

109<sup>TH</sup> CONGRESS  
2<sup>D</sup> SESSION

# H. R. 5656

To provide for Federal energy research, development, demonstration, and commercial application activities, and for other purposes.

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## IN THE HOUSE OF REPRESENTATIVES

JUNE 21, 2006

Mrs. BIGGERT (for herself, Mr. BOEHLERT, Mr. HALL, Mr. SMITH of Texas, Mr. CALVERT, Mr. EHLERS, Mr. INGLIS of South Carolina, and Mr. WAMP) introduced the following bill; which was referred to the Committee on Science

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## A BILL

To provide for Federal energy research, development, demonstration, and commercial application activities, 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 “Energy Research, De-  
5       velopment, Demonstration, and Commercial Application  
6       Act of 2006”.

7       **SEC. 2. DEFINITIONS.**

8       For the purposes of this Act—

1           (1) the term “biomass” has the meaning given  
2 that term in section 932(a)(1) of the Energy Policy  
3 Act of 2005 (42 U.S.C. 16232(a)(1));

4           (2) the term “cellulosic feedstock” has the  
5 meaning given the term “lignocellulosic feedstock”  
6 in section 932(a)(2) of the Energy Policy Act of  
7 2005 (42 U.S.C. 16232(a)(2));

8           (3) the term “engineering-scale” means the  
9 minimum size required to predict with confidence all  
10 physical processes controlling the performance of a  
11 full-scale industrial facility;

12           (4) the term “National Laboratory” has the  
13 meaning given the term “nonmilitary energy labora-  
14 tory” in section 903(3) of the Energy Policy Act of  
15 2005 (42 U.S.C. 16182(3)); and

16           (5) the term “Secretary” means the Secretary of  
17 Energy.

18 **SEC. 3. FUTUREGEN.**

19           (a) IN GENERAL.—The Secretary shall carry out a  
20 project to demonstrate the feasibility of the commercial  
21 application of advanced clean coal energy technology, in-  
22 cluding carbon capture and geological sequestration, for  
23 electricity generation.

24           (b) INDUSTRY INVOLVEMENT.—The Secretary may  
25 conduct the project through a financial assistance coopera-

1 tive agreement with a consortium of coal-fired power pro-  
2 ducers, coal companies, and other electric utility industry  
3 and mining industry participants

4 (c) REQUIREMENTS.—The Secretary shall design the  
5 project to ensure that—

6 (1) the project is operating by 2012;

7 (2) the project shall be able—

8 (A) to achieve at least a 99 percent reduc-  
9 tion in sulfur dioxide emissions or, when burn-  
10 ing coal containing 3 pounds or less of sulfur  
11 per million British thermal units, the project  
12 shall be able to emit no more than 0.03 pounds  
13 of sulfur dioxide emissions per million British  
14 thermal units of thermal energy produced by  
15 the project;

16 (B) to emit no more than 0.05 pounds of  
17 nitrogen oxide emissions per million British  
18 thermal units of thermal energy produced by  
19 the project;

20 (C) to achieve at least a 90 percent reduc-  
21 tion in mercury emissions;

22 (D) to emit no more than 0.005 of total  
23 particulate emissions in the flue gas per million  
24 British thermal units of thermal energy pro-  
25 duced by the project; and

1 (E) to achieve at least a 90 percent reduc-  
2 tion in carbon dioxide emissions; and

3 (3) the project demonstrates the feasibility of  
4 electricity generation from coal using advanced clean  
5 coal technology with carbon capture and geological  
6 sequestration at a cost not greater than 10 percent  
7 higher than the average of all commercial integrated  
8 coal gasification combined cycle electric generating  
9 plants operating in the United States as of the date  
10 of enactment of this Act.

11 (d) **COMMERCIALLY AVAILABLE ADVANCED CLEAN**  
12 **COAL TECHNOLOGY.**—To reduce technical risk and focus  
13 development efforts on system integration, the Secretary  
14 shall, to the extent practicable, ensure that the project uti-  
15 lizes available advanced clean coal technology, such as coal  
16 gasification technology, for those components of the  
17 project where such technology would be appropriate.

18 (e) **AUTHORIZATION OF APPROPRIATIONS.**—There  
19 are authorized to be appropriated to the Secretary to carry  
20 out this section—

- 21 (1) \$54,000,000 for fiscal year 2007;  
22 (2) \$112,000,000 for fiscal year 2008;  
23 (3) \$130,000,000 for fiscal year 2009;  
24 (4) \$95,000,000 for fiscal year 2010;  
25 (5) \$75,000,000 for fiscal year 2011; and

1 (6) \$71,000,000 for fiscal year 2012.

2 **SEC. 4. ADVANCED FUEL CYCLE TECHNOLOGIES FOR NU-**  
3 **CLEAR POWER.**

4 (a) IN GENERAL.—The Secretary shall carry out a  
5 program of research, development, demonstration, and  
6 commercial application for advanced nuclear fuel cycle  
7 technologies for generating electricity and industrial pro-  
8 cess heat from nuclear power, including technologies for  
9 spent fuel recycling, waste minimization, and reduction of  
10 radioactivity of final waste products.

11 (b) OBJECTIVES.—The Secretary shall design the  
12 program under this section to develop technologies that  
13 would—

14 (1) minimize the volume and heat load of high-  
15 level nuclear waste destined for storage in a geologi-  
16 cal repository to the extent that a single repository  
17 would be sufficient for storing all nuclear waste gen-  
18 erated by United States commercial nuclear power  
19 plants during this century;

20 (2) increase the proliferation resistance of com-  
21 mercial nuclear power reactors and their associated  
22 fuel systems and infrastructure; and

23 (3) increase the amount of useful energy that  
24 can be extracted from nuclear fuel.

25 (c) SYSTEMS ANALYSIS.—

1           (1) IN GENERAL.—The Secretary shall develop  
2 a comprehensive modeling and simulation capability  
3 to enable a thorough analysis of possible advanced  
4 nuclear fuel cycle systems. The modeling and sim-  
5 ulation capability shall be capable of examining—

6           (A) all of the components of each advanced  
7 nuclear fuel cycle system analyzed, including—

8                   (i) spent fuel separations technologies;

9                   (ii) advanced burner reactor tech-  
10 nologies;

11                   (iii) fuel fabrication technologies;

12                   (iv) advanced thermal reactor tech-  
13 nologies, including advanced thermal reac-  
14 tor designs that would be capable of reduc-  
15 ing the toxicity or radioactivity of spent  
16 nuclear fuel components; and

17                   (v) waste disposal technologies;

18           (B) the manner in which possible tech-  
19 nology and engineering choices for individual  
20 components might affect the overall system,  
21 and how various system components would  
22 interact with one another; and

23           (C) quantitative mass flows of nuclear fuel  
24 and spent nuclear fuel, including projected in-  
25 ventories and transportation requirements for

1 nuclear fuel and spent nuclear fuel, for any ex-  
2 amined system.

3 (2) ADVANCED NUCLEAR FUEL CYCLE SYSTEM  
4 PLAN.—

5 (A) ANALYSIS.—The Secretary shall con-  
6 duct a thorough analysis of more than one pos-  
7 sible configuration of an advanced nuclear fuel  
8 cycle system using the analytical capability de-  
9 veloped under paragraph (1). Each possible ad-  
10 vanced nuclear fuel cycle system configuration  
11 examined shall include both advanced burner  
12 reactors and advanced thermal reactors, and  
13 the analysis shall consider the degree to which  
14 each type of reactor could be utilized to reduce  
15 the toxicity or radioactivity of spent nuclear  
16 fuel components. The analysis of each possible  
17 configuration of an advanced nuclear fuel cycle  
18 system examined shall examine the compat-  
19 ibility of fuel cycle system components, includ-  
20 ing each of the system component technologies  
21 described in paragraph (1)(A), and the degree  
22 to which the examined system would meet the  
23 objectives described in subsection (b).

24 (B) PLAN.—Using the results of the anal-  
25 yses developed under subparagraph (A), and

1 not later than June 30, 2007, the Secretary  
2 shall develop a detailed plan for research, devel-  
3 opment, demonstration, and commercial appli-  
4 cation on advanced nuclear fuel cycle system  
5 technologies, including proposed technology op-  
6 tions for each of the system component tech-  
7 nologies described in paragraph (1)(A) and any  
8 proposed engineering-scale demonstrations of  
9 such system component technologies. The plan  
10 shall include an estimate of the design, engi-  
11 neering, construction and lifetime operating  
12 costs of any proposed engineering-scale dem-  
13 onstration. In developing the plan, the Sec-  
14 retary shall consider the integration into an ad-  
15 vanced nuclear fuel cycle system of advanced  
16 thermal reactors capable of reducing the tox-  
17 icity or radioactivity of spent nuclear fuel com-  
18 ponents.

19 (C) CONSULTATION.—In developing the  
20 plan under subparagraph (B), the Secretary  
21 shall consult with—

22 (i) technical experts from United  
23 States and foreign companies that design  
24 or engineer nuclear power plants or nu-  
25 clear fuel reprocessing facilities;

1                   (ii) technical experts from United  
2                   States electric utilities that operate nuclear  
3                   power plants;

4                   (iii) economists with expertise in nu-  
5                   clear power and electricity markets;

6                   (iv) the Nuclear Energy Research Ad-  
7                   visory Committee;

8                   (v) the Chairman of the Nuclear Reg-  
9                   ulatory Commission; and

10                  (vi) the Administrator of the Environ-  
11                  mental Protection Agency.

12                  (3) NATIONAL ACADEMY OF SCIENCES RE-  
13                  VIEW.—The Secretary shall enter into an arrange-  
14                  ment with the National Academy of Sciences to con-  
15                  duct a review of the plan developed under paragraph  
16                  (2)(B), including by reviewing the validity of the un-  
17                  derlying analyses required in paragraph (2)(A).

18                  (d) REPORT.—Not later than June 30, 2008, the  
19                  Secretary shall transmit to Congress a report that includes  
20                  the research, development, demonstration, and commercial  
21                  application plan developed under subsection (c)(2)(B), the  
22                  report from the National Academy of Sciences on the re-  
23                  view conducted under subsection (c)(3), a revised research,  
24                  development, demonstration, and commercial application  
25                  plan that takes into account the findings, conclusions, and

1 recommendations of the report from the National Acad-  
2 emy of Sciences, and an explanation of any instances  
3 where the Secretary does not concur with the findings,  
4 conclusions, and recommendations of the report from the  
5 National Academy of Sciences.

6 (e) PROHIBITION.—The Secretary shall not initiate  
7 detailed design or construction of any demonstration facil-  
8 ity that is capable of processing 750 kilograms or more  
9 per year of nuclear fuel or spent nuclear fuel and that  
10 is designed to demonstrate the advanced nuclear fuel sys-  
11 tem component technologies described in subsection  
12 (c)(1)(A)(ii) and (iii) until 90 days after the report under  
13 subsection (d) has been transmitted to Congress.

14 (f) AUTHORIZATION OF APPROPRIATIONS.—

15 (1) ALLOCATIONS.—From amounts authorized  
16 to be appropriated under section 951(d)(1) of the  
17 Energy Policy Act of 2005 (42 U.S.C. 16271(d)(1)),  
18 there are authorized to be appropriated to the Sec-  
19 retary to carry out this section such sums as may  
20 be necessary for each of fiscal years 2007 through  
21 2009.

22 (2) ADDITIONAL AMOUNTS.—There are author-  
23 ized to be appropriated to the Secretary to carry out  
24 this section such sums as may be necessary for each  
25 of fiscal years 2010 through 2012.

1 **SEC. 5. ADVANCED BATTERY TECHNOLOGIES.**

2 (a) IN GENERAL.—The Secretary shall carry out a  
3 program of research, development, demonstration, and  
4 commercial application for advanced battery technologies  
5 for use in motor vehicles, particularly for plug-in hybrid  
6 electric vehicles.

7 (b) OBJECTIVE.—The Secretary shall design the pro-  
8 gram under this section to develop technologies that would  
9 enable a light-duty, plug-in hybrid electric vehicle to travel  
10 up to 40 miles on battery power alone.

11 (c) AUTHORIZATION OF APPROPRIATIONS.—There  
12 are authorized to be appropriated to the Secretary to carry  
13 out this section—

14 (1) \$31,000,000 for fiscal year 2007;

15 (2) \$34,100,000 for fiscal year 2008;

16 (3) \$37,500,000 for fiscal year 2009; and

17 (4) \$41,250,000 for fiscal year 2010.

18 (d) DEFINITION.—For purposes of this section, the  
19 term “plug-in hybrid electric vehicle” has the meaning  
20 given the term in section 10.

21 **SEC. 6. ADVANCED BIOFUEL TECHNOLOGIES.**

22 (a) IN GENERAL.—The Secretary shall carry out a  
23 program of research, development, demonstration, and  
24 commercial application for production of liquid fuels from  
25 biomass.

1 (b) OBJECTIVES.—The Secretary shall design the  
2 program under this section to—

3 (1) develop technologies that would make eth-  
4 anol produced from cellulosic feedstocks cost com-  
5 petitive with ethanol produced from corn by 2012;

6 (2) conduct research and development on how  
7 to apply advanced genetic engineering and bio-  
8 engineering techniques to increase the efficiency and  
9 lower the cost of industrial-scale production of liquid  
10 fuels from cellulosic feedstocks; and

11 (3) conduct research and development on the  
12 production of hydrocarbons other than ethanol from  
13 biomass.

14 (c) AUTHORIZATION OF APPROPRIATIONS.—From  
15 amounts authorized to be appropriated under section  
16 931(c) of the Energy Policy Act of 2005 (42 U.S.C.  
17 16231(c)), there are authorized to be appropriated to the  
18 Secretary to carry out this section—

19 (1) \$150,000,000 for fiscal year 2007;

20 (2) \$160,000,000 for fiscal year 2008; and

21 (3) \$175,000,000 for fiscal year 2009.

22 **SEC. 7. ADVANCED HYDROGEN STORAGE TECHNOLOGIES.**

23 (a) IN GENERAL.—The Secretary shall carry out a  
24 program of research, development, demonstration, and  
25 commercial application for technologies to enable practical

1 onboard storage of hydrogen for use as a fuel for light-  
2 duty motor vehicles.

3 (b) OBJECTIVE.—The Secretary shall design the pro-  
4 gram under this section to develop practical hydrogen  
5 storage technologies that would enable a hydrogen-fueled  
6 light-duty motor vehicle to travel 300 miles before refuel-  
7 ing.

8 (c) AUTHORIZATION OF APPROPRIATIONS.—In addi-  
9 tion to amounts otherwise authorized to be appropriated,  
10 there are authorized to be appropriated to the Secretary  
11 to carry out this section—

12 (1) \$46,000,000 for fiscal year 2007;

13 (2) \$50,000,000 for fiscal year 2008;

14 (3) \$55,000,000 for fiscal year 2009; and

15 (4) \$60,000,000 for fiscal year 2010.

16 **SEC. 8. ADVANCED SOLAR PHOTOVOLTAIC TECHNOLOGIES.**

17 (a) IN GENERAL.—The Secretary shall carry out a  
18 program of research, development, demonstration, and  
19 commercial application for advanced solar photovoltaic  
20 technologies.

21 (b) OBJECTIVES.—The Secretary shall design the  
22 program under this section to develop technologies that  
23 would—

24 (1) make electricity generated by solar photo-  
25 voltaic power cost-competitive by 2015; and

1           (2) enable the widespread use of solar photo-  
2           voltaic power.

3           (c) AUTHORIZATION OF APPROPRIATIONS.—There  
4           are authorized to be appropriated to the Secretary to carry  
5           out this section—

6           (1) \$148,000,000 for fiscal year 2007;

7           (2) \$155,000,000 for fiscal year 2008;

8           (3) \$165,000,000 for fiscal year 2009; and

9           (4) \$180,000,000 for fiscal year 2010.

10 **SEC. 9. ADVANCED WIND ENERGY TECHNOLOGIES.**

11           (a) IN GENERAL.—The Secretary shall carry out a  
12           program of research, development, demonstration, and  
13           commercial application for advanced wind energy tech-  
14           nologies.

15           (b) OBJECTIVES.—The Secretary shall design the  
16           program under this section to—

17           (1) improve the efficiency and lower the cost of  
18           wind turbines;

19           (2) minimize adverse environmental impacts;  
20           and

21           (3) develop new small-scale wind energy tech-  
22           nologies for use in low wind speed environments.

23           (c) AUTHORIZATION OF APPROPRIATIONS.—There  
24           are authorized to be appropriated to the Secretary to carry  
25           out this section—

- 1 (1) \$44,000,000 for fiscal year 2007;
- 2 (2) \$48,400,000 for fiscal year 2008;
- 3 (3) \$53,240,000 for fiscal year 2009; and
- 4 (4) \$58,564,000 for fiscal year 2010.

5 **SEC. 10. PLUG-IN HYBRID ELECTRIC VEHICLE TECH-**  
6 **NOLOGY PROGRAM.**

7 (a) **SHORT TITLE.**—This section may be cited as the  
8 “Plug-In Hybrid Electric Vehicle Act of 2006”.

9 (b) **DEFINITIONS.**—In this section:

10 (1) **BATTERY.**—The term “battery” means a  
11 device or system for the electrochemical storage of  
12 energy.

13 (2) **E85.**—The term “E85” means a fuel blend  
14 containing 85 percent ethanol and 15 percent gaso-  
15 line by volume.

16 (3) **ELECTRIC DRIVE TRANSPORTATION TECH-**  
17 **NOLOGY.**—The term “electric drive transportation  
18 technology” means—

19 (A) vehicles that use an electric motor for  
20 all or part of their motive power and that may  
21 or may not use offboard electricity, including  
22 battery electric vehicles, fuel cell vehicles, hy-  
23 brid electric vehicles, plug-in hybrid electric ve-  
24 hicles, flexible fuel plug-in hybrid electric vehi-  
25 cles, and electric rail; and

1 (B) related equipment, including electric  
2 equipment necessary to recharge a plug-in hy-  
3 brid electric vehicle.

4 (4) FLEXIBLE FUEL PLUG-IN HYBRID ELEC-  
5 TRIC VEHICLE.—The term “flexible fuel plug-in hy-  
6 brid electric vehicle” means a plug-in hybrid electric  
7 vehicle—

8 (A) warranted by its manufacturer as ca-  
9 pable of operating on any combination of gaso-  
10 line or E85 for its onboard internal combustion  
11 or heat engine; or

12 (B) that uses a fuel cell for battery charg-  
13 ing when disconnected from offboard power  
14 sources.

15 (5) FUEL CELL VEHICLE.—The term “fuel cell  
16 vehicle” means an onroad vehicle that uses a fuel  
17 cell (as defined in section 803 of the Energy Policy  
18 Act of 2005 (42 U.S.C. 16152)).

19 (6) HYBRID ELECTRIC VEHICLE.—The term  
20 “hybrid electric vehicle” means a vehicle that—

21 (A) can be propelled using liquid combus-  
22 tible fuel and electric power provided by an on-  
23 board battery; and

24 (B) utilizes regenerative power capture  
25 technology to recover energy expended in brak-

1           ing the vehicle for use in recharging the bat-  
2           tery.

3           (7) PLUG-IN HYBRID ELECTRIC VEHICLE.—The  
4           term “plug-in hybrid electric vehicle” means a hy-  
5           brid electric onroad light-duty vehicle that can be  
6           propelled solely on electric power for a minimum of  
7           20 miles under city driving conditions, and that is  
8           capable of recharging its battery from an offboard  
9           electricity source.

10          (c) PROGRAM.—The Secretary shall conduct a pro-  
11         gram of research, development, demonstration, and com-  
12         mercial application on technologies needed for the develop-  
13         ment of plug-in hybrid electric vehicles, including—

14                 (1) high capacity, high efficiency batteries, to—

15                         (A) improve battery life, energy storage ca-  
16                         pacity, and power delivery capacity, and lower  
17                         cost; and

18                         (B) minimize waste and hazardous mate-  
19                         rial production in the entire value chain, includ-  
20                         ing after the end of the useful life of the bat-  
21                         teries;

22                 (2) high efficiency onboard and offboard charg-  
23                 ing components;

1           (3) high power drive train systems for pas-  
2           senger and commercial vehicles and for supporting  
3           equipment;

4           (4) onboard energy management systems, power  
5           trains, and systems integration for plug-in hybrid  
6           electric vehicles, flexible fuel plug-in hybrid electric  
7           vehicles, and hybrid electric vehicles, including effi-  
8           cient cooling systems and systems that minimize the  
9           emissions profile of such vehicles; and

10          (5) lightweight materials, including research,  
11          development, demonstration, and commercial appli-  
12          cation to reduce the cost of materials such as steel  
13          alloys and carbon fibers.

14          (d) PLUG-IN HYBRID ELECTRIC VEHICLE DEM-  
15          ONSTRATION PROGRAM.—

16               (1) ESTABLISHMENT.—The Secretary shall es-  
17               tablish a competitive grant pilot demonstration pro-  
18               gram to provide not more than 25 grants annually  
19               to State governments, local governments, metropoli-  
20               tan transportation authorities, or combinations  
21               thereof to carry out a project or projects for dem-  
22               onstration of plug-in hybrid electric vehicles.

23               (2) APPLICATIONS.—

24                       (A) REQUIREMENTS.—The Secretary shall  
25                       issue requirements for applying for grants

1 under the demonstration pilot program. The  
2 Secretary shall require that applications, at a  
3 minimum, include a description of how data will  
4 be—

5 (i) collected on the—

6 (I) performance of the vehicle or  
7 vehicles and the components, includ-  
8 ing the battery, energy management,  
9 and charging systems, under various  
10 driving speeds, trip ranges, traffic,  
11 and other driving conditions;

12 (II) costs of the vehicle or vehi-  
13 cles, including acquisition, operating,  
14 and maintenance costs, and how the  
15 project or projects will be self-sus-  
16 taining after Federal assistance is  
17 completed; and

18 (III) emissions of the vehicle or  
19 vehicles, including greenhouse gases,  
20 and the amount of petroleum dis-  
21 placed as a result of the project or  
22 projects; and

23 (ii) summarized for dissemination to  
24 the Department, other grantees, and the  
25 public.

1 (B) PARTNERS.—An applicant under sub-  
2 paragraph (A) may carry out a project or  
3 projects under the pilot program in partnership  
4 with one or more private entities.

5 (3) SELECTION CRITERIA.—

6 (A) PREFERENCE.—When making awards  
7 under this subsection, the Secretary shall con-  
8 sider each applicant’s previous experience in-  
9 volving plug-in hybrid electric vehicles and shall  
10 give preference to proposals that—

11 (i) provide the greatest demonstration  
12 per award dollar, with preference increas-  
13 ing as the number of miles that a plug-in  
14 hybrid electric vehicle can be propelled  
15 solely on electric power under city driving  
16 conditions increases; and

17 (ii) maximize the non-Federal share of  
18 project funding and demonstrate the great-  
19 est likelihood that each project proposed in  
20 the application will be maintained or ex-  
21 panded after Federal assistance under this  
22 subsection is completed.

23 (B) BREADTH OF DEMONSTRATIONS.—In  
24 awarding grants under this subsection, the Sec-  
25 retary shall ensure the program will dem-

1           onstrate plug-in hybrid electric vehicles under  
2           various circumstances, including—

- 3                   (i) driving speeds;  
4                   (ii) trip ranges;  
5                   (iii) driving conditions;  
6                   (iv) climate conditions; and  
7                   (v) topography,

8           to optimize understanding and function of plug-  
9           in hybrid electric vehicles.

10          (4) PILOT PROJECT REQUIREMENTS.—

11               (A) SUBSEQUENT FUNDING.—An applicant  
12               that has received a grant in one year may apply  
13               for additional funds in subsequent years, but  
14               the Secretary shall not provide more than  
15               \$10,000,000 in Federal assistance under the  
16               pilot program to any applicant for the period  
17               encompassing fiscal years 2007 through fiscal  
18               year 2011.

19               (B) INFORMATION.—The Secretary shall  
20               establish mechanisms to ensure that the infor-  
21               mation and knowledge gained by participants in  
22               the pilot program are shared among the pilot  
23               program participants and are available to other  
24               interested parties, including other applicants.

1           (5) AWARD AMOUNTS.—The Secretary shall de-  
2           termine grant amounts, but the maximum size of  
3           grants shall decline as the cost of producing plug-in  
4           hybrid electric vehicles declines or the cost of con-  
5           verting a hybrid electric vehicle to a plug-in hybrid  
6           electric vehicle declines.

7           (e) COST SHARING.—The Secretary shall carry out  
8           the program under this section in compliance with section  
9           988(a) through (d) and section 989 of the Energy Policy  
10          Act of 2005 (42 U.S.C. 16352(a) through (d) and 16353).

11          (f) AUTHORIZATION OF APPROPRIATIONS.—There  
12          are authorized to be appropriated to the Secretary—

13                 (1) for carrying out subsection (c),  
14                 \$250,000,000 for each of fiscal years 2007 through  
15                 2011, of which up to \$50,000,000 may be used for  
16                 the program described in paragraph (5) of that sub-  
17                 section; and

18                 (2) for carrying out subsection (d),  
19                 \$50,000,000 for each of fiscal years 2007 through  
20                 2011.

21 **SEC. 11. PHOTOVOLTAIC DEMONSTRATION PROGRAM.**

22          (a) SHORT TITLE.—This section may be cited as the  
23          “Solar Utilization Now Demonstration Act of 2006” or  
24          the “SUN Act of 2006”.

1 (b) IN GENERAL.—The Secretary shall establish a  
2 program of grants to States to demonstrate advanced pho-  
3 tovoltaic technology.

4 (c) REQUIREMENTS.—

5 (1) ABILITY TO MEET REQUIREMENTS.—To re-  
6 ceive funding under the program under this section,  
7 a State must submit a proposal that demonstrates,  
8 to the satisfaction of the Secretary, that the State  
9 will meet the requirements of subsection (g).

10 (2) COMPLIANCE WITH REQUIREMENTS.—If a  
11 State has received funding under this section for the  
12 preceding year, the State must demonstrate, to the  
13 satisfaction of the Secretary, that it complied with  
14 the requirements of subsection (g) in carrying out  
15 the program during that preceding year, and that it  
16 will do so in the future, before it can receive further  
17 funding under this section.

18 (3) FUNDING ALLOCATION.—Except as pro-  
19 vided in subsection (d), each State submitting a pro-  
20 posal that meets the requirements under subsection  
21 (c) shall receive funding under the program based on  
22 the proportion of United States population in the  
23 State according to the 2000 census. In each fiscal  
24 year, the portion of funds attributable under this  
25 paragraph to States that have not submitted pro-

1 proposals that meet the requirements under subsection  
2 (c) in the time and manner specified by the Sec-  
3 retary shall be distributed pro rata to the States  
4 that have submitted proposals that meet the require-  
5 ments under subsection (c) in the specified time and  
6 manner.

7 (d) COMPETITION.—If more than \$80,000,000 is  
8 available for the program under this section for any fiscal  
9 year, the Secretary shall allocate 75 percent of the total  
10 amount of funds available according to subsection (c)(3),  
11 and shall award the remaining 25 percent on a competitive  
12 basis to the States with the proposals the Secretary con-  
13 siders most likely to encourage the widespread adoption  
14 of photovoltaic technologies. In awarding funds under this  
15 subsection, the Secretary may give preference to proposals  
16 that would demonstrate the use of newer materials or  
17 technologies.

18 (e) PROPOSALS.—Not later than 6 months after the  
19 date of enactment of this Act, and in each subsequent fis-  
20 cal year for the life of the program, the Secretary shall  
21 solicit proposals from the States to participate in the pro-  
22 gram under this section.

23 (f) COMPETITIVE CRITERIA.—In awarding funds in  
24 a competitive allocation under subsection (d), the Sec-  
25 retary shall consider—

1           (1) the likelihood of a proposal to encourage the  
2 demonstration of, or lower the costs of, advanced  
3 photovoltaic technologies; and

4           (2) the extent to which a proposal is likely to—

5                 (A) maximize the amount of photovoltaics  
6 demonstrated;

7                 (B) maximize the proportion of non-Fed-  
8 eral cost share; and

9                 (C) limit State administrative costs.

10         (g) STATE PROGRAM.—A program operated by a  
11 State with funding under this section shall provide com-  
12 petitive awards for the demonstration of advanced photo-  
13 voltaic technologies. Each State program shall—

14           (1) require a contribution of at least 60 percent  
15 per award from non-Federal sources, which may in-  
16 clude any combination of State, local, and private  
17 funds, except that at least 10 percent of the funding  
18 must be supplied by the State;

19           (2) limit awards for any single project to a  
20 maximum of \$1,000,000;

21           (3) prohibit any nongovernmental recipient  
22 from receiving more than \$1,000,000 per year;

23           (4) endeavor to fund recipients in the commer-  
24 cial, industrial, institutional, governmental, and resi-  
25 dential sectors;

1           (5) limit State administrative costs to no more  
2 than 10 percent of the grant;

3           (6) report annually to the Secretary on—

4                 (A) the amount of funds disbursed;

5                 (B) the amount of photovoltaics purchased;

6           and

7                 (C) the results of the monitoring under  
8 paragraph (7);

9           (7) provide for measurement and verification of  
10 the output of a representative sample of the  
11 photovoltaics systems demonstrated throughout the  
12 average working life of the systems, or at least 20  
13 years; and

14           (8) require that applicant buildings must have  
15 received an independent energy efficiency audit dur-  
16 ing the 6-month period preceding the filing of the  
17 application.

18           (h) UNEXPENDED FUNDS.—If a State fails to expend  
19 any funds received under subsection (c) or (d) within 3  
20 years of receipt, such remaining funds shall be returned  
21 to the Treasury.

22           (i) REPORTS.—The Secretary shall report to Con-  
23 gress 5 years after funds are first distributed to the States  
24 under this section—

25                 (1) the amount of photovoltaics demonstrated;

- 1 (2) the number of projects undertaken;
- 2 (3) the administrative costs of the program;
- 3 (4) the amount of funds that each State has
- 4 not received because of a failure to submit a quali-
- 5 fying proposal, as described in subsection (c)(3);
- 6 (5) the results of the monitoring under sub-
- 7 section (g)(7); and
- 8 (6) the total amount of funds distributed, in-
- 9 cluding a breakdown by State.

10 (j) **AUTHORIZATION OF APPROPRIATIONS.**—There  
11 are authorized to be appropriated to the Secretary for the  
12 purposes of carrying out this section—

- 13 (1) \$50,000,000 for fiscal year 2007;
- 14 (2) \$100,000,000 for fiscal year 2008;
- 15 (3) \$150,000,000 for fiscal year 2009;
- 16 (4) \$200,000,000 for fiscal year 2010; and
- 17 (5) \$300,000,000 for fiscal year 2011.

18 **SEC. 12. ENERGY EFFICIENT BUILDING GRANT PROGRAM.**

19 (a) **ENERGY EFFICIENT BUILDING PILOT GRANT**  
20 **PROGRAM.**—

- 21 (1) **IN GENERAL.**—Not later than 6 months  
22 after the date of enactment of this Act, the Sec-  
23 retary shall establish a pilot program to award  
24 grants to businesses and organizations for new con-  
25 struction of energy efficient buildings, or major ren-

1       ovations of buildings that will result in energy effi-  
2       cient buildings, to demonstrate innovative energy ef-  
3       ficiency technologies, especially those sponsored by  
4       the Department of Energy.

5               (2) AWARDS.—The Secretary shall award  
6       grants under this subsection competitively to those  
7       applicants whose proposals—

8                       (A) best demonstrate—

9                               (i) likelihood to meet or exceed the  
10                               standards referred to in subsection (b)(2);

11                               (ii) likelihood to maximize cost-effec-  
12                               tive energy efficiency opportunities; and

13                               (iii) advanced energy efficiency tech-  
14                               nologies; and

15                       (B) are least likely to be realized without  
16       Federal assistance.

17               (3) AMOUNT OF GRANTS.—Grants under this  
18       subsection shall be for up to 50 percent of design  
19       and energy modeling costs, not to exceed \$50,000  
20       per building. No single grantee may be eligible for  
21       more than 3 grants per year under this program.

22               (4) GRANT PAYMENTS.—

23                       (A) INITIAL PAYMENT.—The Secretary  
24       shall pay 50 percent of the total amount of the  
25       grant to grant recipients upon selection.

1           (B) REMAINDER OF PAYMENT.—The Sec-  
2           retary shall pay the remaining 50 percent of the  
3           grant only after independent certification that  
4           operational buildings are energy efficient build-  
5           ings as defined in subsection (b).

6           (C) FAILURE TO COMPLY.—The Secretary  
7           shall not provide the remainder of the payment  
8           unless the building is certified within 6 months  
9           after operation of the completed building to  
10          meet the requirements described in subpara-  
11          graph (B), or in the case of major renovations  
12          the building is certified within 6 months of the  
13          completion of the renovations.

14          (5) REPORT TO CONGRESS.—Not later than 3  
15          years after awarding the first grant under this sub-  
16          section, the Secretary shall transmit to Congress a  
17          report containing—

18                 (A) the total number and dollar amount of  
19                 grants awarded under this subsection; and

20                 (B) an estimate of aggregate cost and en-  
21                 ergy savings enabled by the pilot program  
22                 under this subsection.

23          (6) ADMINISTRATIVE EXPENSES.—Administra-  
24          tive expenses for the program under this subsection  
25          shall not exceed 10 percent of appropriated funds.

1 (b) DEFINITION OF ENERGY EFFICIENT BUILD-  
2 ING.—For purposes of this section the term “energy effi-  
3 cient building” means a building that—

4 (1) achieves a reduction in energy consumption  
5 of—

6 (A) at least 25 percent for new construc-  
7 tion, compared to the energy standards set by  
8 the 2004 International Energy Conservation  
9 Code (in the case of residential buildings) or  
10 ASHRAE Standard 90.1–2004; or

11 (B) at least 20 percent for major renova-  
12 tions, compared to energy consumption before  
13 renovations are begun; and

14 (2) is constructed or renovated in accordance  
15 with the most current, appropriate, and applicable  
16 voluntary consensus standards, as determined by the  
17 Secretary, such as those listed in the assessment  
18 under section 914(b), or revised or developed under  
19 section 914(c), of the Energy Policy Act of 2005.

20 (c) AUTHORIZATION OF APPROPRIATIONS.—There  
21 are authorized to be appropriated to the Secretary for car-  
22 rying out this section \$10,000,000 for each of the fiscal  
23 years 2008 through 2012.

24 **SEC. 13. ENERGY EXTENSION.**

25 (a) DEFINITIONS.—For purposes of this section:

1           (1) COOPERATIVE EXTENSION.—The term “Co-  
2           operative Extension” means the extension services  
3           established at the land-grant colleges and univer-  
4           sities under the Smith-Lever Act of May 8, 1914.

5           (2) DEPARTMENT.—The term “Department”  
6           means the Department of Energy.

7           (3) ENERGY SUPPLY RESEARCH AND DEVELOP-  
8           MENT PROGRAMS.—The term “energy supply re-  
9           search and development programs” means the re-  
10          search, development, demonstration, and commercial  
11          application programs in the Office of Energy Effi-  
12          ciency and Renewable Energy, the Office of Elec-  
13          tricity Delivery and Energy Reliability, and the Of-  
14          fice of Fossil Energy.

15          (4) INSTITUTION OF HIGHER EDUCATION.—The  
16          term “institution of higher education” has the  
17          meaning given that term in section 101(a) of the  
18          Higher Education Act of 1965 (20 U.S.C. 1001(a)).

19          (5) LAND-GRANT COLLEGES AND UNIVER-  
20          SITIES.—The term “land-grant colleges and univer-  
21          sities” means—

22                 (A) 1862 Institutions (as defined in sec-  
23                 tion 2 of the Agricultural Research, Extension,  
24                 and Education Reform Act of 1998 (7 U.S.C.  
25                 7601));

1 (B) 1890 Institutions (as defined in sec-  
2 tion 2 of that Act); and

3 (C) 1994 Institutions (as defined in section  
4 2 of that Act).

5 (b) IN GENERAL.—

6 (1) GRANTS.—The Secretary, through the en-  
7 ergy supply research and development programs of  
8 the Department, shall carry out a program to award  
9 competitive, merit-reviewed grants to Cooperative  
10 Extension services or offices, States, local govern-  
11 ments, institutions of higher education, and non-  
12 profit institutions with expertise in energy research  
13 or extension, or consortia thereof, to conduct activi-  
14 ties to transfer knowledge and information about ad-  
15 vanced energy technologies that increase efficiency of  
16 energy use, especially those developed at the Na-  
17 tional Laboratories and by the Department, to indi-  
18 viduals, businesses, nonprofit entities, and public en-  
19 tities, including local governments and school dis-  
20 tricts.

21 (2) REQUIREMENT.—To receive funding under  
22 this section, a grant applicant must already operate  
23 an outreach program capable of transferring knowl-  
24 edge and information about advanced energy tech-  
25 nologies that increase efficiency of energy use, or

1 must partner with an entity that has such an out-  
2 reach program.

3 (c) USES OF FUNDS.—Funds awarded under this  
4 section may be used for the following activities:

5 (1) Developing and distributing informational  
6 materials on technologies that could use energy more  
7 efficiently.

8 (2) Carrying out small-scale projects to dem-  
9 onstrate technologies that could use energy more ef-  
10 ficiently.

11 (3) Developing and conducting seminars, work-  
12 shops, long-distance learning sessions, and other ac-  
13 tivities to aid in the dissemination of knowledge and  
14 information on technologies that could use energy  
15 more efficiently.

16 (4) Providing or coordinating onsite energy  
17 evaluations for a wide range of energy end-users.

18 (5) Examining the energy efficiency needs of  
19 energy end-users to develop recommended research  
20 projects for the Department.

21 (6) Hiring experts in energy efficient tech-  
22 nologies to carry out activities described in para-  
23 graphs (1) through (5).

1           (7) Carrying out any other activities the Sec-  
2           retary believes will accomplish the purposes de-  
3           scribed in subsection (b)(1).

4           (d) SELECTION PROCESS APPLICATION.—An appli-  
5           cant seeking funding under this section shall submit an  
6           application to the Secretary at such time, in such manner,  
7           and containing such information as the Secretary may re-  
8           quire. The application shall include, at a minimum—

9           (1) a description of the applicant’s current out-  
10          reach program and of why it would be capable of  
11          transferring knowledge and information about ad-  
12          vanced energy technologies that increase efficiency of  
13          energy use;

14          (2) a description of the activities the applicant  
15          would carry out, of the technologies that would be  
16          transferred, and of who would be carrying out those  
17          activities;

18          (3) a description of how the proposed activities  
19          would be appropriate to the specific energy needs of  
20          the area to be served;

21          (4) an estimate of the number and types of en-  
22          ergy end-users expected to be reached through such  
23          activities; and

24          (5) a description of how the applicant will as-  
25          sess the success of the program.

1 (e) REVIEW OF APPLICATIONS.—In evaluating the  
2 applications submitted under this section, the Secretary  
3 shall consider, at a minimum—

4 (1) the ability of the applicant to effectively  
5 carry out the proposed program;

6 (2) the appropriateness of the applicant’s out-  
7 reach program for carrying out the program de-  
8 scribed in this section; and

9 (3) the likelihood that proposed activities could  
10 be expanded or used as a model for other areas.

11 (f) AWARDS.—

12 (1) DISTRIBUTION.—In making awards under  
13 this section, the Secretary shall ensure that, to the  
14 extent practicable, the program enables the transfer  
15 of knowledge and information about a variety of  
16 technologies and enables the transfer of knowledge  
17 and information in a variety of geographic areas.

18 (2) FOCUS.—In making awards under this sec-  
19 tion, the Secretary shall give priority to applicants  
20 that would significantly expand on or fill a gap in  
21 existing programs in a geographical region.

22 (g) COST SHARING.—The Secretary shall require  
23 cost-sharing in accordance with the requirements of sec-  
24 tion 988 of the Energy Policy Act of 2005 (42 U.S.C.  
25 16352) for commercial application activities.

1 (h) DURATION.—

2 (1) INITIAL GRANT PERIOD.—A grant awarded  
3 under this section shall be for a period of 5 years.

4 (2) INITIAL EVALUATION.—Each grantee under  
5 this section shall be evaluated during its third year  
6 of operation under procedures established by the  
7 Secretary to determine if the grantee is accom-  
8 plishing the purposes of this section described in  
9 subsection (b)(1). The Secretary shall terminate any  
10 grant that does not receive a positive evaluation. If  
11 an evaluation is positive, the Secretary may extend  
12 the grant for 3 additional years beyond the original  
13 term of the grant.

14 (3) ADDITIONAL EXTENSION.—If a grantee re-  
15 ceives an extension under paragraph (2), the grantee  
16 shall be evaluated again during the second year of  
17 the extension. The Secretary shall terminate any  
18 grant that does not receive a positive evaluation. If  
19 an evaluation is positive, the Secretary may extend  
20 the grant for a final additional period of 3 additional  
21 years beyond the original extension.

22 (4) LIMITATION.—No grantee may receive more  
23 than 11 years of support under this section without  
24 reapplying for support and competing against all  
25 other applicants seeking a grant at that time.

1 (i) TECHNICAL ASSISTANCE.—The Secretary and the  
2 National Laboratories may provide technical assistance on  
3 advanced energy technologies and methods to grantees.

4 (j) AUTHORIZATION OF APPROPRIATIONS.—There  
5 are authorized to be appropriated to the Secretary for car-  
6 rying out this section—

7 (1) \$25,000,000 for fiscal year 2008;

8 (2) \$27,375,000 for fiscal year 2009;

9 (3) \$30,000,000 for fiscal year 2010;

10 (4) \$32,900,000 for fiscal year 2011; and

11 (5) \$36,000,000 for fiscal year 2012.

12 **SEC. 14. GREEN ENERGY EDUCATION.**

13 (a) DEFINITION.—For the purposes of this section:

14 (1) DIRECTOR.—The term “Director” means  
15 the Director of the National Science Foundation.

16 (2) HIGH PERFORMANCE BUILDING.—The term  
17 “high performance building” has the meaning given  
18 that term in section 914(a) of the Energy Policy Act  
19 of 2005 (42 U.S.C. 16194(a)).

20 (b) GRADUATE TRAINING IN ENERGY RESEARCH  
21 AND DEVELOPMENT.—

22 (1) FUNDING.—In carrying out research, devel-  
23 opment, demonstration, and commercial application  
24 activities authorized for the Department of Energy,  
25 the Secretary may contribute funds to the National

1 Science Foundation for the Integrative Graduate  
2 Education and Research Traineeship program to  
3 support projects that enable graduate education re-  
4 lated to such activities.

5 (2) CONSULTATION.—The Director shall con-  
6 sult with the Secretary when preparing solicitations  
7 and awarding grants for projects described in para-  
8 graph (1).

9 (c) CURRICULUM DEVELOPMENT FOR HIGH PER-  
10 FORMANCE BUILDING DESIGN.—

11 (1) FUNDING.—In carrying out advanced en-  
12 ergy technology research, development, demonstra-  
13 tion, and commercial application activities author-  
14 ized for the Department of Energy related to high  
15 performance buildings, the Secretary may contribute  
16 funds to curriculum development activities at the  
17 National Science Foundation for the purpose of im-  
18 proving undergraduate or graduate interdisciplinary  
19 engineering and architecture education related to the  
20 design and construction of high performance build-  
21 ings, including development of curricula, of labora-  
22 tory activities, of training practicums, or of design  
23 projects. A primary goal of curriculum development  
24 activities supported under this section shall be to im-  
25 prove the ability of engineers, architects, and plan-

1       ners to work together on the incorporation of ad-  
2       vanced energy technologies during the design and  
3       construction of high performance buildings.

4           (2) CONSULTATION.—The Director shall con-  
5       sult with the Secretary when preparing solicitations  
6       and awarding grants for projects described in para-  
7       graph (1).

8           (3) PRIORITY.—In awarding grants with re-  
9       spect to which the Secretary has contributed funds  
10      under this subsection, the Director shall give priority  
11      to applications from departments, programs, or cen-  
12      ters of a school of engineering that are partnered  
13      with schools, departments, or programs of design,  
14      architecture, and city, regional, or urban planning.

15 **SEC. 15. ARPA-E STUDY.**

16       (a) IN GENERAL.—The Secretary shall enter into an  
17      arrangement with the National Academy of Sciences to  
18      conduct a detailed study of, and make further rec-  
19      ommendations on, the October 2005 National Academy of  
20      Sciences recommendation to establish an Advanced Re-  
21      search Projects Agency-Energy (in this section referred to  
22      as ARPA-E).

23       (b) REPORT.—Not later than 12 months after the  
24      date of enactment of this Act, the Secretary shall transmit  
25      to Congress the study described in subsection (a) and the

1 Secretary's response to the findings, conclusions, and rec-  
2 ommendations of that study.

3 (c) TERMS OF REFERENCE.—The Secretary shall en-  
4 sure that the study described in subsection (a) addresses  
5 the following questions:

6 (1) What basic research related to new energy  
7 technologies is occurring now, what entities are  
8 funding it, and what is preventing the results of that  
9 research from reaching the market?

10 (2) What economic evidence indicates that the  
11 limiting factor in the market penetration of new en-  
12 ergy technologies is a lack of basic research on path-  
13 breaking new technologies? What barriers do those  
14 trying to develop new energy technologies face dur-  
15 ing later stages of research and development?

16 (3) To what extent is the Defense Advanced  
17 Research Projects Agency an appropriate model for  
18 an energy research agency, given that the Federal  
19 Government would not be the primary customer for  
20 its technology and where cost is an important con-  
21 cern?

22 (4) How would research and development spon-  
23 sored by ARPA-E differ from research and develop-  
24 ment conducted by the National Laboratories or  
25 sponsored by the Department of Energy through the

1 Office of Science, the Office of Energy Efficiency  
2 and Renewable Energy, the Office of Fossil Energy,  
3 the Office of Electricity Delivery and Energy Reli-  
4 ability, and the Office of Nuclear Energy?

5 (5) Should industry or National Laboratories be  
6 recipients of ARPA-E grants? What institutional or  
7 organizational arrangements would be required to  
8 ensure that ARPA-E sponsors transformational,  
9 rather than incremental, research and development?

○