

109TH CONGRESS
1ST SESSION

S. _____

To improve the global competitiveness of the United States in science and energy technology, to strengthen basic research programs at the Department of Energy, and to provide support for mathematics and science education at all levels through the resources available through the Department of Energy, including at the National Laboratories.

IN THE SENATE OF THE UNITED STATES

Mr. DOMENICI (for himself, Mr. BINGAMAN, Mr. ALEXANDER, Ms. MIKULSKI, Mr. LUGAR, Mr. DODD, Mr. HATCH, Mr. OBAMA, Mr. WARNER, Mr. LIEBERMAN, Mr. BOND, Mrs. MURRAY, Mr. BURNS, Mr. BAYH, Mr. CRAIG, Ms. CANTWELL, Mrs. HUTCHISON, Mr. MENENDEZ, Mr. DEWINE, Mr. KOHL, Mr. THOMAS, Mr. KERRY, Mr. SMITH, Mr. NELSON of Florida, Mr. VOINOVICH, Mr. LEAHY, Mr. ALLEN, Mr. AKAKA, Mr. TALENT, Mrs. CLINTON, Mr. CHAMBLISS, Ms. STABENOW, Mr. CORNYN, Mr. DAYTON, Mr. COLEMAN, and Mr. MARTINEZ) introduced the following bill; which was read twice and referred to the Committee on

A BILL

To improve the global competitiveness of the United States in science and energy technology, to strengthen basic research programs at the Department of Energy, and to provide support for mathematics and science education at all levels through the resources available through the Department of Energy, including at the National Laboratories.

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 “Protecting America’s
5 Competitive Edge Through Energy Act of 2006” or the
6 “PACE-Energy Act”.

7 **SEC. 2. MATHEMATICS, SCIENCE, AND ENGINEERING EDU-**
8 **CATION AT THE DEPARTMENT OF ENERGY.**

9 (a) SCIENCE EDUCATION PROGRAMS.—Section 3164
10 of the Department of Energy Science Education Enhance-
11 ment Act (42 U.S.C. 7381a) is amended—

12 (1) by redesignating subsections (b) through (d)
13 as subsections (c) through (e), respectively;

14 (2) by inserting after subsection (a) the fol-
15 lowing:

16 “(b) ORGANIZATION OF MATHEMATICS, SCIENCE,
17 AND ENGINEERING EDUCATION PROGRAMS.—

18 “(1) DIRECTOR OF MATHEMATICS, SCIENCE
19 AND ENGINEERING EDUCATION.—The Secretary,
20 acting through the Under Secretary for Science (re-
21 ferred to in this subsection as the ‘Under Sec-
22 retary’), shall appoint a Director of Mathematics,
23 Science, and Engineering Education (referred to in
24 this subsection as the ‘Director’) with the principal
25 responsibility for administering mathematics,

1 science, and engineering education programs of the
2 Department.

3 “(2) QUALIFICATIONS.—The Director shall be
4 an individual, who by reason of professional back-
5 ground and experience, is specially qualified to ad-
6 vise the Under Secretary on all matters pertaining
7 to mathematics, science, and engineering education
8 at the Department.

9 “(3) DUTIES.—The Director shall—

10 “(A) oversee all mathematics, science, and
11 engineering education programs of the Depart-
12 ment;

13 “(B) represent the Department as the
14 principal interagency liaison for all mathe-
15 matics, science, and engineering education pro-
16 grams, unless otherwise represented by the Sec-
17 retary or the Under Secretary;

18 “(C) prepare the annual budget and advise
19 the Under Secretary on all budgetary issues for
20 mathematics, science, and engineering edu-
21 cation programs of the Department; and

22 “(D) perform other such matters related to
23 mathematics, science, and engineering edu-
24 cation as are required by the Secretary or the
25 Under Secretary.

1 “(4) STAFF AND OTHER RESOURCES.—The
2 Secretary shall assign to the Director such personnel
3 and other resources as the Secretary considers nec-
4 essary to permit the Director to carry out the duties
5 of the Director.

6 “(5) ASSESSMENT.—The Secretary shall offer
7 to enter into a contract with the National Academy
8 of Sciences under which the National Academy, not
9 later than 5 years after, and not later than 10 years
10 after, the date of enactment of this paragraph, shall
11 assess the performance of the mathematics, science,
12 and engineering education programs of the Depart-
13 ment.

14 “(6) AUTHORIZATION OF APPROPRIATIONS.—
15 There are authorized to be appropriated such sums
16 as are necessary to carry out this subsection.”; and
17 (3) by striking subsection (d) (as redesignated
18 by paragraph (1)) and inserting the following:

19 “(d) MATHEMATICS, SCIENCE, AND ENGINEERING
20 EDUCATION FUND.—The Secretary shall establish a
21 Mathematics, Science, and Engineering Education Fund,
22 using not less than 0.3 percent of the amount made avail-
23 able to the Department for research, development, dem-
24 onstration, and commercial application for each fiscal
25 year, to carry out sections 3165, 3166, and 3167.”.

1 (b) DEFINITION.—Section 3168 of the Department
2 of Energy Science Education Enhancement Act (42
3 U.S.C. 7381d) is amended by adding at the end the fol-
4 lowing:

5 “(5) NATIONAL LABORATORY.—The term ‘Na-
6 tional Laboratory’ has the meaning given the term
7 in section 2 of the Energy Policy Act of 2005 (42
8 U.S.C. 15801).”.

9 (c) MATHEMATICS, SCIENCE, AND ENGINEERING
10 EDUCATION PROGRAMS.—The Department of Energy
11 Science Education Enhancement Act (42 U.S.C. 7381 et
12 seq.) is amended—

13 (1) by inserting after section 3162 the fol-
14 lowing:

15 **“Subpart A—Science Education Enhancement”;**

16 (2) in section 3169, by striking “part” and in-
17 serting “subpart”; and

18 (3) by adding at the end the following:

19 **“Subpart B—Mathematics, Science, and Engineering**
20 **Education Programs**

21 **“SEC. 3170. DEFINITIONS.**

22 “In this subpart:

23 “(1) DIRECTOR.—The term ‘Director’ means
24 the Director of Mathematics, Science, and Engineer-
25 ing Education.

1 “(2) NATIONAL LABORATORY.—The term ‘Na-
2 tional Laboratory’ has the meaning given the term
3 in section 2 of the Energy Policy Act of 2005 (42
4 U.S.C. 15801).

5 **“CHAPTER 1—ASSISTANCE FOR SPE-**
6 **CIALTY SCHOOLS FOR MATHEMATICS**
7 **AND SCIENCE**

8 **“SEC. 3171. ASSISTANCE FOR SPECIALTY SCHOOLS FOR**
9 **MATHEMATICS AND SCIENCE.**

10 “(a) IN GENERAL.—Consistent with sections 3165
11 and 3166, the Director shall make available necessary
12 funds for a program using scientific and engineering staff
13 of the National Laboratories, in which the staff—

14 “(1) assists teaching courses at statewide spe-
15 cialty secondary schools that provide comprehensive
16 mathematics and science (including engineering)
17 education; and

18 “(2) uses National Laboratory scientific equip-
19 ment in the teaching of the courses.

20 “(b) REPORT TO CONGRESS.—Not later than 2 years
21 after the date of enactment of the Protecting America’s
22 Competitive Edge Through Energy Act of 2006, the Di-
23 rector shall submit a report to the appropriate committees
24 of Congress detailing the impact of the activities assisted
25 with funds made available under this section.

1 **“CHAPTER 2—EXPERIENTIAL-BASED**
2 **LEARNING OPPORTUNITIES**
3 **“SEC. 3175. EXPERIENTIAL-BASED LEARNING OPPORTUNI-**
4 **TIES.**

5 “(a) INTERNSHIPS AUTHORIZED.—From the
6 amounts authorized under subsection (d), the Secretary,
7 acting through the Director, shall establish a summer in-
8 ternship program for middle school and secondary school
9 students that shall—

10 “(1) provide the students with internships at
11 the National Laboratories; and

12 “(2) promote experiential, hands-on learning in
13 mathematics or science.

14 “(b) ELIGIBILITY CRITERIA.—The Director shall es-
15 tablish criteria to determine the sufficient level of aca-
16 demic preparedness necessary for a student to be eligible
17 for an internship under this section.

18 “(c) PRIORITY.—

19 “(1) IN GENERAL.—The Director shall give pri-
20 ority for an internship under this section to a stu-
21 dent who meets the eligibility criteria described in
22 subsection (b) and who attends a school—

23 “(A)(i) in which not less than 40 percent
24 of the children enrolled in the school are from
25 low-income families; or

1 “(ii) that is designated with a school locale
2 code of 7 or 8, as determined by the Secretary
3 of Education; and

4 “(B) for which there is—

5 “(i) a high percentage of teachers who
6 are not teaching in the academic subject
7 areas or grade levels in which the teachers
8 were trained to teach;

9 “(ii) a high teacher turnover rate; or

10 “(iii) a high percentage of teachers
11 with emergency, provisional, or temporary
12 certification or licenses.

13 “(2) COORDINATION.—The Director shall con-
14 sult with the Secretary of Education in order to de-
15 termine whether a student meets the priority re-
16 quirements of this subsection.

17 “(d) AUTHORIZATION OF APPROPRIATIONS.—There
18 is authorized to be appropriated to carry out this section
19 \$50,000,000 for each of the fiscal years 2007 through
20 2013.

1 **“CHAPTER 3—NATIONAL LABORATORIES**
2 **CENTERS OF EXCELLENCE IN MATHE-**
3 **MATICS AND SCIENCE EDUCATION**

4 **“SEC. 3181. NATIONAL LABORATORIES CENTERS OF EXCEL-**
5 **LENCE IN MATHEMATICS AND SCIENCE EDU-**
6 **CATION.**

7 “(a) IN GENERAL.—The Secretary shall establish at
8 each of the National Laboratories a program to support
9 a Center of Excellence in Mathematics and Science at 1
10 public secondary school located in the region of the Na-
11 tional Laboratory to provide assistance in accordance with
12 subsection (c).

13 “(b) GOALS.—The Secretary shall establish goals and
14 performance assessments for each Center of Excellence
15 authorized under subsection (a).

16 “(c) ASSISTANCE.—Consistent with sections 3165
17 and 3166, the Director shall make available necessary
18 funds for a program using scientific and engineering staff
19 of the National Laboratories, during which the staff—

20 “(1) assists teaching courses at the Centers of
21 Excellence in Mathematics and Science; and

22 “(2) uses National Laboratory scientific equip-
23 ment in the teaching of the courses.

24 “(d) EVALUATION.—The Secretary shall consider the
25 results of the performance assessments required under

1 subsection (b) in any performance review of a National
2 Laboratories management and operations contractor.

3 **“CHAPTER 4—SUMMER INSTITUTES**

4 **“SEC. 3185. SUMMER INSTITUTES.**

5 “(a) DEFINITION OF SUMMER INSTITUTE.—In this
6 section, the term ‘summer institute’ means an institute at
7 a National Laboratory, conducted during the summer,
8 that—

9 “(1) is conducted for a period of not less than
10 2 weeks;

11 “(2) includes, as a component, a program that
12 provides direct interaction between students and fac-
13 ulty; and

14 “(3) provides for follow-up training during the
15 academic year.

16 “(b) SUMMER INSTITUTE PROGRAMS AUTHOR-
17 IZED.—The Secretary, acting through the Director, shall
18 establish or expand program of summer institutes at each
19 of the National Laboratories to provide additional training
20 to strengthen the mathematics and science teaching skills
21 of teachers employed at public schools in kindergarten
22 through grade 12 education, with a particular focus on
23 teachers of kindergarten through grade 8.

1 **“CHAPTER 5—DISTINGUISHED SCIENTIST**
2 **PROGRAM**

3 **“SEC. 3191. DISTINGUISHED SCIENTIST PROGRAM.**

4 “(a) PURPOSE.—The purpose of this section is to
5 promote scientific and academic excellence at National
6 Laboratories.

7 “(b) ESTABLISHMENT.—The Secretary, acting
8 through the Director and in consultation with the Director
9 of the Office of Science, shall establish a program to sup-
10 port the appointment of distinguished scientists by Na-
11 tional Laboratories.

12 “(c) QUALIFICATIONS.—Successful candidates under
13 this section shall be persons who, by reason of professional
14 background and experience, are able to bring international
15 recognition to the appointing National Laboratory in their
16 field of scientific endeavor.

17 “(d) SELECTION.—A distinguished scientist ap-
18 pointed under this section shall be selected through an
19 open peer review process.

20 “(e) APPOINTMENT.—An appointment by a National
21 Laboratory under this section shall be at the rank of the
22 highest grade of distinguished scientist or technical staff
23 of the National Laboratory.

1 “(f) DURATION.—An appointment under this section
2 shall be for 6 years, consisting of 2 3-year funding allot-
3 ments.

4 “(g) USE OF FUNDS.—Funds made available under
5 this section may be used for—

6 “(1) the salary of the distinguished scientist
7 and support staff;

8 “(2) undergraduate, graduate, and post-doc-
9 toral appointments;

10 “(3) research-related equipment;

11 “(4) professional travel; and

12 “(5) such other requirements as the Director
13 determines are necessary to carry out the purpose of
14 the program.

15 “(h) REVIEW.—

16 “(1) IN GENERAL.—The appointment of a dis-
17 tinguished scientist under this section shall be re-
18 viewed at the end of the first 3-year allotment for
19 the distinguished scientist through an open peer re-
20 view process to determine if the appointment is
21 meeting the purpose of this section under subsection
22 (a).

23 “(2) FUNDING.—Funding of the appointment
24 of the distinguished scientist for the second 3-year

1 allotment shall be determined based on the review
2 conducted under paragraph (1).”.

3 **SEC. 3. DEPARTMENT OF ENERGY EARLY-CAREER RE-**
4 **SEARCH GRANTS.**

5 (a) PURPOSE.—It is the purpose of this section to
6 authorize research grants in the Department of Energy
7 for early-career scientists and engineers for purposes of
8 pursuing independent research.

9 (b) DEFINITION OF ELIGIBLE EARLY-CAREER RE-
10 SEARCHER.—In this section, the term “eligible early-ca-
11 reer researcher” means an individual who—

12 (1) completed a doctorate or other terminal de-
13 gree not more than 10 years before the date of en-
14 actment of this Act and has demonstrated promise
15 in the field of science, technology, engineering, or
16 mathematics; or

17 (2) has an equivalent professional qualification
18 in the field of science, technology, engineering, or
19 mathematics.

20 (c) GRANT PROGRAM AUTHORIZED.—

21 (1) IN GENERAL.—The Secretary of Energy,
22 through the Director of the Office of Science of the
23 Department of Energy, shall award not less than 65
24 grants per year to outstanding eligible early-career
25 researchers to support the work of such researchers

1 in the Department, particularly the National Lab-
2 oratories, or other federally-funded research and de-
3 velopment centers.

4 (2) APPLICATION.—An eligible early-career re-
5 searcher who desires to receive a grant under this
6 section shall submit to the Secretary of Energy an
7 application at such time, in such manner, and ac-
8 companied by such information as the Secretary may
9 require.

10 (3) SPECIAL CONSIDERATION.—In awarding
11 grants under this section, the Secretary of Energy
12 shall give special consideration to eligible early-ca-
13 reer researchers who have followed alternative career
14 paths such as working part-time or in non-academic
15 settings, or who have taken a significant career
16 break or other leave of absence.

17 (4) DURATION AND AMOUNT.—A grant under
18 this section shall be 5 years in duration. An eligible
19 early career-researcher who receives a grant under
20 this section shall receive \$100,000 for each year of
21 the grant period.

22 (5) USE OF FUNDS.—An eligible early career-
23 researcher who receives a grant under this section
24 shall use the grant funds for basic research in nat-
25 ural sciences, engineering, mathematics, or computer

1 sciences at the Department of Energy, particularly
2 the National Laboratories, or other federally-funded
3 research and development center.

4 (6) AUTHORIZATION OF APPROPRIATIONS.—
5 There are authorized to be appropriated to carry out
6 this section—

7 (A) \$6,500,000 for fiscal year 2007;

8 (B) \$13,000,000 for fiscal year 2008;

9 (C) \$19,500,000 for fiscal year 2009;

10 (D) \$26,000,000 for fiscal year 2010; and

11 (E) \$32,500,000 for fiscal year 2011.

12 **SEC. 4. ADVANCED RESEARCH PROJECTS AUTHORITY-EN-**
13 **ERGY.**

14 (a) DEFINITIONS.—In this section:

15 (1) ARPA-E.—The term “ARPA-E” means the
16 Advanced Research Projects Authority-Energy es-
17 tablished under subsection (b).

18 (2) FUND.—The term “Fund” means the Ac-
19 celeration Fund for Research and Development of
20 Energy Technologies established under subsection
21 (c).

22 (3) SECRETARY.—The term “Secretary” means
23 the Secretary of Energy.

24 (4) UNDER SECRETARY.—The term “Under
25 Secretary” means the position of Under Secretary

1 for Science established under section 202(b) of the
2 Department of Energy Organization Act (42 U.S.C.
3 7132(b)).

4 (b) ARPA-E.—

5 (1) ESTABLISHMENT.—There is established the
6 Advanced Research Projects Authority–Energy.

7 (2) DIRECTOR.—ARPA-E shall be headed by a
8 Director, who shall be appointed by the Secretary
9 and report to the Under Secretary.

10 (3) RESPONSIBILITIES.—The Director shall use
11 the Fund to award competitive, merit-based grants,
12 cooperative agreements, and contracts to public or
13 private entities (including businesses, federally fund-
14 ed research and development centers, and institu-
15 tions of higher education) to—

16 (A) support basic and applied energy re-
17 search to promote revolutionary changes in
18 technologies that would promote the missions of
19 the Department of Energy;

20 (B) advance the development, testing, eval-
21 uation, and deployment of critical energy tech-
22 nologies; and

23 (C) accelerate prototyping and develop-
24 ment of technologies that would address na-
25 tional energy priorities.

1 (4) TARGETED COMPETITIONS.—The Director
2 may solicit proposals to address areas of national
3 need in science and energy technology, as identified
4 by the Director.

5 (5) COORDINATION.—The Director—

6 (A) shall ensure that the activities of
7 ARPA-E are coordinated with activities of other
8 appropriate research agencies; and

9 (B) may carry out projects under this sec-
10 tion jointly with other agencies.

11 (6) PERSONNEL.—

12 (A) IN GENERAL.—In hiring personnel for
13 ARPA-E, the Secretary shall have the hiring
14 and management authorities described in sec-
15 tion 1101 of the Strom Thurmond National De-
16 fense Authorization Act for Fiscal Year 1999
17 (Public Law 105–261; 5 U.S.C. 3104 note).

18 (B) TERM.—The term of appointments for
19 an employee under subparagraph (A) may not
20 exceed 5 years, except that the Secretary may
21 renew the term of appointment of the employee
22 for an additional term of 5 years.

23 (7) DEMONSTRATIONS.—The Director shall pe-
24 riodically hold energy technology demonstrations to

1 improve contact among technology developers, ven-
2 dors, and acquisition personnel.

3 (c) FUND.—

4 (1) ESTABLISHMENT.—There is established in
5 the Treasury of the United States a revolving fund,
6 to be known as the “Acceleration Fund for Research
7 and Development of Energy Technologies”, con-
8 sisting of—

9 (A) such amounts as are appropriated to
10 the Fund under paragraph (5); and

11 (B) any interest earned on investment of
12 amounts in the Fund under paragraph (3).

13 (2) EXPENDITURES FROM FUND.—

14 (A) IN GENERAL.—Subject to subpara-
15 graph (B), on request by the Director, the Sec-
16 retary of the Treasury shall transfer from the
17 Fund to the Director such amounts as the Di-
18 rector determines are necessary to carry out
19 this section.

20 (B) ADMINISTRATIVE EXPENSES.—An
21 amount not exceeding 5 percent of the amounts
22 in the Fund shall be available for each fiscal
23 year to pay the administrative expenses nec-
24 essary to carry out this section.

25 (3) INVESTMENT OF AMOUNTS.—

1 (A) IN GENERAL.—The Secretary of the
2 Treasury shall invest such portion of the Fund
3 as is not, in the judgment of the Secretary of
4 the Treasury, required to meet current with-
5 draws.

6 (B) INTEREST-BEARING OBLIGATIONS.—
7 Investments may be made only in interest-bear-
8 ing obligations of the United States.

9 (C) ACQUISITION OF OBLIGATIONS.—For
10 the purpose of investments under subparagraph
11 (A), obligations may be acquired—

12 (i) on original issue at the issue price;

13 or

14 (ii) by purchase of outstanding obliga-
15 tions at the market price.

16 (D) SALE OF OBLIGATIONS.—Any obliga-
17 tion acquired by the Fund may be sold by the
18 Secretary of the Treasury at the market price.

19 (E) CREDITS TO FUND.—The interest on,
20 and the proceeds from the sale or redemption
21 of, any obligations held in the Fund shall be
22 credited to, and form a part of, the Fund.

23 (4) TRANSFERS OF AMOUNTS.—

24 (A) IN GENERAL.—The amounts required
25 to be transferred to the Fund under this sub-

1 section shall be transferred at least monthly
2 from the general fund of the Treasury to the
3 Fund on the basis of estimates made by the
4 Secretary of the Treasury.

5 (B) ADJUSTMENTS.—Proper adjustment
6 shall be made in amounts subsequently trans-
7 ferred to the extent prior estimates were in ex-
8 cess of or less than the amounts required to be
9 transferred.

10 (5) AUTHORIZATION OF APPROPRIATIONS.—

11 There are authorized to be appropriated to the
12 Fund—

13 (A) \$300,000,000 for fiscal year 2007;

14 (B) \$500,000,000 for fiscal year 2008;

15 (C) \$700,000,000 for fiscal year 2009;

16 (D) \$900,000,000 for fiscal year 2010;

17 and

18 (E) \$1,000,000,000 for fiscal year 2011.

19 **SEC. 5. AUTHORIZATION OF APPROPRIATIONS FOR THE DE-**
20 **PARTMENT OF ENERGY FOR BASIC RE-**
21 **SEARCH.**

22 Section 971(b) of the Energy Policy Act of 2005 (42
23 U.S.C. 16311(b)) is amended—

24 (1) in paragraph (2), by striking “and” at the
25 end;

1 (2) in paragraph (3), by striking the period at
2 the end and inserting a semicolon; and
3 (3) by adding at the end the following:
4 “(4) \$5,320,000,000 for fiscal year 2010;
5 “(5) \$5,851,000,000 for fiscal year 2011;
6 “(6) \$6,436,000,000 for fiscal year 2012; and
7 “(7) \$7,080,000,000 for fiscal year 2013.”.