 1960s estimated conservatively that at least 10 dollars were returned to the economy in real economic activity, for every dollar of tax money invested. I can think of no bandaid or makeshift economic palliative that can have that kind of qualitative and long-lasting positive impact on the nation's economy.

If the only reason why we are cutting space station funding, for example, is because of the deficit, then we are cutting off our noses to spite our faces. In addition to

irritating our allies, who have indicated their willingness to spend billions of their own dollars on this project, stretching out the timetable for completing the space station will only increase the total cost of the program. So much for "saving money."

An Economic Catastrophe

A recent in-depth study of the U.S. and world economy by the weekly Executive Intelligence Review has shown not only that there is no "recovery" in the United States at the current time, but also that basic industry has been on a dangerous decline for the past 10 years.

In no major industrial category, including energy, has there been any significant real growth. Basic steel production fell by nearly 50% between 1972 and 1983, from 120 million metric tons to just over 67 million metric tons. Energy consumption per million persons fell from 86.22 trillion kilocalories to 77.63, over the same period of time.

The rate of decline has been similar for cement, machine tools, tractors, automobiles, and other basic industrial categories.

Tax dollars that are drained off to pay the usurious interest on the federal debt are what causes a spiraling deficit. Each percentage point increase in Federal Reserve chairman Paul Volcker's interest rate throws more people out of work. They stop paying taxes, and end up on the public dole.

The government ends up with a shrinking tax base and more and more commitments for unemployment insurance, welfare, food stamps, and the like. To meet these payment requirements, the government borrows money--at Volcker's interest rate. At the current time, the combined public and private debt of the United States could never actually be paid.

This combined indebtedness is about $8 trillion. Quite a ghastly sum, and considerably more than our entire annual Gross National Product. Serious changes in domestic economic policy are required. A simple one-year moratorium on federal debt payments alone, would wipe out this year's deficit, for example.

Then, from there, the government must get back in to the business of creating a low-interest rate, high-growth environment for business and industry. Investment in national research and development programs should become the centerpiece for providing tomorrow's economic growth. Without constantly increasing the productivity of industry and agriculture, the nation cannot maintain the rate of growth that keeps it a world leader.

If the "spin-offs" from the 1960s space nuclear power projects had been commercialized, for example, this country would lead the world in high-temperature nuclear reactors, fast breeder reactors, and other frontier energy technologies. The current tri-agency SP-100 program will continue NASA's role in developing improved energy technologies. With a progrowth national credit policy, rather than the dictates of Paul Volker and the International Monetary Fund, NASA could get the U.S. nuclear and overall energy infrastructure back on its feet.

New materials that will be created both in space-based processing and manufacturing and also in the application of improved technology here on Earth, will open the door to higher-temperature and more efficient processing methods in industry. The Three M Company reports that the work they have done in readying their experiments to fly on the Space Shuttle, has already led to better methods of research in their existing laboratories.

Setting National Priorities

In addition to all the practical benefits of the NASA programs, the civilian space program allows man to dream of becoming more than he thought he could be. It gives children a motivation to learn science and sets goals for their future. It creates an environment of technological optimism in the country that allows for new discoveries.

President Reagan has created a National Space Commission to "devise an aggressive space agenda to carry America into the 21st century." In 1969, President Nixon created a similar Task Group after the first lunar landing. In the end, however, it was not his Task Group that set the agenda for the post-Apollo space era. It was the dictates of the Budget Office.

We have a second opportunity now to plan to embark on those same goals for the next quarter century of our space program--a space station, lunar colonization, a manned mission to Mars, and unmanned probes to learn more about how the Solar System and the universe work and were created.

This year's budget deliberations should take place within that perspective. This time around it is surely possible that other nations will make the commitments the U.S. refuses to make, and that their economies will reap the benefits of investment in the future technologies and scientific understanding that would keep this nation a world leader.

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Marsha Freeman
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HUD-Independent Agencies Subcommittee

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Session IV
THE FRONTIERS OF SCIENCE AND TECHNOLOGY

The research in fusion power has led to the discovery of phenomena which cannot be accounted for by the fundamental concepts of modern physics. Similar non-linear, self-organizing phenomena have become central to such previously separate fields as plasma physics, high energy physics, and superconductivity theory.

The Concept of Energy 2:00 PM
Uwe Parpart,
Director of Research,
Fusion Energy Foundation

The Frontiers of Superconductivity
Dr. Bernd Matthias,
University of California at San Diego

Panelists
Dr. Steven Bardwell,
Director of Plasma Physics,
Fusion Energy Foundation

Dr. Robert Moon,
University of Chicago

Dr. Igor Alexoff,
University of Tennessee, Electrical Engineering Department, Fellow—American Physical Society

Dr. John Schoonover,
Fusion Energy Foundation

Vid Beldous,
Cummins Engine, Columbia, Indiana

Eric Lerner,
Fusion Energy Foundation

THE FUSION ENERGY FOUNDATION

The Fusion Energy Foundation(FEF) was founded in November, 1974, at a meeting attended by representatives of the U.S. Labor Party, the United Nations, the International Atomic Energy Agency, the U.S. Atomic Energy Commission, scientists who have made significant contributions to fusion research, and interested laymen.

Its purpose is to provide a forum of independent, high-level scientific discussion of fusion from the standpoint of comprehensive policy-making. The FEF has held forums on fusion development at the Franklin Institute, Boston Museum of Science, New York Academy of Science, The Massachusetts Institute of Technology, Wesleyan University, and many other distinguished institutions. The FEF has sponsored many one-day conferences scattered throughout the United States on the prospects for fusion power and its effect on expanding world agricultural and industrial production.

The Foundation publishes a bi-monthly *Newsletter* summarizing and analyzing all major developments in the fusion field, and sponsors the *International Journal of Fusion Energy* to synthesize and stimulate conceptual advances in fusion-plasma research.

For more information contact:
Chicago: (312) 663-3692 New York: (212) 563-8645

REGISTRATION FORM
Science and Technological Development: Solving the Energy Crisis

Enclosed is a check or money order for $
for ( ) registrants and ( ) dinners.

Name

Organization

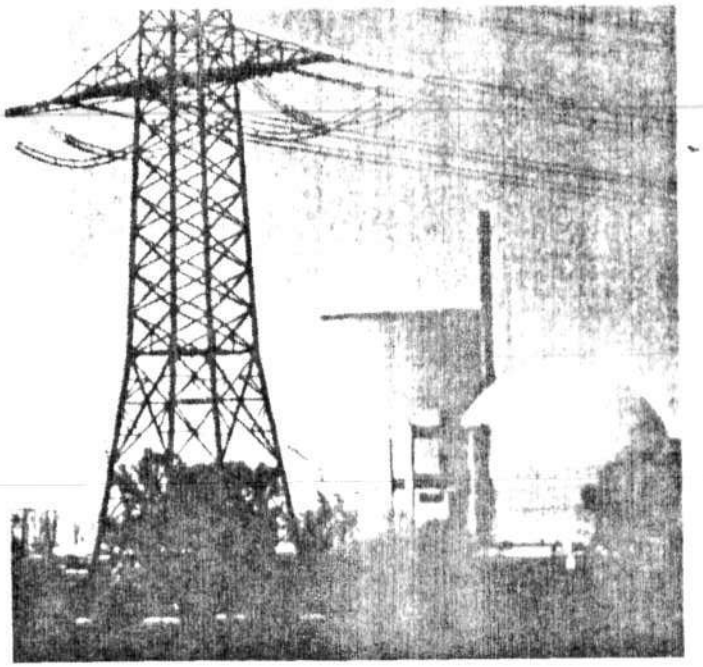
Registration Fees:

Corporation	100.00
Organizations and University Departments	50.00
Individuals	20.00
Students	10.00
Dinner, June 23—$10 (not included in registration)	

Checks are payable to
FUSION ENERGY FOUNDATION
GPO Box 1943
New York, N.Y. 10001

A Conference On SCIENCE AND TECHNOLOGICAL DEVELOPMENT:

SOLVING THE ENERGY CRISIS



Sponsored by:

The Fusion Energy Foundation

June 23, 24
Conrad Hilton Hotel
720 South Michigan Ave.
Chicago, Illinois

CONFERENCE AGENDA

Energy policy is the most important political and economic issue of 1977. An energy policy must be capable of providing the basis for a vast increase in agricultural and industrial development in both the advanced and Third World nations. Expansion of all currently available energy resources will be required, including coal, oil, gas and nuclear fission. Beyond these present energy sources, controlled thermonuclear fusion power will be the future energy source for such development programs. The development of thermonuclear fusion will require superseding the current frontiers of science.

THURSDAY, JUNE 23

Registration 8:30 AM

Welcoming Address **9:00 AM**

Session I

ADVANCED TECHNOLOGIES IN NUCLEAR ENERGY

A near-term commitment to the rapid development of fusion power will require immediate large increases in the use of existing resources. Advanced fission technologies, including the fission-fusion hybrid and fast breeder reactor, will be critical in providing the needed energy. In addition, the scientific and engineering experience of advanced fission technology is a prerequisite for commercial fusion as it poses the problems that must be solved for all advanced nuclear power.

The Transition from Fission to Fusion **9:30 AM**
Jon C. Gilberston,
Nuclear Engineer, Fusion Energy Foundation
Mr. Pardue, panelist
Batelle Laboratory, Columbus, Ohio

Lunch **12:30 PM**

Session II

PROSPECTS FOR FUSION POWER BY THE 1990s

Fusion power, providing energy in various thermal and radiative forms, will transform all aspects of the world economy — from resource definition and extraction to integrated industrial processing. Given the substantial remaining scientific and technological problems to be dealt with prior to realization of economical fusion reactors, it is necessary to utilize our accumulated experience to significantly broaden the scientific research and development program, in order to optimize the prospects for rapid convergence on viable solutions.

The Status of Fusion Research **1:30 PM**
Dr. Steven Bardwell,
Director of Plasma Physics,
Fusion Energy Foundation

Professor Finis Southworth, panelist
University of Illinois,
Nuclear Engineering Department

dinner **5:30 PM**

Keynote Address **7:00 PM**
TOWARDS AN ENERGY POLICY FOR THE UNITED STATES
There is a critical need for a policy fostering industrial growth through the high energy dense resources of fossil and nuclear power, as opposed to the current regression toward eighteenth century technologies of wood-burning, wind, solar and tides. The devastating effects of the policy of energy conservation on energy and industrial production will be addressed and contrasted with the economic impact of an energy growth policy.

Dr. Morris Levitt,
Executive Director,
Fusion Energy Foundation

FRIDAY, JUNE 24

Session III

ADVANCED TECHNOLOGIES IN AGRICULTURE AND FOSSIL FUELS

A policy of rapid energy growth will make possible the use of the most advanced technologies in agriculture, permanently solving the world's food supply problems. In this transition period we must use the most efficient available methods for fossil fuel energy production including such technologies as Magnetohydrodynamics.

Advanced Technologies and the Transition to Fusion **9:00AM**
Marsha Freeman,
Director of Industrial Research,
Fusion Energy Foundation

Panelists
Dr. Leslie Sheffield,
University of Nebraska, Extension Farm Management Specialist (Irrigation)

Calvin G. Larson,
Professional Agricultural Engineer, Chairman of Environmental and Energy Committee, San Francisco, South Bay Chapter

Dr. C. Mel Adams,
Professor at Large, Former Dean, College of Engineering, University of Cincinnati

Ruth Plant,
Biological Sciences Section,
Fusion Energy Foundation

coffee **11:00 AM**

Dr. John Dicks,
University of Tennessee Space Institute, MHD Program

And a representative from Argonne National Labs, MHD Program

Energy & Jobs in an Expanding Economy

May 9 • 10 A.M. - 9 P.M.

AT MARYGROVE COLLEGE
Library Lecture Hall
8425 W. McNichols
Detroit, Michigan

Registration: $100. Corporate
$15. Individual

9:00 AM	Registration
10:00 AM	Invocation, Keynote Address and Panel I
2:00 PM	Lunch
3:00 PM	Panel II
7:30 PM	Panel III

Please send pre-registration fees, and all information requests, to:

Fusion Energy Foundation
Midwest Headquarters
2011 Park Ave., Ste. 612
Detroit, MI 48226
(313) 964-2550

Conference Coordinator: Scott Elliott

The Fusion Energy Foundation

The Fusion Energy Foundation (FEF) was founded in November 1974 at a meeting attended by representatives of the U.S. Labor Party, the United Nations, the International Atomic Energy Agency, the U.S. Atomic Energy Commission, scientists who have made significant contributions to fusion research, and interested laymen.

Its purpose is to provide a forum of independent, high-level scientific discussion of fusion from the standpoint of comprehensive policy making. The FEF has been invited to speak at dozens of universities in North America and Europe, and to testify before numerous state and national legislative committees. As a result of this testimony, half-a-dozen state legislatures have passed bills memorializing Congress to fund an accelerated fusion development program.

The foundation publishes the monthly *Fusion* magazine summarizing and analyzing all major developments in the fusion field and other frontiers of science, and sponsors the *International Journal of Fusion Energy* to synthesize and stimulate conceptual advances in fusion-plasma research.

Furthermore, the FEF has initiated groundbreaking research in diverse areas, including plasma physics and climatology.

The Industrial Development of South Africa

conference sponsored by the Fusion Energy Foundation
May 2, 1978 • Madison Hotel • Washington, D.C.

Speakers:

Mr. Oswald T. Ndanga, Associate Professor of International Relations, Allen University, Columbia, S.C., Deputy Representative of the Patriotic Front — Z.A.N.U.

Frederick Setiz, President, Rockefeller University

Peter Vanneman, Professor, Department of Geology & Anthropology, Western Texas State University

A Representative from the Office of the League of Arab States, Washington, D.C.

Stephen Dean, U.S. Department of Energy

(affiliations are for purposes of identification only)

For further information contact: The Fusion Energy Foundation
G.P.O. Box 1943, New York, New York 10001
(212) 563-8645

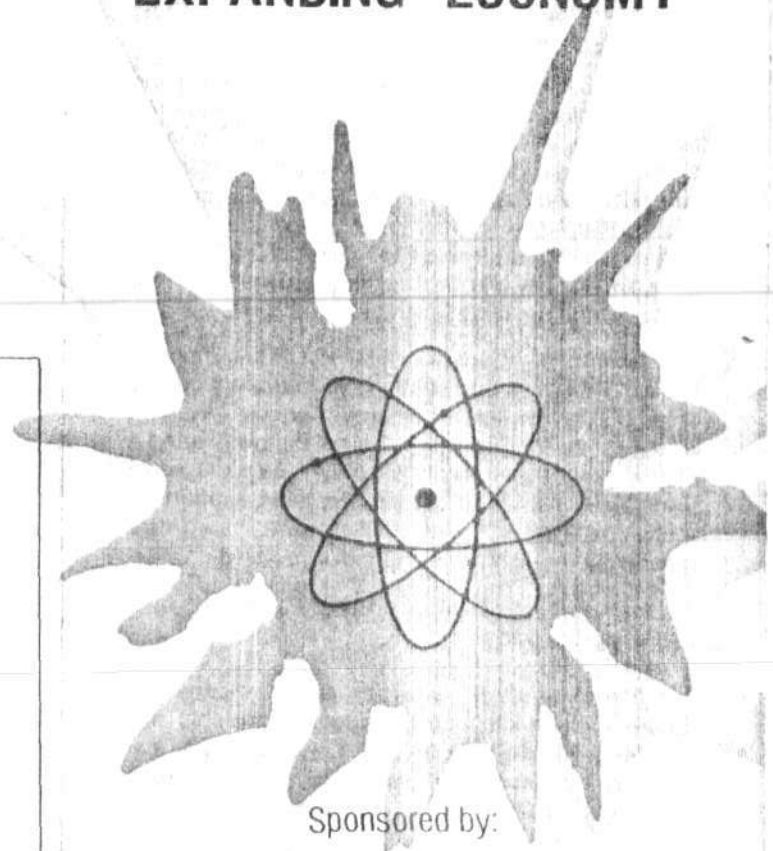
Mideast Conference Transcripts

Excerpted transcripts of the proceedings of the Conference on Middle East Peace and Development (held in New York City, Jan. 24, 1978) — $25.

Full transcripts of the Middle East Peace and Development Conference — $250.

A NATIONAL ENERGY CONFERENCE

ENERGY AND JOBS IN AN EXPANDING ECONOMY



Sponsored by:

Fusion Energy Foundation

May 9 • Detroit

Energy & Jobs in an Expanding Economy

The NAACP Energy Report of December 27, 1977, opened exciting possibilities for realignment in the national debate over economic and energy growth policies. It has initiated a new and fruitful ferment in the progrowth vs. environmentalist debate — in the industrial community and the labor movement.

This is the most critical question facing the United States. Shall we have accelerated energy production, or a conservation-oriented stagnation? Can we best create employment through labor-intensive methods, or rapid investment in high-technology production? Can the United States once again lead an invigorated world economy, or will we and our trading partners fall into protectionism and declining production?

This export question is now the center of national discussion. Leading forces are publicly recognizing the lawful interconnection between international political and financial stability and a strong American export policy. Export-Import Bank Chairman John Moore has been explicit on this connection, and the urgent need for massively lifting the Ex-Im lending ceiling.

Nuclear Energy must be the leading edge of this export boom.

The pro-growth majority of Americans can make their voice heard. Provided that this new ferment of discussion is furthered, we can achieve a renewed national commitment to technological and scientific expansion — the American way.

Energy policy is central to this debate.

The purpose and theme of this conference is to settle these questions — for the industrial community, the labor movement, and all other citizens — in this crucial election year.

PANEL I

Energy & the Economy

The health of the United States economy depends on the increasing availability of increased qualities of energy. The success of the American System of development proves that high-technology and high energy investment provide the most rapid development of the individual members of that society.

Further, U.S. exports of especially nuclear power plants and infrastructure is the central requirement for the stabilization and development of the world economy.

The implications for U.S. business and labor will also be discussed, from the standpoint of a potential U.S. export of up to 1000 gigawatts of nuclear energy production to the nations of the underdeveloped world.

PANEL II

Energy and Natural Law

Contrary to some, the U.S. Constitution is not neutral on the topic of economic growth and the material well-being of its citizens. The Constitution requires inreased rates of progress.

The recent decades' legislative and judicial action on 'environmental law' will be viewed from this standpoint.

PANEL III

Advanced Energy Technologies

Existing and potential nuclear fission and fusion technologies give us the practical means for launching a world-wide renovation of production capacities and methods.

The latest developments in fission-fusion research will be presented and analyzed, including groundbreaking discoveries made recently in the U.S. and U.S.S.R.

New technologies such as the application of Magneto-hydrodynamics (MHD) technologies will also be discussed.

Speakers:*

Dr. Arthur Farrell (Invocation) — Pastor, 9th Baptist Church of Cincinnati.

Mike Trbovich — Vice-President of the United Mine Workers of America, 1972-1977.

O.B. Falls — President, NucleDyne Corporation, former Advisor to International Atomic Energy Agency.

Henry Mills — Indiana State Chairman of the National Association for the Advancement of Colored People.

Carol White — Author of "*Energy Potential: Toward A New Electromagnetic Field Theory.*"

Bluford Moor — Chairman, Energy Committee of Engineers and Scientists of Cincinnati.

Darrell Lankford — Nuclear programs analyst, Consumers Power Company. Formerly Nuclear Informations specialist for the Tennessee Valley Authority.

Max Dean, Esq. — Attorney of Record before the U.S. Supreme Court in an Amicus Curiae brief in Consumers Power vs. Aeschliman.

Dr. Morris Levitt — Executive Director, Fusion Energy Foundation. Editor-in-Chief, *Fusion* Magazine.

Jon Gilbertson — Nuclear Safety Engineer, Advanced Technologies, Inc. formerly with Combustion Engineering.

*Organizational affiliation for identification only. Further speakers are being confirmed, and will be announced.

Fusion Energy Foundation
Suite 2404, 888 Seventh Av., N.Y., N.Y. 10019 Tel: (212) 265-3749

The FEF cordially invites you to participate in a

SPECIAL WORKSHOP

Saturday, December 15, 1979 10:00a.m. - 6:00p.m.

FEF Office, Suite 2404, 888 Seventh Av. (Access on 57th St.)

New York City, N.Y.

on

"New Physical Implications of Solutions to Nonlinear

Partial Differential Equations"

****

In the past fifteen years a new set of numerical and analytical methods for solution of nonlinear partial differential equations has been developed. These techniques have led to new and unexpected solutions to many of the classical equations of mathematical physics.

The physical implications of these new solutions have just begun to be understood. A whole new class of physical phenomena has been clarified as the result of this work. Solitons, coherent flow patterns, shock waves, and generalized vortex motion have been discovered to be the basis for a host of physical effects.

The FEF workshop will focus on the physical significance of the solutions to highly nonlinear partial differential equations.

****

Preliminary list of topics and speakers:

"Recent Results in Simulations of Fluid Dynamics"

Separate Presentations by: Dr. F. Tappert, University of Miami (Florida)
Dr. G. Deem, Bell Labs

"A Reconsideration of Riemann's Method"

Dr. U. Parpart, FEF

To: Dr. Steven Bardwell, FEF, Suite 2404, 888 Seventh Av., N.Y., N.Y. 10019

I PLAN TO ATTEND THE DEC. 15 SEMINAR ____

NAME _____

AFFILIATION _____

ADDRESS _____ PHONE _____

(212) 265-3749

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Suite 1711 • 250 West 57th Street • New York, N.Y. 10019 • (212) 265-3740

ANNUAL AWARDS DINNER Honoring:

DR. ADOLF BUSEMANN

November 6, 1981

DORAL INN HOTEL

New York City

Pioneer in Physics and Aerodynamics

Adolf Busemann is one of the most outstanding exponents of Riemann's hydrodynamic method in this century. His intellectual influence and outstanding pedagogy has penetrated deeply into all aspects of plasma physics, aerodynamics, and the theory of shock waves.

In the 1920s, Busemann worked under Ludwig Prandtl, leader of the German hydrodynamicist school. Busemann's research on the formation and propagation of shock waves led to the solution of the aerodynamic problems of flight at supersonic speeds. The extrapolation of his work on aerodynamics was taken up during his research at the German rocket laboratory at Peenemünde just before and during World War II on focused shock waves. Busemann's work during that period has had a tremendous influence on the foundations of inertial confinement fusion research.

After World War II, Busemann moved to the United States and worked with NASA at Langley Field in Virginia. There Busemann studied the forces and surface heating of space vehicles. He also directed a seminar on electrodynamics, in the course of which he made some critically important discoveries on magnetohydrodynamic vortices. Several new and promising fusion machines, like the spheromak and reversed-field pinch, are variants of Busemann's magnetohydrodynamic vortices.

Busemann, now 80 years old, is professor emeritus at the University of Colorado. He holds many distinguished honors and is a member of the U.S. Academy of Engineering.

Fusion Energy Foundation

May 13, 1981, 9 am to 5 pm **L'Enfant Plaza Hotel, Wash., D.C.**

Fusion Energy: The National Security Implications

The development of fusion energy and related technologies has become critical for the national security of the United States.

By developing fusion and applying the technology to industry, scientific breakthroughs can occur which define entirely new natural resources — thus solving the apparent dilemma of "strategic resources shortages." The danger of military conflict over dwindling resource supplies will be eliminated.

By applying fusion to the development of new weapons-systems, the military security of the United States will be greatly enhanced. The Soviet Union is thought to be engaged in weapons development of this type, and failure on the part of the United States to do so will mean unpreparedness to fight a war in the 1980s.

Because the development of fusion is so critical to American national security, a full review of this issue is required.

Luncheon Speaker:

Hon. Mike McCormack

Member, DOE Advisory Task Force; former Member of Congress

"Why We Need an Apollo-style Crash Fusion Program"

12 noon, Monet Room, L'Enfant Plaza Hotel

Session 1: What Fusion Means for the Military

9 am to 12 noon
Renior Room

Speakers:

Dr. Uwe Parpart, Director of Research, Fusion Energy Foundation;
graduate, West German Naval Academy

Dr. Frederick Tappert, Professor of Physics, University of Miami

- What are the military applications of fusion?
- How far have the Soviets advanced?
- Is the U.S. falling behind?
- How would fusion affect America's in-depth military capabilities?
- Implications of fission-fusion hybrid reactor.

Session 2: What Fusion Means for the Economy

2 pm to 5 pm
Renoir Room

Speakers:

Dr. Stephen Bardwell, Editor, Fusion magazine

Dr. George Hazelrigg, Director of Systems Engineering, Econ Inc.

Dr. James Maniscalco, Director of Fusion Engineering, TRW, Inc.

- What are the technological spinoffs from fusion?
- How quickly can fusion research payoff?
- How can fusion affect raw materials mining and processing?
- The fusion breeder, an early application of fusion that makes sense.

Registration, entire day, includes luncheon: $100
Luncheon only: $35

Please make checks payable to:
Fusion Energy Foundation
c/o 2025 Eye Street, NW, Suite 520
Washington, DC 20006

May 13, 1981, 9 am to 5 pm:
L'Enfant Plaza Hotel
L'Enfant Plaza, SW
Washington, D.C.

For more information, call:
Wash., D.C.: 202-223-5614
New York: 212-265-3749
Baltimore: 301-235-1543

FUSION ENERGY FOUNDATION

Presents: A Conference of Civic Pride and Dedication for Houston

AMERICA'S NEXT TWENTY YEARS IN SPACE: REVIVING A NATIONAL COMMITMENT TO GREATNESS

Wednesday, July 8, 1981 • Astrodome Marriott Hotel • 2100 So. Braeswood, Houston

2 P.M. -- 17-Minute NASA Film: The First Flight of the Space Shuttle

2:20 P.M. -- WHERE WE STAND NOW: OUR PROGRAM VERSUS THEIRS
Speakers: * James Hudson, Supervisor, Rockwell Industries; working in the Space Shuttle Program at Johnson Space Center
* James E. Oberg, West's leading expert on Soviet space program; author, Red Star in Orbit

7:30 P.M. -- 17-Minute NASA Film: The First Flight of the Space Shuttle

7:50 P.M. -- THE CITIZEN IN SPACE: SCIENTIFIC AND INDUSTRIAL REVOLUTION
Speakers: * Carol White, Fusion Energy Foundation; author, Energy Potential
* Dr. Krafft Ehricke, Astrophysicist and President, Space Global Corp., La Jolla, Calif; author on subject of space propulsion and industrialization
* Dr. Claude Nicollier, Mission Specialist and Representative of Switzerland to the European Space Agency.

When America successfully launched the first mission of the Space Shuttle Columbia this spring, for the first time in almost a decade the American people were uplifted with pride in anticipation of the restoration of our nation's accomplishments in advanced technology. Rekindled that day was pride in our commitment to science for the benefit of all mankind, and in restoring America's role as a beacon to other nations.

This conference is one of a national series sponsored by the Fusion Energy Foundation aimed at realizing that potential. Join us.

REGISTRATION: $25 per person
For Information: Nicholas Benton (713) 972-1714
6430 Richmond Ave. Suite 270
Houston, Tx. 77057.

JOIN THE FIGHT TO REVIVE AMERICA'S COMMITMENT TO CONQUER SPACE...
ADVERTISE YOUR BUSINESS CARD IN THE CONFERENCE PROGRAM.

Under the headline, "Congratulations Columbia, NASA, and America!" Texas members of the Fusion Energy Foundation and businesses supporting the U.S. space program are submitting their business cards to be printed in the program for the July 8 FEF conference in Houston.

Join them! For a tax-deductible contribution of $100, $250, or $1,000 your business card or business card-sized message can appear in the program, and your registration is included. Call us at (713) 972-1714, or send your card and a check to the Fusion Energy Foundation, c/o Nicholas Benton, 6430 Richmond, Suite 270, Houston 77057. Deadline is July 1.

Remember, the contribution is tax-deductible.

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Seminar

PRESIDENT REAGAN'S NEW "BEAM-WEAPONS" POLICY FOR NUCLEAR DEFENSE: IMPLICATIONS FOR EAST-WEST AND NORTH-SOUTH

--What are the defensive ABM technologies?

--How rapidly can they be developed to protect against ICBMS?

--The impact on technology transfer

--The impact on international stability and war-avoidance

--slides of ABM uses and spinoffs

sponsored by FEF.

speakers to include Paul Gallagher from FEF

and an EIR speaker.

Thursday, Mar. 31

2:30-5:00pm

United Engineering Center
Rm. 110-111

345 E. 47 St.(accross First Ave. from United Nations)

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PANEL DISCUSSION

FUSION OR FAMINE BY 2000:

THE FUSION TIMETABLE AND THE WORLD ENERGY DEFICIT

SPEAKERS

STEVEN BARDWELL, EDITOR-IN-CHIEF, FUSION MAGAZINE
UWE PARPART, DIRECTOR OF RESEARCH, FUSION ENERGY FOUNDATION
EDWIN KINTNER, FORMER DIRECTOR, US OFFICE OF FUSION ENERGY

THURSDAY, SEPT. 2
7:30 PM

BALTIMORE HILTON
EDGAR ALLAN POE ROOM

BREAKTHROUGH IN NUCLEAR FUSION:
POLARIZED FUEL MEANS "BREAKEVEN" HAS BEEN ACHIEVED

Since the oil crisis of 1973, the United States has committed itself to an energy policy based on permanent shortages, conservation, and resource control. At several critical junctures since that time, strategic policy decisions have rejected the technological and industrial potentials for producing more energy: nuclear fission development has been slowed to almost zero; the Congressional mandate for a massive nuclear fusion research program has been ignored by the Office of Management and Budget; the progress of the next generation of nuclear reactors has been almost completely stopped with the cuts in funding for the high temperature reactor and the Clinch River Breeder; and malign neglect by the government has left the nation's nuclear industry unable to compete internationally and crippled domestically.

The United States now has a second chance. Recent developments in the field of fusion energy offer us the technological possibility for achieving the cheap, clean and unlimited energy from nuclear fusion by 1995.

-over-

Scientists in research groups at Princeton Plasma Physics Laboratory and Brookhaven National Laboratory have reported the theoretical demonstration of a new type of fusion fuel, called "polarized fuel," which dramatically lowers the temperature and density requirements for fusion ignition. This new type of fuel takes advantage of the enhanced rate of fusion reactions which occur when the reacting fuel is magnetically aligned (polarized) to speed up desirable fusion reaction cycles and suppress the undesirable ones.

The use of polarized fuel relaxes the temperature and density conditions required for fusion by factors varying from 1.5 to 2.5. This means that fusion experiments now in operation have achieved sufficient temperature and density conditions to ignite polarized fuel. The long-awaited achievement of "fusion breakeven" will have been achieved as soon as these theoretical projections concerning polarized fuel have been demonstrated.

If these calculations are borne out in current experiments, commercial fusion reactors will be smaller and simpler than previously conceived; there will be better control of the reaction products, including suppression of neutron emission; and early implementation of advanced reactor designs.

The achievement of commercial energy production using nuclear fusion by the year 1995 is entirely realistic. Even before the recent developments concerning polarized fuel, the Japanese finalized their plans for a research development program which would produce a prototype 100 megawatt reactor by 1993 and commercial reactor for export by 2000. The Japanese program using this timetable is now the world's largest fusion research program. The U.S. can do no less. The prospects for the realization of the cheap and unlimited energy from fusion are even better than scientists had estimated 6 months ago.

Fusion by the year 2050--long the refrain of many Department of Energy officials--can no longer be justified either on scientific or engineering grounds. The time has come for a national commitment, enforcing the Fusion Energy Engineering Act of 1980, mandating an accelerating national fusion effort for commercial fusion by the year 2000. Not only the United States depends on this commitment--the world does as well.

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A CRASH PROGRAM TO DEVELOP ANTIMISSILE BEAM WEAPONS FOR DEPLOYMENT DURING THE 1980s

Special briefing by the Fusion Energy Foundation

Wednesday, October 26

2:00 pm to 4:00 pm

Senate Energy Committee Hearing Room
Room 366, Third Floor
Dirksen Senate Office Building

The Fusion Energy Foundation (FEF), author of the just-released book, "Beam Defense: An Alternative to Nuclear Destruction," invites you to attend a special briefing on the feasibility of a crash program to develop and deploy beam weapons within a three to five year period. The current strategic posture of the Soviet Union demands that the United States break from the doctrine of mutually assured destruction (and its cognates such as the builddown/midgetman proposals) and fully implement the policy of mutually assured survival announced by President Reagan on March 23, 1983.

The FEF will present its program, which calls for an ABM "Manhattan Project" starting at $10 billion per year. The FEF will review the continuing beam-technology results, both announced and reported, which make such a crash program feasible. The speakers will also discuss the revolutionary implications of beam technologies for the civilian economy and demonstrate that a real economic recovery can be attained only by the "science driver" effect of such a crash program.

The current strategic crisis faced by the United States and its NATO allies can only be addressed by the overthrow of MAD and the adoption of a policy which will produce a defense of the continental U.S. and Europe by 1986.

SPEAKERS

Dr. Steven Bardwell
Director, Plasma Physics Research, FEF

Col. Marc Geneste, Ret.
Vice President, Center for the Study of Total Strategy
Paris, France
Spokesman, "France and Her Army"

Paul Gallagher
Executive Director, FEF

For more information: Washington--Robert Gallagher, (202) 955-5935
New York--(212) 247-8439

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Senate Energy Committee Meeting Room
Room 366, Third Floor,
Dirksen Senate Office Building

Topics include:

- Defense of continental U.S. and Europe by 1986
- Directed energy technologies that can be developed now
- A detailed ABM "Manhattan Project" starting at $10 billion per year
- How to drive a scientific-economic recovery
- The wreckage of M.A.D., SALT and builddown: opening the window of vulnerability wider

The Soviet rejection of President Reagan's March 23 strategic proposal, makes that proposal no less essential as the core of U.S. strategic policy in the near term. Both conventional and exotic weapons capable of intercepting nuclear warheads in all their phases can be built and deployed, beginning with deployments appropriate to the cruder tasks of interception of slower-moving missiles, or defense of limited areas. Continuing beam-technology results both announced and reported demonstrate that defense of the U.S. and Europe can be taken as a goal to meet the current strategic crisis of the NATO countries.

The crash program for 3-5 year beam weapons development to be presented by FEF, was presented for the first time to an October 6, 1983 Bonn, West Germany meeting of military and political officials from Italy, Germany, and France. This will be its first presentation in Washington.

For more information: New York--Robert Gallagher, 212-247-8439
Washington--Laura Cohen, 202-955-5932