

103<sup>D</sup> CONGRESS  
2<sup>D</sup> SESSION

# H. R. 4908

To authorize the hydrogen and fusion research, development, and demonstration programs, and the high energy physics and nuclear physics programs, of the Department of Energy, and for other purposes.

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## IN THE HOUSE OF REPRESENTATIVES

AUGUST 5, 1994

Mrs. LLOYD (for herself, Mr. BOUCHER, Mr. BROWN of California, Mr. WALKER, and Mr. BOEHLERT) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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## A BILL

To authorize the hydrogen and fusion research, development, and demonstration programs, and the high energy physics and nuclear physics programs, of the Department of Energy, and for other purposes.

1       *Be it enacted by the Senate and House of Representa-*  
2       *tives of the United States of America in Congress assembled,*

3       **SECTION 1. SHORT TITLE.**

4       This Act may be cited as the “Hydrogen, Fusion, and  
5 High Energy and Nuclear Physics Research Act of 1994”.

6       **SEC. 2. GENERAL FINDINGS.**

7       The Congress finds that—

1           (1) by the year 2050, the world will need to  
2 supply between 2 and 3 times as much energy as is  
3 presently produced to meet minimum requirements  
4 for food, shelter, transportation, and economic secu-  
5 rity;

6           (2) meeting the increased energy demands of  
7 the year 2050 cannot be achieved without substan-  
8 tial environmental degradation unless there is a  
9 massive shift from dependence on fossil fuels which  
10 today provide more than three-quarters of all energy  
11 supply;

12           (3) a wide variety of nonfossil fuel energy tech-  
13 nologies must be developed to meet the expected de-  
14 mand of the year 2050;

15           (4) the Federal Government has a responsibility  
16 to fund research in energy technologies to help meet  
17 future expected energy demand where the technical  
18 or economic risks of development are too high, or  
19 the development time is too long, to be borne solely  
20 by the private sector, or where the benefits accrue  
21 to all and cannot be recouped by a private investor;  
22 and

23           (5) despite the urgent need to develop a wide  
24 variety of nonfossil energy technologies, the Federal  
25 Government's investment in all energy supply re-

1 search and development (including fossil fuels) has  
2 declined in real terms by more than two-thirds in  
3 the last 14 years.

4 **SEC. 3. DEFINITIONS.**

5 For purposes of this Act—

6 (1) the term “alternative fusion concepts”  
7 means any concepts for the production of energy  
8 based on the fusing of atomic nuclei other than to-  
9 roidal magnetic fusion concepts, including heavy ion  
10 inertial fusion, aneutronic fusion, and electrostatic  
11 fusion;

12 (2) the term “demonstration” means a dem-  
13 onstration to determine technological and economic  
14 feasibility;

15 (3) the term “Department” means the Depart-  
16 ment of Energy;

17 (4) the term “Fusion Energy Research Pro-  
18 gram” means the program described in section 203;

19 (5) the term “host country” means the country  
20 selected by the international partners as the site for  
21 the ITER facility;

22 (6) the term “international partners” means  
23 the United States, the European Atomic Energy  
24 Community, Japan, and the Russian Federation;

1           (7) the term “ITER” means the International  
2     Thermonuclear Experimental Reactor;

3           (8) the term “magnetic fusion” means fusion  
4     based on toroidal confinement concepts;

5           (9) the term “Secretary” means the Secretary  
6     of Energy; and

7           (10) the term “Tokamak Physics Experiment”  
8     means a facility to replace the Tokamak Fusion Test  
9     Reactor which is designed to be capable of conduct-  
10    ing experiments on reactions with a pulse length of  
11    at least 15 minutes and demonstrating a more com-  
12    pact and efficient magnetic fusion reactor design.

13           **TITLE I—HYDROGEN ENERGY**  
14                   **RESEARCH PROGRAM**

15    **SEC. 101. SHORT TITLE.**

16           This title may be cited as the “Hydrogen Future Act  
17    of 1994”.

18    **SEC. 102. FINDINGS.**

19           The Congress finds that—

20           (1) fossil fuels, the main energy source of the  
21     present, have provided this country with tremendous  
22     supply but are limited and polluting, and their pro-  
23     duction and utilization technologies are mature;

24           (2) the basic scientific fundamentals are needed  
25     for private sector investment and development of

1 new and better energy sources and enabling tech-  
2 nologies;

3 (3) hydrogen holds tremendous promise as a  
4 new and better energy source because it secures a  
5 practically infinite supply from water and combusts  
6 purely to water;

7 (4) hydrogen production efficiency is a major  
8 technical barrier to society collectively benefitting  
9 from one of the great energy sources of the future;

10 (5) an aggressive, results-oriented, multiyear re-  
11 search initiative on efficient hydrogen fuel produc-  
12 tion and use should continue; and

13 (6) the current Federal effort to develop hydro-  
14 gen as a fuel is inadequate.

15 **SEC. 103. PURPOSES.**

16 The purposes of this title are—

17 (1) to provide for the development and dem-  
18 onstration of the processes and technologies needed  
19 to produce, store, transport, and utilize hydrogen for  
20 transportation, industrial, residential, and utility ap-  
21 plications; and

22 (2) to foster industry participation during each  
23 stage of the Department of Energy hydrogen re-  
24 search, development, and demonstration program to

1 ensure that technology transfer to the private sector  
2 occurs to develop viable, marketable products.

3 **SEC. 104. RESEARCH, DEVELOPMENT, AND DEMONSTRATION.**  
4 **TION.**

5 (a) PROGRAM GOAL.—The goal of the program de-  
6 scribed in this section is the demonstration, by the year  
7 2000, of the practicability of utilizing hydrogen for trans-  
8 portation, industrial, residential and utility applications on  
9 a broad scale.

10 (b) PRODUCTION.—The Secretary shall support hy-  
11 drogen energy production research, development, and  
12 demonstration in the following areas, including funding  
13 for at least 1 technical demonstration in each such area:

- 14 (1) Photoconversion.
- 15 (2) Bioconversion.
- 16 (3) Electrolysis of water.

17 (c) STORAGE.—The Secretary shall support research,  
18 development, and demonstration of safe and economical  
19 storage of hydrogen, both for onboard vehicle and station-  
20 ary use. Such research, development, and demonstration  
21 should be aimed at improving existing methods and devel-  
22 oping new approaches in each of the following areas, in-  
23 cluding funding for at least 1 technical demonstration in  
24 each such area:

- 25 (1) Hydrides and porous materials.

1 (2) Liquefaction and cryogenics.

2 (3) Compressed gas, especially low-temperature  
3 dense gas.

4 (4) Advanced methods, such as iron oxide,  
5 microspheres, and phase change materials.

6 (d) USE.—The Secretary shall support hydrogen en-  
7 ergy research, development, and demonstration for each  
8 of the following uses, including funding for at least 1 tech-  
9 nical demonstration in each such area:

10 (1) Fuel cell systems for stationary applica-  
11 tions.

12 (2) Fuel cell systems for mobile applications.

13 (3) Electricity generation using hydrogen as a  
14 fuel source for utility and industrial applications.

15 (4) Heating and cooling using hydrogen.

16 (e) TRANSPORTATION.—The Secretary shall support  
17 research, development, and demonstration of safe, effi-  
18 cient, and nonpolluting hydrogen-based transportation ve-  
19 hicles of the following types, including funding for at least  
20 1 technical demonstration of each such type:

21 (1) An economically feasible, low emission  
22 motor vehicle using hydrogen as a combustible power  
23 supply, either in pure form or mixed with other  
24 fuels, in a hybrid electric vehicle using a hydrogen  
25 fuel cell.

1           (2) An economically feasible, zero emission or  
2           low emission engine using hydrogen.

3           (f) SCHEDULE.—Within 180 days after the date of  
4           enactment of this Act, the Secretary shall solicit proposals  
5           for carrying out the research and development activities  
6           authorized under this section. Awards of financial assist-  
7           ance shall be made within 1 year after such date of enact-  
8           ment.

9           (g) COST SHARING.—(1) Except as otherwise pro-  
10          vided in section 105, for research and development pro-  
11          grams carried out under this title, the Secretary shall re-  
12          quire a commitment from non-Federal sources of at least  
13          20 percent of the cost of the project. The Secretary may  
14          reduce or eliminate the non-Federal requirement under  
15          this paragraph if the Secretary determines that the re-  
16          search and development is of a basic or fundamental na-  
17          ture.

18          (2) The Secretary shall require at least 50 percent  
19          of the costs directly and specifically related to any dem-  
20          onstration project under this title to be provided from non-  
21          Federal sources. The Secretary may reduce the non-Fed-  
22          eral requirement under this paragraph if the Secretary de-  
23          termines that the reduction is necessary and appropriate  
24          considering the technological risks involved in the project

1 and is necessary to serve the purposes and goals of this  
2 title.

3 (3) In calculating the amount of the non-Federal  
4 commitment under paragraph (1) or (2), the Secretary  
5 shall include cash, personnel, services, equipment, and  
6 other resources.

7 (h) DUPLICATION OF PROGRAMS.—Nothing in this  
8 title shall require the duplication of activities carried out  
9 under otherwise authorized programs of the Department  
10 of Energy.

11 **SEC. 105. HIGHLY INNOVATIVE TECHNOLOGIES.**

12 Of the amounts made available for carrying out sec-  
13 tion 104, up to 5 percent may be used to support research  
14 on highly innovative energy technologies. Such amounts  
15 shall not be subject to the cost sharing requirements in  
16 section 104(g).

17 **SEC. 106. TECHNOLOGY TRANSFER.**

18 The Secretary shall foster the exchange of generic,  
19 nonproprietary information and technology developed pur-  
20 suant to section 104, or other similiar Federal programs,  
21 among industry, academia, and the Federal Government  
22 with regard to production and use of hydrogen.

23 **SEC. 107. REPORTS TO CONGRESS.**

24 Within 18 months after the date of enactment of this  
25 Act, and annually thereafter, the Secretary shall transmit

1 to the Congress a detailed report on the status and  
2 progress of the Department of Energy's hydrogen re-  
3 search, development, and demonstration programs. Such  
4 report shall include an analysis of the effectiveness of such  
5 programs, to be prepared and submitted by the Hydrogen  
6 Technical Advisory Panel established under section 108  
7 of the Spark M. Matsunaga Hydrogen Research, Develop-  
8 ment, and Demonstration Act of 1990. Such Panel shall  
9 also make recommendations for improvements to such  
10 programs if needed, including recommendations for addi-  
11 tional legislation.

12 **SEC. 108. COORDINATION AND CONSULTATION.**

13 (a) COORDINATION WITH OTHER FEDERAL AGEN-  
14 CIES.—The Secretary shall coordinate all hydrogen re-  
15 search, development, and demonstration activities with  
16 other Federal agencies involved in similar research, devel-  
17 opment, and demonstration, including the Department of  
18 Defense and the National Aeronautics and Space Adminis-  
19 tration.

20 (b) CONSULTATION.—The Secretary shall consult  
21 with the Hydrogen Technical Advisory Panel established  
22 under section 108 of the Spark M. Matsunaga Hydrogen  
23 Research, Development, and Demonstration Act of 1990  
24 as necessary in carrying out this title.

1 **SEC. 109. REPEAL.**

2 Sections 104 and 105 of the Spark M. Matsunaga  
3 Hydrogen Research, Development, and Demonstration Act  
4 of 1990 are repealed.

5 **SEC. 110. AUTHORIZATION OF APPROPRIATIONS.**

6 (a) GENERAL AUTHORIZATION.—There are author-  
7 ized to be appropriated, to carry out the purposes of this  
8 title, in addition to any amounts made available for such  
9 purposes under other Acts—

10 (1) \$12,000,000 for fiscal year 1995;

11 (2) \$20,000,000 for fiscal year 1996;

12 (3) \$40,000,000 for fiscal year 1997; and

13 (4) \$60,000,000 for fiscal year 1998.

14 (b) RELATED AUTHORIZATIONS.—For each fiscal  
15 year from 1995 through 1998, the total amount author-  
16 ized to be appropriated for Energy Supply Research and  
17 Development Activities shall not exceed \$3,302,170,000.

18 **TITLE II—FUSION ENERGY**  
19 **RESEARCH PROGRAM**

20 **SEC. 201. FINDINGS.**

21 The Congress finds that—

22 (1) fusion energy is one of the nonfossil fuel  
23 technologies which could potentially provide safe,  
24 abundant, environmentally sound, secure, and af-  
25 fordable energy supplies in the future;

1           (2) in the last 16 years, fusion energy research-  
2           ers have made significant progress toward realizing  
3           magnetic fusion as a viable source of energy, in-  
4           creasing power production from test reactors more  
5           than a million-fold over that time period;

6           (3) while significant engineering, technical, and  
7           scientific challenges remain to make fusion energy  
8           commercially viable, limited funding remains the pri-  
9           mary constraint to more rapid progress;

10          (4) the technical risks and the long time scale  
11          needed to demonstrate the commercial viability of  
12          fusion energy will likely require a stable, predictable,  
13          and sustained investment of government funding for  
14          decades to come;

15          (5) while magnetic fusion is the leading fusion  
16          technology, research on alternative fusion concepts  
17          should continue to be supported;

18          (6) opportunities to participate in international  
19          fusion experiments can dramatically lower the cost  
20          to the Federal Government of fusion energy re-  
21          search;

22          (7) the United States must demonstrate that it  
23          is a credible partner in international scientific pro-  
24          grams by being able to make and keep long-term  
25          commitments to funding and participation; and

1           (8) the United States should commit to partici-  
2           pating in the siting, construction, and operation of  
3           ITER as soon as practicable.

4 **SEC. 202. PURPOSES.**

5           The purposes of this title are—

6           (1) to provide direction and authorize appro-  
7           priations for a broadly based fusion energy research,  
8           development, and demonstration program;

9           (2) to ensure that alternative fusion concepts  
10          receive adequate funding and management attention  
11          from the Department of Energy;

12          (3) to provide an accelerated commitment to  
13          United States participation in ITER and provide au-  
14          thorization of appropriations for such activity con-  
15          tingent on meeting program milestones; and

16          (4) to provide for the selection of a host coun-  
17          try and establish a site selection process for ITER.

18 **SEC. 203. FUSION ENERGY RESEARCH PROGRAM.**

19          (a) FUSION PROGRAM.—The Secretary shall carry  
20          out in accordance with the provisions of this title a Fusion  
21          Energy Research Program, including research, develop-  
22          ment, and demonstration to demonstrate the technical and  
23          economic feasibility of producing safe, environmentally  
24          sound, and affordable energy from fusion.

1           (b) PROGRAM GOALS.—The goals of the Fusion En-  
2   ergy Research Program are to demonstrate by the year  
3   2010 the practicability of commercial electric power pro-  
4   duction and to lead to commercial production of fusion  
5   energy by the year 2040.

6           (c) PROGRAM ELEMENTS.—The Fusion Energy Re-  
7   search Program shall consist of the following elements:

8           (1) Research, development, and demonstration  
9           on magnetic fusion energy technology, including—

10                   (A) research on plasma physics and con-  
11                   trol, confinement, ignition, and burning;

12                   (B) the design, construction, and operation  
13                   of experimental fusion reactors, including the  
14                   Tokamak Physics Experiment, and the develop-  
15                   ment of special materials for such reactors, the  
16                   facilities to develop such materials, and the de-  
17                   velopment of components which support the op-  
18                   eration of such reactors, such as diagnostic and  
19                   remote maintenance equipment; and

20                   (C) participation by the United States in-  
21                   dustrial sector in the design and construction of  
22                   fusion reactors, and cooperation with utilities.

23           (2) Research, development, and demonstration  
24           of alternative fusion concepts, to be administered  
25           through a Program Director for Alternative Fusion

1 Research, including research and development need-  
2 ed to build and test an Induction Linac Systems Ex-  
3 periment, and for systems engineering and design of  
4 a prototype inertial fusion energy power plant suit-  
5 able for the eventual development of a heavy ion  
6 based commercial power plant, for the purpose of  
7 developing heavy ion inertial fusion energy.

8 (3) Participation in the design, construction,  
9 and operation of ITER with the goal of ITER be-  
10 coming operational by the year 2005.

11 **SEC. 204. INDEPENDENT REVIEW OF FUSION TECH-**  
12 **NOLOGIES.**

13 Within 6 months after the date of enactment of this  
14 Act, the Secretary shall contract with the National Acad-  
15 emy of Sciences to conduct a study, to be completed within  
16 18 months after such contract is executed, which—

17 (1) examines the various magnetic fusion tech-  
18 nologies and alternative fusion concepts to assess  
19 their current state of development;

20 (2) evaluates the potential of such technologies  
21 and concepts to become commercially viable sources  
22 of energy in the future;

23 (3) identifies research and development goals  
24 and priorities, and the range of probable costs and

1 time scales needed to achieve commercial viability;  
2 and

3 (4) reviews facilities formerly proposed by the  
4 Department of Energy for construction during the  
5 past 10 years, comparing their proposed capabilities  
6 and the justification offered for such proposals with  
7 the rationale for the subsequent withdrawal of the  
8 proposals.

9 **SEC. 205. NATIONAL ACADEMY OF SCIENCES STUDY.**

10 Within 6 months after the date of enactment of this  
11 Act, the Secretary shall contract with the National Acad-  
12 emy of Sciences to conduct a study, to be completed within  
13 18 months after such contract is executed, which examines  
14 the status and promise of other energy sources, including  
15 deuterated metal, and improvements in the efficient use  
16 of energy which could affect our national energy needs on  
17 the same time scale and quantity as projected fusion en-  
18 ergy development, and which identifies priorities for re-  
19 search on other energy sources and energy-efficient de-  
20 vices and practices.

21 **SEC. 206. ITER SITE SELECTION PROCESS.**

22 (a) ITER STUDY AND REPORT.—Within 120 days  
23 after the date of enactment of this Act, the Secretary shall  
24 submit to Congress a study which compares the technical  
25 and scientific advantages and disadvantages and the eco-

1 nomic costs and benefits to the United States of siting  
2 ITER in the United States with siting ITER outside of  
3 the United States. Such study shall include the consider-  
4 ation of the impact on employment of constructing ITER  
5 in the United States, the effect of manufacturing major  
6 ITER subsystems (such as superconducting magnets) in  
7 the United States, and the effect of siting on United  
8 States funding requirements for participation in ITER.

9 (b) HOST-COUNTRY SELECTION.—The Secretary  
10 shall seek to reach an agreement with the international  
11 partners which provides for—

12 (1) the selection of a host country in which to  
13 site ITER by October, 1995;

14 (2) the equitable distribution of economic and  
15 technological benefits among the international part-  
16 ners, including the siting and construction of ITER  
17 and related facilities and the manufacture of major  
18 ITER subsystems;

19 (3) substantial United States industry and util-  
20 ity involvement in the design, construction, and op-  
21 eration of ITER to ensure United States industry  
22 and utility expertise in the technologies developed;  
23 and

24 (4) a schedule to complete site-specific design  
25 activities by 1998.

1 (c) UNITED STATES SITE SELECTION.—The Sec-  
2 retary shall—

3 (1) immediately initiate a process for identify-  
4 ing candidate sites within the United States which  
5 meet the site requirements for the construction and  
6 operation of ITER; and

7 (2) propose within 90 days after the date of en-  
8 actment of this Act a process for selection of a site  
9 within the United States by June, 1996, if the Unit-  
10 ed States is selected as the host country for ITER  
11 pursuant to the international agreement described in  
12 subsection (b).

13 (d) FINAL COST ESTIMATE.—The Secretary shall  
14 provide to Congress, within 90 days following the comple-  
15 tion of site-specific design activities, a detailed estimate  
16 of the final projected total cost and cost to the United  
17 States of the construction and operation of ITER based  
18 on final site-specific engineering and construction designs.

19 **SEC. 207. REPORTS AND MISCELLANEOUS PROVISIONS.**

20 (a) CONTINGENCY PLAN.—Within 120 days after the  
21 date of enactment of this Act, the Secretary shall submit  
22 to Congress a report on the feasibility of conducting a par-  
23 allel design effort on the Tokamak Physics Experiment to  
24 augment the capabilities of or accelerate construction of  
25 the Tokamak Physics Experiment in the event that an

1 international agreement cannot be reached on the site se-  
2 lection or construction of ITER.

3 (b) PROGRAM REPORT.—Within 180 days after the  
4 date of enactment of this Act, and biennially thereafter,  
5 the Secretary shall prepare and submit to the Congress  
6 a report on the Fusion Energy Research Program and the  
7 progress it has made in meeting the goals and require-  
8 ments of this title.

9 (c) CONSULTATION.—(1) In consultation with the  
10 Secretary of Defense, the Secretary shall review the re-  
11 search and development activities of the defense Inertial  
12 Confinement Fusion Program to determine the potential  
13 of such activities to contribute to the civilian Inertial Fu-  
14 sion Energy Program.

15 (2) Within 120 days after the date of enactment of  
16 this Act, the Secretary, in consultation with the Secretary  
17 of Defense, shall submit a report to Congress with rec-  
18 ommendations for sharing budget and other resources in  
19 order to enhance the civilian energy applications of the  
20 defense Inertial Confinement Fusion Program.

21 (d) DUPLICATION OF ACTIVITIES.—Nothing in this  
22 title shall require the duplication of activities carried out  
23 under otherwise authorized programs of the Department  
24 of Energy.

1 **SEC. 208. AUTHORIZATION OF APPROPRIATIONS.**

2 (a) FUSION ENERGY RESEARCH PROGRAM.—There  
3 are authorized to be appropriated to the Secretary for car-  
4 rying out the Fusion Energy Research Program  
5 \$376,563,000 for fiscal 1995, \$425,000,000 for fiscal  
6 year 1996, and \$475,000,000 for fiscal year 1997.

7 (b) ALTERNATIVE FUSION RESEARCH.—From the  
8 sums authorized in subsection (a), there are authorized  
9 to be appropriated to the Secretary for carrying out the  
10 Alternative Fusion Research Program under section  
11 203(c)(2)—

12 (1) \$10,000,000 for fiscal year 1995 for the In-  
13 duction Linac Systems Experiment project and re-  
14 lated base programs, and for the engineering and  
15 design of a prototype inertial fusion energy power  
16 plant;

17 (2) \$30,000,000 for fiscal year 1996, of  
18 which—

19 (A) not more than \$20,000,000 shall be  
20 for the Induction Linac Systems Experiment  
21 project and related base programs; and

22 (B) not more than \$5,000,000 shall be for  
23 the engineering and design of a prototype iner-  
24 tial fusion energy power plant; and

25 (3) \$33,000,000 for fiscal year 1997, of  
26 which—

1 (A) not more than \$20,000,000 shall be  
2 for the Induction Linac Systems Experiment  
3 project and related base programs; and

4 (B) not more than \$5,000,000 shall be for  
5 the engineering and design of a prototype iner-  
6 tial fusion energy power plant.

7 (c) TOKAMAK PHYSICS EXPERIMENT.—(1) Except as  
8 provided in paragraph (2), there are authorized to be ap-  
9 propriated to the Secretary for the period encompassing  
10 fiscal years 1995 through 2000 not to exceed  
11 \$700,000,000, to complete the design, development, and  
12 construction of the Tokamak Physics Experiment.

13 (2) None of the funds are authorized to be appro-  
14 priated for any fiscal year under paragraph (1) unless,  
15 within 60 days after the submission of the President's  
16 budget request for that fiscal year, the Secretary—

17 (A) certifies to the Congress that—

18 (i) the technical goals of the design, devel-  
19 opment, and construction are being met;

20 (ii) the design, development, and construc-  
21 tion can be completed without further author-  
22 ization of appropriations beyond amounts au-  
23 thorized under paragraph (1); and

1 (iii) the design, development, and construc-  
2 tion can be completed by the end of fiscal year  
3 2000; or

4 (B) submits to the Congress a report which de-  
5 scribes—

6 (i) the circumstances which prevent a cer-  
7 tification under subparagraph (A);

8 (ii) remedial actions undertaken or to be  
9 undertaken with respect to such circumstances;  
10 and

11 (iii) a justification for proceeding with the  
12 program, if appropriate.

13 (d) CONSTRUCTION OF ITER.—No funds are author-  
14 ized for the construction of ITER.

15 (e) LIMITATION ON MAGNETIC FUSION FACILI-  
16 TIES.—No funds are authorized for the design, engineer-  
17 ing, or construction of any magnetic fusion facility other  
18 than ITER, facilities related to ITER, and the Tokamak  
19 Physics Experiment.

20 **SEC. 209. REPEAL OF ADVISORY COMMITTEE.**

21 Section 7 of the Magnetic Fusion Energy Engineer-  
22 ing Act of 1980 (42 U.S.C. 9306), authorizing the Tech-  
23 nical Panel on Magnetic Fusion, is repealed.

1     **TITLE III—HIGH ENERGY AND**  
2                   **NUCLEAR PHYSICS**

3     **SEC. 301. SHORT TITLE.**

4           This title may be cited as the “Department of Energy  
5 High Energy and Nuclear Physics Authorization Act of  
6 1994”.

7     **SEC. 302. DEFINITIONS.**

8           For the purposes of this title—

9                   (1) the term “CERN” means the European Or-  
10                   ganization for Nuclear Research;

11                   (2) the term “construction” means all activities  
12                   necessary for completion of a project and its sup-  
13                   porting infrastructure, and includes conventional  
14                   construction and the fabrication, installation, test-  
15                   ing, and preoperation of technical systems;

16                   (3) the term “conventional construction” means  
17                   the design and construction of civil works, facilities,  
18                   and other infrastructure necessary to construct a  
19                   project, including tunnels, buildings, and roads, nec-  
20                   essary to house and support the technical systems,  
21                   and utilities as necessary for the direct support of  
22                   elements of a project; and

23                   (4) the term “Large Hadron Collider project”  
24                   means the Large Hadron Collider project at CERN.

1 **SEC. 303. AUTHORIZATION OF APPROPRIATIONS.**

2 (a) HIGH ENERGY PHYSICS.—There are authorized  
3 to be appropriated to the Secretary for high energy phys-  
4 ics activities of the Department—

5 (1) \$695,400,000 for fiscal year 1996;

6 (2) \$719,700,000 for fiscal year 1997;

7 (3) \$744,900,000 for fiscal year 1998; and

8 (4) \$713,600,000 for fiscal year 1999.

9 Funds authorized under paragraphs (1) through (4) may  
10 be expended for the B-factory at the Stanford Linear Ac-  
11 celerator Center and the Fermilab Main Injector. Funds  
12 may also be expended for research, development, and plan-  
13 ning for the Large Hadron Collider and its associated de-  
14 tectors. No funds are authorized for United States partici-  
15 pation in the construction and operation of the Large  
16 Hadron Collider project until the Secretary certifies to the  
17 Congress that there is an international agreement that in-  
18 cludes the provisions described in section 304(a).

19 (b) NUCLEAR PHYSICS.—There are authorized to be  
20 appropriated to the Secretary for nuclear physics activities  
21 of the Department—

22 (1) \$337,100,000 for fiscal year 1996;

23 (2) \$348,900,000 for fiscal year 1997;

24 (3) \$361,100,000 for fiscal year 1998; and

25 (4) \$373,700,000 for fiscal year 1999.

1 None of the funds authorized under paragraph (2), (3),  
2 or (4) are authorized to be appropriated for facility oper-  
3 ations of the Los Alamos Meson Physics Facility. Funds  
4 authorized under paragraphs (1) through (4) may be ex-  
5 pended for the Relativistic Heavy Ion Collider at  
6 Brookhaven National Laboratory.

7 (c) LIMITATION ON MAJOR CONSTRUCTION  
8 PROJECTS.—No funds may be expended for the construc-  
9 tion and operation of any high energy and nuclear physics  
10 facility construction project of the Department, with total  
11 project expenditures projected to be in excess of  
12 \$100,000,000, unless funds are specifically authorized for  
13 such purposes in an Act that is not an appropriations Act.  
14 Funds authorized under subsections (a) and (b) may be  
15 expended for preliminary research, development, and plan-  
16 ning for such projects.

17 **SEC. 304. THE LARGE HADRON COLLIDER PROJECT.**

18 (a) NEGOTIATIONS.—The Secretary, in consultation  
19 with the Director of the National Science Foundation and  
20 the Secretary of State, shall enter into negotiations with  
21 CERN concerning United States participation in the plan-  
22 ning and construction of the Large Hadron Collider  
23 project, and shall ensure that any agreement incorporates  
24 provisions to protect the United States investment in the  
25 project, including provisions for—

1           (1) fair allocation of costs and benefits among  
2 project participants;

3           (2) a limitation on the amount of United States  
4 contribution to project construction and an estimate  
5 of the United States contribution to subsequent op-  
6 erating costs;

7           (3) a cost and schedule control system for the  
8 total project;

9           (4) a preliminary statement of costs and the  
10 schedule for all component design, testing, and fab-  
11 rication, including technical goals and milestones,  
12 and a final statement of such costs and schedule  
13 within 1 year after the date on which the parties  
14 enter into the agreement;

15           (5) a preliminary statement of costs and the  
16 schedule for total project construction and operation,  
17 including technical goals and milestones, and a final  
18 statement of such costs and schedule within 1 year  
19 after the date on which the parties enter into the  
20 agreement;

21           (6) reconsideration of the extent of United  
22 States participation if technical or operational mile-  
23 stones described in paragraphs (4) and (5) are not  
24 met, or if the project falls significantly behind sched-  
25 ule;

1 (7) conditions of access for United States and  
2 other scientists to the facility; and

3 (8) a process for addressing international co-  
4 ordination and cost sharing on high energy physics  
5 projects beyond the Large Hadron Collider.

6 (b) OTHER INTERNATIONAL NEGOTIATIONS.—Noth-  
7 ing in this Act shall be construed to preclude the President  
8 from entering into negotiations with respect to inter-  
9 national science agreements.

10 (c) REQUIREMENT.—The Director of the Office of  
11 Science and Technology Policy shall report, within 3  
12 months after the date of enactment of this Act, to the  
13 Committee on Science, Space, and Technology of the  
14 House of Representatives and to the Committee on Com-  
15 merce, Science, and Transportation of the Senate on spe-  
16 cific goals for international coordination in megascience  
17 projects, including an action plan needed to achieve these  
18 goals. The action plan shall address such issues as cost  
19 sharing and financial support, site location, access, and  
20 management of megascience facilities.

21 **SEC. 305. OPERATING PLAN.**

22 Within 30 days after the date of the enactment of  
23 any Act appropriating funds for the high energy or nuclear  
24 physics activities of the Department, the Secretary shall  
25 transmit to the Committee on Science, Space, and Tech-

1 nology of the House of Representatives and the Committee  
2 on Energy and Natural Resources of the Senate a plan  
3 for the operations of the high energy and nuclear physics  
4 activities of the Department, as adjusted to reflect the  
5 amounts appropriated for such purposes by such Act.

6 **SEC. 306. LONG-RANGE PLANNING AND GOVERNANCE.**

7 (a) PROGRAM GOVERNANCE REVIEW.—

8 (1) REQUIREMENT.—The Secretary shall con-  
9 tract with an appropriate independent organization  
10 to review the governance of all elements of the De-  
11 partment’s high energy and nuclear physics pro-  
12 grams. Such review shall include—

13 (A) an evaluation of the staff allocation  
14 and funding balance among facility operations,  
15 construction, and research support; and

16 (B) an analysis of the extent to which the  
17 Department’s high energy and nuclear physics  
18 advisory groups represent the diversity of, and  
19 the full range of interests among, high energy  
20 and nuclear physics researchers.

21 (2) REPORT TO CONGRESS.—The Secretary  
22 shall submit a report to Congress within 18 months  
23 after the date of enactment of this Act detailing the  
24 results of the review required by this section, includ-

1 ing recommendations for implementing the results  
2 and schedules for such implementation.

3 (b) LONG-RANGE PLAN.—

4 (1) REQUIREMENT.—The Secretary, in con-  
5 sultation with the high energy and nuclear physics  
6 communities, shall prepare a long-range plan for the  
7 Department of Energy high energy and nuclear  
8 physics programs based on current and projected  
9 program funding levels. The Secretary shall coordi-  
10 nate the preparation of the plan with the Director  
11 of the National Science Foundation, as appropriate,  
12 to ensure that long-range planning efforts and objec-  
13 tives for the entire Federal high energy and nuclear  
14 physics program are appropriately integrated. The  
15 plan shall be modified every 3 years. The long-range  
16 plan shall include—

17 (A) a list of research opportunities to be  
18 pursued, including both ongoing and proposed  
19 activities, listed in order of priority;

20 (B) an analysis of the relevance of each re-  
21 search facility to the research opportunities list-  
22 ed under subparagraph (A);

23 (C) a statement of the optimal balance for  
24 the fiscal year in which the report is submitted  
25 among facility operations, construction, and re-

1 search support and the optimal balance between  
2 university and laboratory research programs;

3 (D) schedules for continuation, consolida-  
4 tion, or termination of each major category of  
5 research programs, and continuation, upgrade,  
6 transfer, or closure of each research facility;

7 (E) a statement by project of efforts to co-  
8 ordinate research projects with the international  
9 community to maximize the use of limited re-  
10 sources and avoid unproductive duplication of  
11 efforts;

12 (F) a description of the extent to which the  
13 plan modifications differ from previous plans  
14 submitted under this subsection, along with an  
15 explanation for such differences; and

16 (G) an estimate of—

17 (i) the number of scientists and grad-  
18 uate students being supported by Federal  
19 high energy and nuclear physics programs;  
20 and

21 (ii) the number of scientists and grad-  
22 uate students needed to carry out produc-  
23 tive and sustainable research programs in  
24 these fields over the next 10 years.

1           (2) REPORTS TO CONGRESS.—(A) The Sec-  
2       retary shall transmit a copy of the original long-  
3       range plan with the President’s annual budget re-  
4       quest to Congress for fiscal year 1997. The plan as  
5       modified shall be submitted with the President’s  
6       budget request to Congress for every third fiscal  
7       year thereafter.

8           (B) The Secretary shall transmit with the  
9       President’s budget request to Congress each year a  
10      report demonstrating the consistency of the current  
11      long-range plan with the budget being requested for  
12      the Department’s high energy and nuclear physics  
13      programs.

14          (c) CAPITAL BUDGET ACCOUNT.—Each of the Presi-  
15      dent’s annual budget requests to the Congress for high  
16      energy physics activities of the Department, and for nu-  
17      clear physics activities of the Department, shall distin-  
18      guish between the budget for capital expenditures, includ-  
19      ing all ongoing and planned major construction and cap-  
20      ital equipment items, and other activities.

21           **TITLE IV—MISCELLANEOUS**  
22           **PROVISIONS**

23      **SEC. 401. UNIVERSITY RADIATION SCIENCE AND TECH-**  
24           **NOLOGY.**

25          (a) FINDINGS.—The Congress finds that—

1           (1) the future of fusion energy and advanced  
2 nuclear energy technology research and development  
3 programs will rely heavily on a healthy and vibrant  
4 university-based radiation science and nuclear engi-  
5 neering academic program;

6           (2) nuclear engineering is a broad, diverse field  
7 with unique academic requirements, including math-  
8 ematics, physics, reactor engineering, nuclear mate-  
9 rials, radiation protection, and reactivity control and  
10 operations;

11          (3) nuclear engineering academic programs at  
12 both undergraduate and graduate levels have de-  
13 clined in terms of the number of students enrolling  
14 in such programs, the number of schools offering  
15 such programs, and the number of research reactors  
16 available on university campuses;

17          (4) the existing nuclear technical community  
18 and faculties are aging, and new, younger graduates  
19 are not entering the field, threatening the United  
20 States technological superiority in this area;

21          (5) a robust, long-term fusion program will be  
22 dependent on the availability of properly trained sci-  
23 entific experts to carry on the program from the cur-  
24 rent leaders in the field;

1           (6) in the 1950s and 1960s, the Federal Gov-  
2           ernment was instrumental in founding and funding  
3           the University Research Reactor program and the  
4           Nuclear Engineering Education and Research pro-  
5           gram, and as a primary user of the graduates of  
6           these programs, continued strong support for these  
7           programs for decades;

8           (7) the decline of Federal support for these pro-  
9           grams has forced many universities to close down re-  
10          search reactors and seriously erode the accompany-  
11          ing academic programs;

12          (8) the current condition of the university re-  
13          search reactors needs attention and funding to up-  
14          grade instrumentation and safety features; and

15          (9) the Federal Government should continue its  
16          fuel assistance program in order to avert further  
17          hardships to the universities.

18          (b) PURPOSES.—The purposes of this section are  
19          to—

20                (1) provide Federal support and maintain and  
21                upgrade the Nation’s Nuclear Engineering Edu-  
22                cation and Research and University Research Reac-  
23                tor programs, while continuing the University Reac-  
24                tor Fuel Assistance program;

1           (2) combine these programs into a comprehen-  
2           sive and cohesive national program which will sup-  
3           port the future needs of the Nation across many sci-  
4           entific and technological disciplines; and

5           (3) provide the nuclear engineering education  
6           and university research reactor academic community  
7           opportunities to consult and cooperate with the De-  
8           partment of Energy and the national laboratories in  
9           the decisionmaking and priority setting processes.

10          (c) PROGRAM DIRECTION.—

11           (1) COMBINING OF PROGRAMS.—The Secretary  
12           shall combine the Nuclear Engineering Research and  
13           Education program, the University Research Reac-  
14           tor program, and the University Reactor Fuel As-  
15           sistance program to form a new University Radi-  
16           ation Science and Technology program to be in-  
17           cluded as a separate and distinct part of the Univer-  
18           sity and Science Education program.

19           (2) COLLABORATION.—The Secretary, in devel-  
20           oping the annual budget request and program plan  
21           for the University Radiation Science and Technology  
22           program, shall collaborate with the university radi-  
23           ation science and technology community (including  
24           academia, professional societies, and the national  
25           laboratories).

1 (d) REPORTS.—

2 (1) COMPREHENSIVE PLAN.—The Secretary  
3 shall request the Nuclear Engineering Education  
4 Department Heads Organization and the National  
5 Organization of Test, Research, and Training Reac-  
6 tors to submit, within 60 days after the date of en-  
7 actment of this Act, to the Congress and the Sec-  
8 retary a minimum of a 5-year comprehensive na-  
9 tional plan for the University Radiation Science and  
10 Technology program. Such plan shall include com-  
11 ments from industry and all appropriate professional  
12 societies.

13 (2) PROGRAM PROPOSAL.—Within 120 days  
14 after the submittal of the plan under paragraph (1),  
15 the Secretary shall submit to the Congress a Univer-  
16 sity Radiation Science and Technology program pro-  
17 posal, which shall incorporate the plan submitted  
18 under paragraph (1) and shall include comments  
19 from the National Academy of Sciences regarding  
20 the completeness of the program proposal.

21 (e) AUTHORIZATION OF APPROPRIATIONS.—There  
22 are authorized to be appropriated to the Secretary for car-  
23 rying out the University Radiation Science and Tech-  
24 nology Program \$25,000,000 for fiscal year 1995,

1 \$25,000,000 for fiscal year 1996, and \$25,000,000 for fis-  
2 cal year 1997.

3 **SEC. 402. LIMITATION ON APPROPRIATIONS.**

4 Notwithstanding any other provision of law, no funds  
5 are authorized to be appropriated for carrying out the pro-  
6 grams for which funds are authorized by this Act for any  
7 fiscal year other than as provided by this Act.

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HR 4908 IH——2

HR 4908 IH——3