

## Calendar No. 622

111TH CONGRESS }  
2d Session }

SENATE

{ REPORT  
{ 111-335

### ADVANCED VEHICLE TECHNOLOGY ACT

SEPTEMBER 28, 2010.—Ordered to be printed

Mr. BINGAMAN, from the Committee on Energy and Natural Resources, submitted the following

### R E P O R T

[To accompany S. 2843]

The Committee on Energy and Natural Resources, to which was referred the bill (S. 2843) to provide for a program of research, development, demonstration, and commercial application in vehicle technologies at the Department of Energy, having considered the same, reports favorably thereon with an amendment and recommends that the bill, as amended, do pass.

The amendment is as follows:

Strike out all after the enacting clause and insert in lieu thereof the following:

#### SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the “Advanced Vehicle Technology Act of 2010”.

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

- Sec. 1. Short title; table of contents.
- Sec. 2. Findings and purposes.
- Sec. 3. Definitions.

#### TITLE I—VEHICLE RESEARCH AND DEVELOPMENT

- Sec. 101. Program.
- Sec. 102. Sensing and communications technologies.
- Sec. 103. Manufacturing.
- Sec. 104. User testing facilities.
- Sec. 105. Reports.
- Sec. 106. Innovative Automotive Demonstration Program.

#### TITLE II—MEDIUM AND HEAVY DUTY COMMERCIAL AND TRANSIT VEHICLES

- Sec. 201. Program.
- Sec. 202. Class 8 truck and trailer systems demonstration.
- Sec. 203. Technology testing and metrics..
- Sec. 204. Nonroad systems pilot program.

TITLE III—ADVANCED TECHNOLOGY VEHICLES MANUFACTURING  
INCENTIVE PROGRAM

Sec. 301 Advanced technology vehicles manufacturing incentive program.

TITLE IV—NATURAL GAS VEHICLES

Sec. 401 Natural gas vehicle research, development, and demonstration.

Sec. 402. Study of increasing natural gas and liquefied petroleum gas vehicles in Federal fleet.

TITLE V—AUTHORIZATION OF APPROPRIATIONS

Sec. 501. Authorization of appropriations.

Sec. 502. Cost-sharing requirement.

**SEC. 2. FINDINGS AND PURPOSES.**

(a) FINDINGS.—Congress finds that—

(1) according to the Energy Information Administration, the transportation sector accounts for approximately 28 percent of the United States primary energy demand and greenhouse gas emissions, and 24 percent of global oil demand;

(2) the United States transportation sector is over 95 percent dependent on petroleum, and over 60 percent of petroleum demand is met by imported supplies;

(3) United States heavy truck fuel consumption will increase 23 percent by 2030, while overall transportation energy use will decline by 1 percent;

(4) the domestic automotive and commercial vehicle manufacturing sectors have increasingly limited resources for research, development, and engineering of advanced technologies;

(5) domestic vehicle, engine, and component manufacturers are playing a more important role in vehicle technology development, and should be better integrated into Federal research efforts;

(6) priorities for vehicle technologies research of the Department of Energy have shifted drastically in recent years among diesel hybrids, hydrogen fuel cell vehicles, and plug-in electric hybrids, with little continuity among the vehicle technologies;

(7) the integration of vehicle, communication, and infrastructure technologies has great potential for efficiency gains through better management of the total transportation system; and

(8) the Federal Government should balance the role of the Federal Government in researching longer-term exploratory concepts and developing nearer-term transformational technologies for domestic-made vehicles.

(b) PURPOSES.—The purposes of this Act are—

(1) to reform and reorient the vehicle technologies programs of the Department of Energy;

(2) to develop and promote the deployment of technologies and practices that—

(A) improve the fuel efficiency and emissions of all vehicles produced in the United States; and

(B) reduce vehicle reliance on petroleum-based fuels;

(3) to support domestic research, development, demonstration, deployment, engineering, and commercial application and domestic manufacturing of advanced vehicles, engines, and components;

(4) to enable vehicles to move larger volumes of goods and more passengers with less energy and emissions;

(5) to develop cost-effective advanced technologies for wide-scale utilization throughout the passenger, commercial, government, and transit vehicle sectors;

(6) to allow for greater consumer choice of domestic-made vehicle technologies and fuels;

(7) to shorten technology development and integration cycles in the domestic vehicle industry;

(8) to ensure a proper balance and diversity of Federal investment in domestic-made vehicle technologies;

(9) to promote the integration of intelligent vehicle technologies with infrastructure-based information and communications systems and the electrical grid; and

(10) to strengthen partnerships between Federal and State governmental agencies and the private and academic sectors.

**SEC. 3. DEFINITIONS.**

In this Act:

(1) ADMINISTRATOR.—The term “Administrator” means the Administrator of the Environmental Protection Agency.

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

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

## TITLE I—VEHICLE RESEARCH AND DEVELOPMENT

### SEC. 101. PROGRAM.

(a) ACTIVITIES.—In carrying out the Vehicle Technologies Program of the Department, the Secretary shall conduct basic and applied research, development, engineering, demonstration, and commercial application activities on materials, technologies, and processes with the potential to substantially reduce or eliminate petroleum use by, and emissions from, passenger and commercial vehicles of the United States, including activities in the areas of—

- (1) hybridization or full electrification of vehicle systems;
- (2) batteries, ultracapacitors, and other energy storage devices;
- (3) power electronics;
- (4) vehicle, component, and subsystem manufacturing technologies and processes;
- (5) engine efficiency and combustion optimization;
- (6) waste heat recovery;
- (7) transmission and drivetrains;
- (8) hydrogen vehicle technologies, including fuel cells and internal combustion engines, and hydrogen infrastructure;
- (9) aerodynamics, rolling resistance, and accessory power loads of vehicles and associated equipment;
- (10) vehicle weight reduction, including lightweight materials;
- (11) friction and wear reduction;
- (12) engine and component durability;
- (13) innovative propulsion systems;
- (14) advanced boosting systems;
- (15) hydraulic hybrid technologies;
- (16) engine compatibility with and optimization for a variety of transportation fuels, including liquid and gaseous fuels;
- (17) predictive engineering, modeling, and simulation of vehicle and transportation systems;
- (18) refueling and charging infrastructure for alternative fueled and electric or plug-in electric hybrid vehicles, including the unique challenges facing rural areas;
- (19) gaseous fuels storage system integration and optimization;
- (20) sensing, communications, and actuation technologies for vehicle, electrical grid, and infrastructure;
- (21) efficient use and recycling of rare earth materials and reduction of precious metals and other high-cost materials in vehicles;
- (22) aftertreatment technologies;
- (23) thermal management of battery systems;
- (24) retrofitting advanced vehicle technologies to existing vehicles;
- (25) development of common standards, specifications, and architectures for both transportation and stationary battery applications;
- (26) development of innovative materials, including constructive, connective, and reinforcing vehicle components; and
- (27) other research areas, as determined by the Secretary.

(b) TRANSFORMATIONAL TECHNOLOGY.—The Secretary, in coordination with the Secretary of Transportation (if appropriate), shall ensure that the Department continues to support domestic research, development, engineering, demonstration, and commercial application activities and maintains competency in mid- to long-term transformational vehicle technologies with the potential to achieve deep reductions in petroleum use and emissions, including activities in the areas of—

- (1) hydrogen vehicle technologies, including fuel cells, internal combustion engines, hydrogen storage, infrastructure, and activities in hydrogen technology validation and safety codes and standards;
- (2) multiple battery chemistries and novel energy storage devices, including nonchemical batteries and electromechanical storage technologies such as hydraulics, flywheels, bipolar design, and compressed air storage;
- (3) communication and connectivity among vehicles, infrastructure, and the electrical grid;
- (4) lightweight vehicles and materials; and

(5) other innovative technologies research and development, as determined by the Secretary.

(c) INDUSTRY PARTICIPATION.—

(1) IN GENERAL.—To the maximum extent practicable, activities under this Act shall be carried out in partnership or collaboration with—

- (A) automotive manufacturers;
- (B) heavy commercial and transit vehicle manufacturers;
- (C) qualified plug-in electric vehicle manufacturers;
- (D) vehicle and engine equipment and component manufacturers;
- (E) manufacturing equipment manufacturers;
- (F) advanced vehicle service providers;
- (G) fuel producers and energy suppliers;
- (H) electric utilities;
- (I) institutions of higher education;
- (J) National Laboratories; and
- (K) independent research laboratories.

(2) ADMINISTRATION.—In carrying out this Act, the Secretary shall—

(A) determine whether a wide range of companies that manufacture or assemble vehicles or components in the United States are represented in ongoing public private partnership activities, including firms that have not traditionally participated in federally sponsored research and development activities, and if practicable, partner with such firms that conduct a substantial portion of relevant research and development activities in the United States;

(B) leverage the capabilities and resources of, and formalize partnerships with, industry-led stakeholder organizations, nonprofit organizations, industry consortia, and trade associations with expertise in the research and development of, and education and outreach activities in, advanced automotive and commercial vehicle technologies;

(C) develop more efficient processes for transferring research findings and technologies to industry;

(D) give consideration to conversion of existing or former vehicle technology development or manufacturing facilities for the purposes of this Act, and support public-private partnerships dedicated to overcoming barriers in commercial application of transformational vehicle technologies that use such industry-led facilities;

(E) promote efforts to ensure that technologies developed under this Act are produced in the United States; and

(F) establish public-private partnerships dedicated to overcoming barriers to the commercial application of transformational vehicle technologies, using existing industry-led domestic technology development facilities of entities with demonstrated expertise in successfully designing and engineering precommercial generations of such transformational technology.

(d) INTERAGENCY AND INTRAAGENCY COORDINATION.—To the maximum extent practicable, the Secretary shall coordinate research, development, engineering, demonstration, and commercial application activities among—

(1) relevant programs within the Department, including—

- (A) the Office of Energy Efficiency and Renewable Energy;
- (B) the Office of Science;
- (C) the Office of Electricity Delivery and Energy Reliability;
- (D) the Office of Fossil Energy;
- (E) the Advanced Research Projects Agency—Energy; and
- (F) other offices, as determined by the Secretary; and

(2) relevant technology research and development programs within the Department of Transportation and other Federal agencies, as determined by the Secretary.

(e) COORDINATION AND NONDUPLICATION.—In coordinating activities, the Secretary shall ensure, to the maximum extent practicable, that activities do not duplicate activities of other programs within the Department or other relevant research agencies.

(f) FEDERAL DEMONSTRATION OF TECHNOLOGIES.—The Secretary shall make information available to procurement programs of Federal agencies regarding the potential to demonstrate technologies resulting from activities funded through programs under this Act.

(g) INTERGOVERNMENTAL COORDINATION.—The Secretary shall seek opportunities to leverage resources and support initiatives of State and local governments in developing and promoting advanced vehicle technologies, manufacturing, and infrastructure.

**SEC. 102. SENSING AND COMMUNICATIONS TECHNOLOGIES.**

(a) **IN GENERAL.**—The Secretary, in coordination with the Secretary of Transportation and relevant research programs of other Federal agencies, shall conduct research, development, engineering, and demonstration activities on connectivity of domestic vehicle and transportation systems, including on sensing, computation, communication, actuation, and information technologies that allow for reduced fuel use, optimized traffic flow, improved freight logistics, and vehicle electrification, including technologies for—

- (1) onboard vehicle, engine, and component sensing and actuation;
- (2) vehicle-to-vehicle sensing and communication;
- (3) vehicle-to-infrastructure sensing and communication;
- (4) vehicle integration with the electrical grid; and
- (5) driver-to-vehicle integration and communication.

(b) **COORDINATION.**—The activities carried out under this section should supplement, and not duplicate, activities under the intelligent transportation system research program of the Department of Transportation.

**SEC. 103. MANUFACTURING.**

The Secretary shall carry out a research, development, engineering, demonstration, and commercial application program of domestic advanced vehicle manufacturing technologies and practices, including innovative processes to—

- (1) increase the production rate and decrease the cost of advanced battery manufacturing;
- (2) vary the capability of individual manufacturing facilities to accommodate different battery chemistries and configurations;
- (3) reduce waste streams, emissions, and energy-intensity of vehicle, engine, advanced battery, and component manufacturing processes;
- (4) recycle and remanufacture used batteries and other vehicle components for reuse in vehicles or stationary applications;
- (5) produce cost-effective lightweight materials, such as advanced metal alloys, polymeric composites, and carbon fiber;
- (6) produce lightweight high pressure storage systems for gaseous fuels;
- (7) design and manufacture purpose-built hydrogen and fuel cell vehicles and components;
- (8) improve the calendar life and cycle life of advanced batteries; and
- (9) produce permanent magnets for advanced vehicles.

**SEC. 104. USER TESTING FACILITIES.**

Activities under this Act may include domestic construction, expansion, or modification of new and existing vehicle, engine, and component research and testing facilities for—

- (1) testing or simulating interoperability of a variety of vehicle components and systems;
- (2) subjecting whole or partial vehicle platforms to fully representative duty cycles and operating conditions;
- (3) developing and demonstrating a range of chemistries and configurations for advanced vehicle battery manufacturing; and
- (4) developing and demonstrating test cycles for new and alternative fuels and other advanced vehicle technologies.

**SEC. 105. REPORTS.**

(a) **TECHNOLOGIES.**—Not later than 18 months after the date of enactment of this Act and annually thereafter through calendar year 2015, the Secretary shall submit to Congress a report regarding the technologies developed as a result of the activities authorized by this title, with a particular emphasis on—

- (1) whether the technologies were successfully adopted for commercial applications; and
- (2) if so, whether those technologies are manufactured in the United States.

(b) **ACTIVITIES.**—At the end of each fiscal year the Secretary shall submit to the relevant Congressional committees of jurisdiction an annual report on activities undertaken during the fiscal year under this title, including—

- (1) active industry participants;
- (2) efforts to recruit new participants;
- (3) progress of the program in meeting goals and timelines; and
- (4) a strategic plan for funding of activities across agencies.

**SEC. 106. INNOVATIVE AUTOMOTIVE DEMONSTRATION PROGRAM.**

(a) **IN GENERAL.**—The Secretary shall establish an Innovative Automotive Demonstration Program, within the Vehicle Technologies Program, to encourage the introduction of new domestic-made advanced technology vehicles into the marketplace

that are designed in their entirety to achieve very high energy efficiency but still provide the capabilities required by consumers in the United States.

(b) ADMINISTRATION.—The Program established under this section shall encourage—

- (1) the introduction of new light duty vehicles into the marketplace that are capable of achieving energy efficiencies significantly greater than required under applicable and pending corporate average fuel economy standards; and
- (2) the use of materials and manufacturing techniques that minimize environmental impacts.

(c) AWARDS.—Awards under this section shall be made on a competitive basis for demonstration of domestic-made vehicles that—

- (1) are primarily for use on public streets, roads, and highways and are not manufactured primarily for off-road use;
- (2) meet all Federal safety requirements;
- (3) achieve at least 70 miles per gallon or the equivalent on drive cycle of the Environmental Protection Agency;
- (4) provide vehicle performance that is judged acceptable to consumers in the United States;
- (5) be affordable to consumers in the United States;
- (6) use materials and manufacturing processes that minimize environmental impacts;
- (7) meet all Federal and State emission requirements; and
- (8) provide new high technology engineering and production employment opportunities.

## TITLE II—MEDIUM AND HEAVY DUTY COMMERCIAL AND TRANSIT VEHICLES

### SEC. 201. PROGRAM.

(a) IN GENERAL.—In carrying out the 21st Century Truck Partnership of the Department, the Secretary, in partnership with relevant research and development programs in other Federal agencies and a range of appropriate industry stakeholders, shall conduct cooperative research, development, demonstration, and commercial application activities on advanced technologies for medium- to heavy-duty commercial, recreational, and transit vehicles, including activities in the areas of—

- (1) engine efficiency and combustion research;
- (2) onboard storage technologies for compressed and liquefied natural gas;
- (3) development and integration of engine technologies designed for natural gas operation of a variety of vehicle platforms;
- (4) waste heat recovery and conversion;
- (5) improved aerodynamics and tire rolling resistance;
- (6) energy and space-efficient emissions control systems;
- (7) heavy hybrid, hybrid hydraulic, plug-in hybrid, and electric platforms, and energy storage technologies;
- (8) drivetrain optimization;
- (9) friction and wear reduction;
- (10) engine idle and parasitic energy loss reduction;
- (11) electrification of accessory loads;
- (12) onboard sensing and communications technologies;
- (13) advanced lightweight materials and vehicle designs;
- (14) increasing load capacity per vehicle;
- (15) thermal management of battery systems;
- (16) recharging infrastructure;
- (17) complete vehicle modeling and simulation;
- (18) hydrogen vehicle technologies, including fuel cells and internal combustion engines, and hydrogen infrastructure;
- (19) retrofitting advanced technologies onto existing truck fleets; and
- (20) integration of those and other advanced systems onto a single truck and trailer platform.

(b) DIRECTOR.—

(1) IN GENERAL.—The Secretary shall appoint a full-time Director to coordinate research, development, demonstration, and commercial application activities in medium- to heavy-duty commercial, recreational, and transit vehicle technologies.

(2) DUTIES.—The Director shall—

- (A) improve coordination and develop consensus between government agency and industry partners, and propose new processes for program man-

agement and priority setting to better align activities and budgets among partners;

(B) regularly conduct workshops, site visits, demonstrations, conferences, investor forums, and other events in which information and research findings are shared among program participants and interested stakeholders;

(C) develop a budget for activities of the Department regarding the interagency program established under this title, and provide consultation and guidance on vehicle technology funding priorities across agencies;

(D) determine a process for reviewing program technical goals, targets, and timetables and, if applicable, aided by life-cycle impact and cost analysis, propose revisions or elimination based on program progress, available funding, and rate of technology adoption;

(E) evaluate ongoing activities of the program and recommend project modifications, including the termination of projects, if applicable; and

(F) other responsibilities, as determined by the Secretary, in consultation with interagency and industry partners.

(d) **REPORTS.**—At the end of each fiscal year, the Secretary shall submit to Congress an annual report that describes activities undertaken during the fiscal year under this title, including—

- (1) active industry participants;
- (2) progress of the program in meeting goals and timelines; and
- (3) a strategic plan for funding of activities across agencies.

**SEC. 202. CLASS 8 TRUCK AND TRAILER SYSTEMS DEMONSTRATION.**

(a) **IN GENERAL.**—The Secretary shall conduct a competitive grant program to demonstrate the integration of multiple advanced technologies on Class 8 truck and trailer platforms with a goal of improving overall freight efficiency, as measured in tons and volume of freight hauled or other work performance-based metrics, by 50 percent, through a combination of technologies described in section 201(a).

(b) **APPLICANT TEAMS.** Applicant teams may be comprised of truck and trailer manufacturers, engine and component manufacturers, fleet customers, information and communications technology manufacturers and providers, researchers of institutions of higher education, and other applicants, as appropriate, for the development and demonstration of integrated Class 8 truck and trailer systems.

**SEC. 203. TECHNOLOGY TESTING AND METRICS.**

The Secretary, in coordination with the partners of the 21st Century Truck Partnership of the Department—

(1) shall develop standard testing procedures and technologies for evaluating the performance of advanced heavy vehicle technologies under a range of representative duty cycles and operating conditions, including heavy hybrid propulsion systems;

(2) shall evaluate heavy vehicle performance using work performance-based metrics other than metrics based on miles per gallon, including—

(A) metrics based on units of volume and weight transported for freight applications; and

(B) appropriate metrics based on performance on nonroad systems; and

(3) may construct heavy duty truck and bus testing facilities.

**SEC. 204. NONROAD SYSTEMS PILOT PROGRAM.**

(a) **IN GENERAL.**—The Secretary shall carry out a pilot program of research, development, demonstration, and commercial applications of technologies to improve total machine or system efficiency for nonroad mobile equipment, including agricultural and construction equipment.

(b) **INFORMATION TRANSFER.**—In carrying out this section, the Secretary shall seek opportunities to transfer relevant research findings and technologies between the nonroad and on-highway equipment and vehicle sectors.

### **TITLE III—ADVANCED TECHNOLOGY VEHICLES MANUFACTURING INCENTIVE PROGRAM**

**SEC. 301. ADVANCED TECHNOLOGY VEHICLES MANUFACTURING INCENTIVE PROGRAM.**

Section 136 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17013) is amended—

(1) in subsection (a)—

(A) in paragraph (1)—

(i) by redesignating subparagraphs (A) through (C) as clauses (i) through (iii), respectively, and indenting appropriately;

- (ii) in the matter preceding clause (i) (as redesignated by clause (i)), by striking “means an ultra efficient vehicle or a light duty vehicle that meets—” and inserting the following:
- “means—
- “(A) an ultra efficient vehicle or a light duty vehicle that meets—”;
- (iii) in clause (iii) (as redesignated by clause (i)), by striking the period at the end and inserting “; or”; and
- (iv) by adding at the end the following:
- “(B) a vehicle such as a medium-duty or heavy-duty work truck, bus, or rail transit vehicle that—
- “(i) is used on a public street, road, highway, or transitway;
- “(ii) meets each applicable emissions standard that is established as of the date of the application; and
- “(iii) as determined by the Secretary, the deployment of which will reduce consumption of motor fuels by 25 percent or more, as compared to current surface transportation technologies that perform a similar function, unless the Secretary determines that—
- “(I) the percentage is not achievable for a vehicle type or class; and
- “(II) an alternative percentage for that vehicle type or class will result in substantial reductions in motor fuel consumption.”;
- (B) in paragraph (3)(B)—
- (i) by striking “equipment and” and inserting “equipment,”; and
- (ii) by inserting “, and manufacturing process equipment” after “suppliers”; and
- (C) by striking paragraph (4) and inserting the following:
- “(4) QUALIFYING COMPONENTS.—The term ‘qualifying components’ means components, systems, or groups of subsystems that the Secretary determines to—
- “(A) be designed for improving fuel economy of advanced technology vehicles; and
- “(B) contribute measurably to the overall fuel economy of the advanced technology vehicles.”;
- (2) in subsection (b), in the matter preceding paragraph (1), by striking “to automobile” and inserting “to advanced technology vehicle”;
- (3) in subsection (d)(1), in the first sentence, by striking “a total of not more than \$25,000,000,000 in”;
- (4) in subsection (h)—
- (A) in the subsection heading, by striking “AUTOMOBILE” and inserting “ADVANCED TECHNOLOGY VEHICLE”; and
- (B) in paragraph (1)(B), by striking “automobiles” each place it appears and inserting “advanced technology vehicles”; and
- (5) in subsection (i), by striking “2012” and inserting “2015”.

## TITLE IV—NATURAL GAS VEHICLES

### SEC. 401. NATURAL GAS VEHICLE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROJECTS.

(a) IN GENERAL.—The Secretary, in coordination with the Administrator, shall conduct a program of natural gas vehicle research, development, and demonstration.

(b) PURPOSES.—The purposes of the program conducted under this section are to focus on—

- (1) the continued improvement and development of new, cleaner, more efficient light-duty, medium-duty, and heavy-duty natural gas and vehicle engines;
- (2) the integration of those engines into light-duty, medium-duty, and heavy-duty natural gas vehicles for onroad and offroad applications;
- (3) the expansion of product availability by assisting manufacturers with the certification of the engines or vehicles described in paragraph (1) or (2) to comply with Federal or California certification requirements and in-use emission standards;
- (4) the demonstration and proper operation and use of the vehicles described in paragraph (2) under all operating conditions;
- (5) the development and improvement of nationally recognized codes and standards for the continued safe operation of vehicles described in paragraph (2) and the components of the vehicles;
- (6) the improvement in the reliability and efficiency of natural gas fueling station infrastructure;
- (7) the certification of natural gas fueling station infrastructure to nationally recognized and industry safety standards;



- (8) the improvement in the reliability and efficiency of onboard natural gas fuel storage systems;
- (9) the development of new natural gas fuel storage materials;
- (10) the certification of onboard natural gas fuel storage systems to nationally recognized and industry safety standards; and
- (11) the use of natural gas engines in hybrid vehicles.

(c) Certification of Aftermarket Conversion Systems.—

(1) IN GENERAL.—The Secretary shall coordinate with the Administrator on issues relating to streamlining the certification of natural gas aftermarket conversion systems to comply with appropriate Federal certification requirements and in-use emission standards.

(2) STREAMLINED CERTIFICATION.—For purposes of paragraph (1), streamlined certification shall include providing aftermarket conversion system manufacturers the option to continue to sell and install systems on engines and test groups for which the manufacturers have previously received a certificate of conformity without having to request a new certificate in future years.

(d) COOPERATION AND COORDINATION WITH INDUSTRY.—In developing and carrying out the program under this section, the Secretary shall coordinate with the natural gas vehicle industry to ensure, to the maximum extent practicable, cooperation between the public and the private sector.

(e) ADMINISTRATION.—The program under this section shall be conducted in accordance with sections 3001 and 3002 of the Energy Policy Act of 1992 (42 U.S.C. 13541, 13542).

(f) REPORT.—Not later than 2 years after the date of enactment of this Act, the Secretary shall submit to the appropriate committees of Congress a report on the implementation of this section.

(g) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Secretary to carry out this section \$30,000,000 for each of fiscal years 2011 through 2015.

**SEC. 402. STUDY OF INCREASING NATURAL GAS AND LIQUEFIED PETROLEUM GAS VEHICLES IN FEDERAL FLEET.**

(a) IN GENERAL.—The Administrator of General Services, in consultation with the Administrator and the Secretary, shall conduct a study of the means by which the Federal fleet could increase the number of light-, medium-, and heavy-duty natural gas and liquefied petroleum gas vehicles in the fleet.

(b) COMPONENTS.—In conducting the study, the Administrator of General Services shall—

(1) take into consideration Executive Order 13514 (74 Fed. Reg. 52117; relating to Federal leadership in environmental, energy, and economic performance) requiring agencies to meet a 30-percent reduction in vehicle fleet petroleum use by 2020;

(2) assess—

(A) the barriers to increasing the number of natural gas and liquefied petroleum gas vehicles in the Federal fleet;

(B) the potential for maximizing the use of natural gas and liquefied petroleum gas vehicles in the fleet;

(C) the expected reductions in petroleum use and greenhouse gas emissions as part of the potential impacts of increasing natural gas and liquefied petroleum in the fleet; and

(D) the lifecycle costs involved in fleet conversions, including the cost savings from reduced fuel consumption;

(3) provide a separate analysis of the potential costs of installing the specific fueling infrastructure required to increase natural gas and liquefied petroleum gas in the fleet; and

(4) include feasibility assessments for increasing the number of light-, medium-, and heavy-duty natural gas and liquefied petroleum gas vehicles in the fleet over a base period of 10 years and accelerated periods of 3 and 5 years.

(c) REPORT.—Not later than 180 days after the date of enactment of this Act, the Administrator of General Services shall submit to the appropriate committees of Congress a report on the results of the study conducted under this section.

## TITLE V—AUTHORIZATION OF APPROPRIATIONS

**SEC. 501. AUTHORIZATION OF APPROPRIATIONS.**

There are authorized to be appropriated to the Secretary such sums as are necessary to carry out this Act.

**SEC. 502. COST-SHARING REQUIREMENT.**

The activities carried out under this Act shall be subject to the cost-sharing requirements of section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

**PURPOSE**

The purpose of S. 2843 is to provide for a program of research, development, demonstration, and commercial application in vehicle technologies at the Department of Energy.

**BACKGROUND AND NEED**

Over the last two decades, federal research priorities in vehicle technology have shifted between passenger and heavy duty vehicles, as well as diesel-hybrids, hydrogen-fueled, and battery-powered drive systems. The variation in priority and funding may be one reason for unsteady progress in advancing any one technology. This illustrates the need for a comprehensive strategy and consistent funding in a broad range of areas, from near-commercial technologies to exploratory research on a variety of systems, and across vehicle size classes. Striking the appropriate research balance and strengthening the federal commitment in this area is especially critical at a time when both the automotive and commercial trucking industries have limited resources for increasingly expensive research and development. S. 2843 lays out a comprehensive research, development, demonstration, and commercial application program, including many subprograms to support advancing U.S. competitiveness in advanced vehicle technologies.

**LEGISLATIVE HISTORY**

S. 2843 was introduced by Senator Stabenow on December 7, 2009. The Subcommittee on Energy held a legislative hearing on the House companion bill, H.R. 3246, on December 8, 2009 (S. Hrg. 111-330). The Committee on Energy and Natural Resources considered S. 2843 and ordered it reported favorably with an amendment in the nature of a substitute on July 21, 2010.

**COMMITTEE RECOMMENDATION AND TABULATION OF VOTES**

The Committee on Energy and Natural Resources, in an open business session on July 21, 2010, by a roll call vote of a quorum present, recommends that the Senate pass S. 2843, if amended as described herein.

The rollcall vote on reporting the measure was 13 yeas, 10 nays, as follows:

YEAS	NAYS
Mr. Bingaman	Ms. Murkowski
Mr. Dorgan	Mr. Burr
Mr. Wyden	Mr. Barrasso
Mr. Johnson*	Mr. Brownback
Ms. Landrieu*	Mr. Risch
Ms. Cantwell*	Mr. McCain*
Mr. Menendez*	Mr. Bennett
Mrs. Lincoln*	Mr. Bunning*
Mr. Sanders	Mr. Sessions*
Mr. Bayh	Mr. Corker*

Ms. Stabenow  
 Mr. Udall  
 Ms. Shaheen

\* Indicates vote by proxy.

#### COMMITTEE AMENDMENT

During its consideration of S. 2843, the Committee adopted an amendment in the nature of a substitute. The amendment adds a new title III, which extends and expands eligibility for the Advanced Technology Vehicles Manufacturing Incentive Program established under section 136 of the Energy Independence and Security Act of 2007, and a new title IV, which directs the Secretary of Energy to conduct a program of natural gas vehicle research, development, and demonstration, and directs the General Services Administration to conduct a study of the means by which the Federal government could increase the number of light, medium, and heavy-duty natural gas and liquefied petroleum gas vehicles in the fleet. In addition, the substitute amendment subjects activities carried out under the bill to the cost-sharing requirements of section 988 of the Energy Policy Act of 2005, and makes clear that the bill is intended to “reform and re-orient” the Department’s existing vehicle programs. The amendment is explained in detail in the section-by-section analysis below.

#### SECTION-BY-SECTION ANALYSIS

*Section 1* provides a short title and table of contents.

*Section 2(a)* states the findings and purpose of the legislation.

Subsection (b) states the purposes of the legislation.

*Section 3* defines terms used in the legislation.

#### TITLE I—VEHICLE RESEARCH AND DEVELOPMENT

*Section 101(a)* directs the Secretary of Energy to conduct research, development, demonstration, and commercial application activities on advanced vehicle materials, technologies, and processes in the areas of: [hybridization and electrification; batteries and energy storage devices; power electronics; manufacturing technologies; engine efficiency and combustion; waste heat recovery; transmission and drivetrains; hydrogen technologies; aerodynamics, rolling resistance, and accessory power loads; weight reduction; friction and wear reduction; durability; innovative propulsion systems; compatibility with non-petroleum fuels; modeling and simulation; refueling and charging infrastructure; sensing and communications; rare earth and precious metals; aftertreatment; battery thermal management; common standards and specifications; and other areas as determined by the Secretary].

Subsection (b) directs the Secretary to maintain programs to retain competency in mid-to-long term transformational vehicle technologies such as hydrogen, multiple battery chemistries, novel energy storage devices, vehicle connectivity, lightweight materials, and other areas as determined by the Secretary.

Subsection (c) specifies that activities should be carried out in partnership or collaboration with a diverse set of non-governmental, private and academic entities, including those which have not previously participated in government-sponsored research and

development activities. The Secretary is required to leverage the resources of and support other organizations with expertise in vehicle technology development and develop streamlined technology transfer mechanisms. The Secretary should also seek to utilize existing or former manufacturing facilities, promote efforts to ensure technologies are produced in the U.S., and establish public-private partnerships for that purpose.

Subsection (d) directs the Secretary to maximize coordination of activities between relevant Departmental programs and offices, and other federal agencies.

Subsection (e) directs the Secretary to avoid duplication of activities of other programs within the Federal government to the maximum extent practicable.

Subsection (f) directs the Secretary inform procurement programs of Federal agencies of the potential for demonstrating technologies funded by this Act.

Subsection (g) directs the Secretary to support State and local government initiatives in advanced vehicle technologies, development, manufacturing, and infrastructure.

*Section 102* creates a research, development, demonstration, and commercial application program, carried out in coordination with the Secretary of Transportation, on sensing and communications technologies in vehicles and infrastructure that will facilitate reduced fuel use, optimized traffic flow, improved freight logistics, and vehicle electrification.

*Section 103* creates a research, development, demonstration, and commercial application program in manufacturing processes to produce advanced vehicle technologies and components.

*Section 104* authorizes the construction, expansion, or modification of user testing facilities for advanced vehicles and components.

*Section 105* specifies the content of required annual reports on the activities undertaken in programs authorized by this Act, including progress on domestic commercialization and the extent of industry participation.

*Section 106* establishes an innovative automotive demonstration program with awards to private entities that bring to market light duty vehicles of significantly better fuel efficiency than is contemplated by federal fuel economy standards.

## TITLE II—MEDIUM AND HEAVY DUTY VEHICLES

*Section 201(a)* directs the Secretary to carry out a collaborative commercial and transit vehicle technology development program in partnership with a variety of industry and federal agency partners, including activities in the areas of: [engine efficiency; combustion; waste heat recovery; aerodynamics; rolling resistance; hybridization and electrification; drivetrains; friction and wear reduction; engine idle and parasitic energy loss; sensing and communications; lightweight materials; battery thermal management; recharging infrastructure; modeling and simulation; retrofitting of existing fleets with new technologies; and integration of multiple technologies onto a single platform].

Subsection (b) directs the Secretary to appoint a full-time director for medium-to-heavy duty truck technology development programs, with responsibilities to include: improving coordination between agencies and program partners; convening of events for shar-

ing information and research findings; developing a program budget and consulting on budget priorities across agency partners; determining a process for reviewing and revising program goals, targets and timetables; and, evaluating program activities and recommending modifications.

Subsection (c) directs the Secretary to submit to Congress an annual report describing program activities, partners, and progress, and proposing a strategic plan for the interagency partnership.

*Section 202* creates a competitive grant program to demonstrate the integration of multiple advanced technologies on truck and trailer platforms that facilitate improved overall freight efficiency.

*Section 203* directs the Secretary, in coordination with interagency partners, to develop standard testing procedures and metrics that represent the unique task-specific operating conditions and duty cycles for heavy-duty vehicles, and authorizes the Secretary to construct heavy duty truck and bus testing facilities.

*Section 204* directs the Secretary to undertake a pilot program in technology development for non-road equipment (such as construction, agricultural, or industrial mobile equipment) and to seek opportunities to transfer relevant research findings between non-road and on-highway sectors.

### TITLE III—ADVANCED TECHNOLOGY VEHICLES MANUFACTURING INCENTIVE PROGRAM

*Section 301* amends section 136 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17013).

Paragraph (1)(A) amends section 136 to allow lending to manufacturers of medium or heavy duty trucks, buses, or rail transit vehicles when the Secretary determines that the deployment of such vehicles will result in a reduction in consumption of motor fuels of 25 percent compared to conventional technologies, or, in cases where such amount is deemed not achievable, a lesser but still substantial reduction.

Paragraph (1)(B) clarifies that loans may be made for manufacturing process equipment for producing qualifying vehicles and components.

Paragraph (1)(C) modifies the definition of “qualifying components” to clarify that components that are designed to improve the fuel economy performance of a qualifying vehicle and contribute measurably to the overall fuel economy of the vehicle qualify for lending, even if the component itself does not yield sufficient fuel economy gain for a given vehicle to qualify as an advanced technology vehicle.

Paragraph (2) makes a conforming amendment.

Paragraph (3) strikes the program’s previously authorized lending cap of \$25,000,000,000.

Paragraph (4) makes a conforming amendment.

Paragraph (5) extends the program’s authorization date from 2012 through 2015.

### TITLE IV—NATURAL GAS VEHICLES

*Section 401(a)* directs the Secretary to coordinate with the Administrator of the Environmental Protection Agency to conduct a

natural gas vehicle research, development, and demonstration program.

Subsection (b) specifies the purposes of the program [including the development of more efficient natural gas and vehicles engines; the integration of those engines in off and on road vehicles; assisting manufacturers in the certification of both the engines and vehicles as compliant with state and federal emissions requirements, including demonstration of proper use; the development of nationally recognized codes relating to safe operation of natural gas engines and vehicles; the improvement of both reliability and safety of natural gas fueling stations and onboard storage systems; and the use of natural gas engines in hybrid vehicles].

Subsection (c) directs the Secretary to work with the Administrator to streamline the certification system for natural gas aftermarket conversion systems and ensure their compliance with Federal standards.

Subsection (d) directs the Secretary to coordinate with the natural gas vehicle industry while developing and carrying out the program.

Subsection (e) directs the program created by this section to be conducted in accordance with sections 3001 and 3002 of the Energy Policy Act of 1992 (42 U.S.C. 13541,13542).

Subsection (f) directs the Secretary to submit a report on the implementation of the program to the appropriate Congressional committees not later than 2 years after enactment.

Subsection (g) authorizes the appropriation of \$30,000,000 for each of fiscal years 2011 through 2015 to be used by the Secretary to carry out the program.

*Section 402(a)* directs the Administrator of General Services, in consultation with the Secretary of Energy and the Administrator of the Environmental Protection Agency, to conduct a study on increasing the number of natural gas and liquefied petroleum gas vehicles in the federal fleet.

Subsection (b) directs that the study include consideration of Executive Order 13514 (74 Fed. Reg. 52117), which requires federal fleet petroleum use to be reduced by 30 percent by 2020, and also assess the various barriers, feasibility, as well as environmental and cost benefits of increased use of such vehicles.

Subsection (c) directs the Administrator of General Services to submit the report not later than 180 days after the date of enactment to the appropriate Congressional committees.

#### TITLE V—AUTHORIZATION OF APPROPRIATIONS

*Section 501* authorizes the Secretary to appropriate the necessary sums to carry out this Act.

*Section 502* subjects activities carried out under S. 2843 to the cost-sharing requirements covered under section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352).

#### COST AND BUDGETARY CONSIDERATIONS

The following estimate of costs of this measure has been provided by the Congressional Budget Office.

*S. 2843—Advanced Vehicle Technology Act of 2010*

Summary: S. 2843 would direct the Secretary of Energy to expand existing activities aimed at developing alternative vehicles with the potential to significantly reduce or eliminate petroleum use and carbon emissions. Assuming appropriation of the necessary amounts, CBO estimates that implementing S. 2843 would cost about \$1.5 billion over the 2011–2015 period. Enacting S. 2843 would not affect direct spending or revenues; therefore, pay-as-you-go procedures do not apply.

S. 2843 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA) and would impose no costs on state, local, or tribal governments.

Estimated cost to the Federal Government: The estimated budgetary impact of S. 2843 is shown in the following table. The costs of this legislation fall within budget function 270 (energy).

	By fiscal year, in millions of dollars—					2011–2015
	2011	2012	2013	2014	2015	
CHANGES IN SPENDING SUBJECT TO APPROPRIATION						
Estimated Authorization Level .....	425	428	435	444	454	2,186
Estimated Outlays .....	130	259	320	362	399	1,470

Basis of estimate: S. 2843 would direct the Secretary of Energy to carry out, in collaboration with vehicle manufacturers and other nonfederal entities, activities to promote the development of vehicles with the potential to significantly reduce petroleum use and carbon emissions. The bill would authorize the appropriation of whatever amounts are necessary to expand existing research and development activities of the Department of Energy (DOE) related to alternative vehicles. In addition, the bill would require the agency to establish new initiatives, particularly related to medium- and heavy-duty and transit vehicles.

S. 2843 does not specify particular targets or goals for DOE to achieve related to alternative vehicles. Research and development activities inherently involve trial and error, and the pace of incremental progress is directly related to the variety of experiments attempted and other factors. For this estimate, CBO assumes that the agency would increase its level of effort by expanding existing programs, launching new initiatives, and increasing the number of technologies tested in order to achieve appreciable progress in research areas addressed by S. 2843. Based on information from the agency, CBO estimates that realizing recognizable gains from such efforts would require additional appropriations of \$425 million in 2011. (According to DOE, funding for activities addressed by the bill totaled about \$300 million in 2010.) That estimate for 2011 includes:

- \$200 million to expand general research and development efforts related to alternative passenger and light-duty commercial vehicles;
- \$130 million to expand and establish research and development related to alternative medium- and heavy-duty commercial vehicles and transit vehicles;
- \$40 million to improve the energy efficiency of manufacturing processes related to alternative vehicles;

- \$30 million to expand programs to develop vehicle sensing and communication technologies;
- \$15 million for vehicle testing facilities; and
- \$10 million for various other activities and reports.

Assuming that future annual appropriations would remain at that 2011 level, adjusted for anticipated inflation, CBO estimates that fully funding S. 2843 would require additional appropriations totaling \$2.2 billion over the 2011–2015 period. (According to DOE, that amount is equivalent to the total amount of funding for activities related to alternative vehicles that has been provided over the past 10 years.) Resulting outlays over that period would total about \$1.5 billion, with \$0.7 billion of additional spending occurring in later years. CBO expects DOE would use those amounts to fund a wider variety of research activities aimed at achieving technical milestones. CBO estimates that significantly accelerating the time frame in which new technologies could become market ready would require even larger increases in funding.

Pay-as-you-go considerations: None.

Intergovernmental and private-sector impact: S. 2843 contains no intergovernmental or private-sector mandates as defined in UMRA and would impose no costs on state, local, or tribal governments.

Estimate prepared by: Federal Costs: Megan Carroll; Impact on State, Local, and Tribal Governments: Ryan Miller; Impact on the Private Sector: Amy Petz.

Estimate approved by: Theresa Gullo, Deputy Assistant Director for Budget Analysis.

#### REGULATORY IMPACT EVALUATION

In compliance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee makes the following evaluation of the regulatory impact which would be incurred in carrying out S. 2843.

The bill is not a regulatory measure in the sense of imposing Government-established standards or significant economic responsibilities on private individuals and businesses.

No personal information would be collected in administering the program. Therefore, there would be no impact on personal privacy.

Little, if any, additional regulatory paperwork would result from the enactment of S. 2843, as ordered reported.

#### CONGRESSIONALLY DIRECTED SPENDING

S. 2843, as ordered reported, does not contain any congressionally directed spending items, limited tax benefits, or limited tariff benefits as defined in rule XLIV of the Standing Rules of the Senate.

#### EXECUTIVE COMMUNICATIONS

The testimony provided by the Department of Energy at the December 8, 2009, Subcommittee hearing on H.R. 3246, the House companion bill to S. 2843, follows:



STATEMENT OF DR. KRISTINA M. JOHNSON, UNDER  
SECRETARY, DEPARTMENT OF ENERGY

Madam Chairman, Ranking Member Risch, and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss several draft energy bills. We deeply appreciate your interest in the views of the Department of Energy (The Department) on these bills. Over many years and many Administrations, the Department has enjoyed an open and productive relationship with this Committee, and those of us serving under President Obama certainly want to continue and strengthen that partnership.

In recent years, Congress has made a very substantial and positive investment in clean energy through the enactment of the Energy Policy Act of 2005 (P.L. 109-58), the Energy Independence and Security Act of 2007 (EISA)(P.L. 110-140), and the clean energy portions of the American Recovery and Reinvestment Act (P.L. 111-5).

This year, the Committee has proposed further investment and we thank you for all your hard work in reporting the American Clean Energy Leadership Act (S. 1462). As President Obama said while dedicating a new solar plant in Central Florida, "At this moment, there is something big happening in America when it comes to creating a clean energy economy. \* \* \* And I have often said that the creation of such an economy is going to require nothing less than the sustained effort of an entire nation—an all-hands-on-deck approach similar to the mobilization that preceded World War II or the Apollo Project."<sup>1</sup>

The American Recovery and Reinvestment Act 2009 (The Recovery Act) alone provided the Department with \$36.7B in appropriations—\$32.7 billion in grant and contract authority, \$4 billion in credit subsidy for loan guarantees, plus \$6.5 billion in borrowing authority for the Power Marketing Administrations. These funds will support some \$100 billion in clean energy and environmental clean up projects when leverage and cost share are included, creating hundreds of thousands of jobs and providing a meaningful down payment on the nation's energy and environmental future.<sup>2</sup>

For this hearing, I would like to offer the Department's views on nine proposed bills, as the Subcommittee has asked. These bills are: H.R. 957, H.R. 2729, H.R. 3165, H.R. 3236, H.R. 3585, S. 737, S. 1617, S. 2773, and S. 2744. I will address each bill in order of introduction starting with the House bills, except the two wind bills, which I will address together.

<sup>1</sup>From "Remarks by the President on Recovery Act Funding for Smart Grid Technology," Press release. October 27, 2009. <http://www.whitehouse.gov/the-press-office/remarks-president-recovery-act-funding-smart-grid-technology>.

<sup>2</sup>The Department has been funded at \$36.7 billion in Recovery Act dollars, after \$2 billion of the original \$38.7 billion was redirected to the Cash for Clunkers program.

## H.R. 957—GREEN ENERGY EDUCATION ACT

Background.—A cornerstone of The Department's mission is to create an energy-literate generation of skilled workers, scientists, and innovators who can accelerate the transition to a clean energy economy and ensure U.S. global competitiveness. The Administration is deeply committed to promoting the creation of green jobs.

While the Department appreciates H.R. 957's focus on building technologies, we would like to impress upon the Committee that a general workforce deficiency is growing across the energy sector. The rapid deployment of new energy technologies, coupled with the fact that 40 to 60 percent of energy utilities' skilled workers and engineers are eligible to retire by 2012<sup>3</sup> reinforces the need for a broad approach to address the green job development and training challenge.

To this end, the Department works closely with the National Science Foundation (NSF) in a number of areas to strengthen scientific educational programs at the technical, undergraduate, and graduate levels. These projects are aimed at creating a pipeline beginning at the K–12 level and extending through the post-graduate level to ensure the ongoing development of a workforce with the skills and capabilities to create and scale-up innovative energy technologies and improve processes over the long-term. Further, the Department is already closely coordinating with NSF on education, green jobs training, and workforce development. The Department recognizes the importance of leveraging NSF resources, and is already taking proactive steps to solidify a stronger working relationship with our colleagues.

H.R. 957 would facilitate stronger collaboration between the Department and the National Science Foundation. As written, the legislation would authorize The Department to fund NSF's flagship interdisciplinary training program (IGERT) to educate architects and engineers to collaborate on high performance building technologies and practices.

H.R. 957 assigns priority funding for applications encouraging partnerships between architectural and engineering schools. These fields are inextricably intertwined, and can advance energy efficiency in the design and construction of high performance buildings.

By supporting multidisciplinary graduate education and curriculum development activities, H.R. 957 will advance the Department's broad energy technology development mission. The bill recognizes the need to produce the next generation of engineers and architects who can work together from design concept to building operation to integrate energy efficiency and renewable energy more fully into the clean, competitive economy of the future.

We would note here that the Department is already undertaking efforts in creating or funding green job training programs through existing authorities.

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<sup>3</sup> Center for Energy Workforce Demand 2007 Report: Gaps in Energy Workforce Pipeline.

Through the Recovery Act, the Department is funding approximately \$140 million in training and technical assistance to develop standardized training curricula for residential energy workers, expand the number of weatherization training centers, and to create a national weatherization worker certification framework.

To serve the commercial building sector, the Department's Building Technologies Program has issued a Funding Opportunity Announcement (FOA) to support the development of training programs for building technicians, operators, energy auditors, and others responsible for building and operating high performance commercial buildings. These programs offer an opportunity to demonstrate how partnerships with the Department of Labor's public workforce system, labor management partnerships, education institutions such as community colleges, and community organizations can meet the workforce needs of the commercial building sector. The Department of Energy estimates that approximately \$7.5 million will be available for multiple awards under this FOA.

Utilities, colleges, universities, labor organizations, and trade associations, will be able to apply for over \$100 million in grants issued through a FOA to improve smart grid technology education and implementation, as well as funding programs and curricula to train or retrain workers in the electric power sector.

Recommendations.—The Department is committed to achieving effective legislation to train and educate the new energy economy work force. The Department backs a coordinated, interagency approach and a balanced investment in education and training opportunities from kindergarten to adult job training, beyond just buildings. Although a good start, H.R. 957 could be improved to more fully address the larger issue of energy education, green jobs creation, and workforce training. I look forward to working with the Committee to strengthen this legislation.

#### H.R. 2729—NATIONAL ENVIRONMENTAL RESEARCH PARKS

Background.—The Department's predecessor, the Atomic Energy Commission, established the first environmental research park in 1972 at the Savannah River Site in South Carolina in response to recommendations from the scientific community, other Federal agencies, and Congress. Between 1972 and 1992 six additional research parks were designated on The Department sites.

The research parks, located on Department-owned land, represent six major eco-regions across the U.S. and provide research opportunities on natural ecosystems as well as on the environmental transport, cycling, and fate of radionuclides and other contaminants resulting from nuclear weapon development and testing. While the Department-sponsored researchers utilize the research parks to conduct high-priority mission relevant research, research park use is dominated by researchers sponsored by other Federal agencies including the National Science Foundation, the

Department of Agriculture, Geological Survey, and the Department of Defense. This is due in large part to the attractiveness of these areas for general ecological-type research beyond the scope of the Department. Currently, stewardship of each research park is the responsibility of its respective laboratory management and operating contractor, with oversight by the managing Department program office.

H.R. 2729 formally institutionalizes existing research parks by directing the Secretary to designate six National Environmental Research Parks as protected outdoor research reserves for the purposes of conducting long-term environmental research on the impacts of human activities on the natural environment.

The bill authorizes \$30 million annually—\$5 million for each of the National Environmental Research Parks—for the Department’s Office of Science to carry out eco-research and education activities.

As a threshold matter, much of the research contemplated by this bill is already being performed. This legislation may also have a few unintended consequences.

- Any official designation of park lands as “protected sites” could impede the parks’ future use for mission priority activities and could restrict the Department’s current authority at the proposed sites.

- While the research parks are well-suited for conducting the research proposed by the bill, much of this research is outside the scope of the Department’s mission and core competencies. An example would be H.R. 2729’s proposed research regarding the general ecology of the site and region in addition to population biology and ecology. Such research should continue to be supported by other, more appropriate Federal agencies.

Recommendations.—The Department recognizes that the current environmental research parks will continue to be a valuable resource for the overall scientific community, and we believe the current support arrangement is working well. As such, current Departmental activities and authorizations are sufficient.

#### WIND

The Department’s Wind Program leads the Nation’s efforts to address the barriers to the acceleration of large-scale deployment of land-based and offshore wind energy.

The Department’s 2008 report, *20% Wind Energy by 2030*, outlines an aggressive scenario in which the U.S. could generate 20% of its electricity by 2030, and it also identifies the technical and non-technical barriers that must be overcome in order to achieve this. The Department’s Wind and Hydropower Technologies Program is currently funding research to address the challenges identified by the report, which include reducing wind turbine capital costs by improving reliability, integrating wind energy into the power grid, addressing environmental and

siting concerns, and building the domestic wind manufacturing industry.

The Department is working to improve reliability of wind technology, by, among other things, reducing blade and gearbox failures. These failures present one of the greatest challenges to wind technology, as they require costly repairs and reduce investor confidence. To reduce the risk facing new turbine technologies, the Department is funding the creation of facilities that will help industry develop the next generation of large wind turbine designs. For example, a new \$45 million large wind turbine drivetrain testing facility, and a new \$25 million large blade test facility capable of testing 90 meter blades have been recently awarded under Recovery Act funding.

To overcome wind energy integration challenges, the Department is developing tools and strategies, such as wind forecasting techniques, which will improve the integration of wind energy with the electrical grid. The Department is funding two state-of-the-art high penetration wind integration studies, the Eastern Wind Integration and Transmission Study and the Western Wind and Solar Integration Study that evaluates the impact of integrating up to 30% wind energy into the U.S bulk power system.

To address the environmental and siting challenges, the Department funds projects that seek to understand and mitigate the impacts of wind energy development on wildlife. For example, the Department funds work at Texas Tech University and Kansas State University to assess the environmental impacts of wind energy on species of grassland birds. Habitat impacts on grassland species are a particular concern because extensive wind energy development could take place in grassy regions of the country. Three other projects funded by the Department will focus on developing tools to assess habitat risks when siting wind energy projects. Jones & Stokes Associates, Inc., The Nature Conservancy, and Pandion Systems, Inc. will each work to develop scalable, spatially-explicit tools to calculate potential environmental impacts from wind deployment. The Department also provides local and state governments with resources to help them make informed decisions about wind power in their communities.

To build the domestic wind manufacturing industry, the Department works with companies to develop innovative manufacturing processes and to develop a qualified wind workforce. For example, the Department is funding PPG Industries in Shelby, NC to improve wind turbine blade manufacturing processes in partnership with MAG-Industrial Automated Systems in Hebron, KY. Current blade fabrication technology is labor-intensive and prone to variability, resulting in incidences of manufacturing defects.<sup>4</sup> The PPG research will develop an automated fabrication methodology to deliver precise control of fiberglass

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<sup>4</sup>Wetzel, Kyle K. "Defect-Tolerant Structural Design of Wind Turbine Blades," *American Institute of Aeronautics and Astronautics, Inc.*, 2009-2409.

preimpregnated material placement. This effort will reduce blade-to-blade variability, lower incidences of premature failure, reduce cost of wind energy, and potentially increase blade manufacturing capability by as much as 100% when fully implemented by a manufacturer. To ensure an adequate wind workforce, the Department is funding a project with Southwest Applied Technology College in Cedar City, Utah, to provide students with practical and applied wind energy training. The school will target skilled unemployed workers and minority populations, especially Hispanic and Native Americans.

The Department's National Wind Technology Center (NWTC) in Boulder, Colorado is recognized internationally as a leading wind energy research and development facility. The NWTC has advanced wind turbine testing capabilities and provides an ideal site for testing turbines under extreme conditions; the NWTC experiences strong wind directionality and gusts up to 85 miles per hour at wind turbine hub height. This year, the NWTC installed a 1.5 MW wind turbine, the first utility-scale turbine to be owned by the Department, as well as a 2.3 MW turbine operated in partnership with industry. These turbines are fully instrumented to act as test platforms for future R&D to further improve the reliability and performance of wind turbine components and to reduce the cost of wind energy. For example, load data from the foundations of these two research turbines will be used to help codify a national standard for permitting requirements of utility scale wind turbines. A uniform permitting standard would provide a significant improvement to the current patchwork regulatory schemes imposed on wind developers.

H.R. 3165—WIND ENERGY RESEARCH AND DEVELOPMENT ACT  
OF 2009

Background.—This legislation authorizes \$200 million annually through 2014 for a cumulative investment of \$1 billion dollars. H.R. 3165 authorizes the Department to carry out a wind R&D program to improve the energy efficiency, reliability, and capacity of wind turbines through new materials and technologies, optimize the design and adaptability of wind energy systems, and reduce the cost of construction, generation, and maintenance of wind energy systems. Finally, the bill requires the Department to fund merit-reviewed, cost-shared demonstration projects conducted in collaboration with industry.

The Department currently has \$80 million in appropriated funding for FY 2010 to pursue RD&D of wind energy technologies. The activities authorized in H.R. 3165 are largely consistent with much of the work currently underway at the Department, and with the Department's 20% *Wind Energy by 2030* report, which identified the barriers and pathways for supplying 20 percent of the Nation's electricity from wind energy by 2030. Using ARPA-E funding, the Department has been able to finance breakthrough wind technologies, High Efficiency Shrouded Wind

Turbine, FloDesign (Wilbraham, MA)<sup>5</sup> and Adaptive Turbine Blades: Blown Wing Technology for Low-Cost Wind Power, PAX Streamline Inc. (San Rafael, CA)<sup>6</sup> which are consistent with the wind program's goals.

H.R. 3165 recognizes the need to resolve the impacts of wind turbines on federal radar assets. These radars are used to ensure aviation safety, support homeland security, protect military assets, and enable timely weather warnings for public safety. The Administration realizes this is a critical unresolved issue.

Recommendations.—The Department would like to work with Congress to tighten Section 3's proposed demonstration program to reflect the development status and needs of the wind industry. We urge the Committee to consider placing special emphasis on the demonstration of innovative offshore wind technologies, including integrated systems, components, structures, materials and infrastructure. Domestic, pre-commercial, leading edge technologies remain the most appropriate investment for a robust demonstration program. The U.S. has yet to install a single offshore wind turbine while Europe has over 1500 MW installed and a target of 40,000 MW by 2020. Investment by the U.S. government is critical for development of a domestic industry. There are numerous offshore wind projects proposed in the Great Lakes, such as the Cuyahoga County Project in Lake Erie, and numerous projects in the Northeast that should be supplied by U.S. manufacturers.

The Department asks that the legislation include a specific authorization for environmental research. One set of persistent issues facing the wind industry are the environmental impacts associated with wind power facilities. Project developers must not only finance, construct, and maintain wind farms, but must also consider the effects of wind energy systems on the surrounding environment. As written, researching the impact of turbines on wildlife and natural habitats could be funded under the Section 12(b)(12) "catch-all" provision of this bill that enables the Secretary to determine if the Department should perform research in addition to the prescribed areas. However, given the significance of environmental issues associated with wind energy systems deployment, the Department would like to see a greater emphasis on addressing this important area of research in collaboration with other responsible federal agencies.

<sup>5</sup> FloDesign Wind Turbine Corporation (Wilbraham, MA) will develop a new shrouded, axial-Bow wind turbine known as the Mixer Ejector Wind Turbine (MEWT), which is capable of delivering significantly more energy per unit swept area with greatly reduced rotor loading as compared to existing horizontal axis wind turbines (HAWT). Prototypes will be built and tested, demonstrating the advantages of lightweight materials and a protective shroud that will reduce noise and safety concerns and accelerate distributed wind applications.

<sup>6</sup> PAX Streamline, Inc (San Rafael, CA), along with Georgia Tech Research Institute, will lead a project to adapt Blown Wing technology for wind turbines, culminating in a 100 kW prototype. Circulation control technology or "Blown Wing" technology creates a virtual airfoil by jetting compressed air out a orifices along a wing and has the potential to radically simplify the manufacture (old operation of wind turbines. Unlike a fixed airfoil, a Blown Wing can be dynamically adjusted to maximize power under a wide range of wind conditions, and can be generated from a slotted extruded pipe that can be domestically manufactured at a fraction of the cost.

The Department is currently funding efforts to evaluate the possible benefits of certain energy storage technologies to assist with wind integration. Areas of study include how the suite of power system flexibility options (including energy storage) can best be utilized to address wind variability issues; evaluation of the use of hydropower to assist with wind integration; and the study of how storage technologies can be integrated into wind power components to extend equipment operating life.<sup>7</sup>

S. 2773—OFFSHORE WIND ENERGY RESEARCH, DEVELOPMENT, DEMONSTRATION, AND COMMERCIAL APPLICATION ACT OF 2009

Background.—Only very recently has the U.S. government invested significantly in offshore wind technology research and development, and consequently, no domestic offshore wind systems or manufacturing base exist for the sector. In FY 2009 and FY 2010 the Federal Government began investing in offshore wind technologies, including an \$8 million Recovery Act funded consortia led by the University of Maine that will deploy two floating offshore turbine prototypes and conduct research to optimize the design of floating platforms, while also providing wind energy career educational opportunities for university students.

S. 2773 authorizes \$50 million annually from FY 2011 through FY 2021, for a cumulative investment of \$500 million. S. 2773 requires the Department to carry out a comprehensive program of research, demonstration, and development of commercial applications for offshore wind energy to improve the efficiency, reliability, and capacity of offshore wind energy systems, at all water depths, while reducing costs throughout the supply chain.

Further, the legislation supports offshore wind resource assessment work, while considering the technologies' environmental impacts, benefits, and mitigation techniques for marine ecosystems and industry. This research would also address the unique challenges to generating energy offshore, including siting and permitting issues, exclusion zones, and transmission needs.

S. 2773 also authorizes the Department to award grants to institutions of higher education to establish one or more national offshore wind centers that meet specified requirements to focus on deepwater offshore floating wind energy technologies.

S. 2773's authorization levels and timeframe appear consistent with prior Departmental and industry assessments necessary to deploy a national offshore R&D program focused on lowering deployment costs, ensuring high tech-

<sup>7</sup>DOE is currently funding energy storage research through the Office of Electricity Delivery and Energy Reliability (OE), and pumped-storage hydropower research and development through the Office of Energy Efficiency and Renewable Energy's Wind and Hydropower Technologies Program. The Wind Program works with these parties to coordinate and collaborate, but feels that continuing to fund these activities under the offices that are already working on storage makes more sense than creating separate storage activities in the Wind R&D bill.



nical reliability, facilitating economic revitalization of U.S. port facilities, and mitigating environmental impacts.

Recommendations.—The Department estimates that only one-third of the cost of an installed offshore wind energy facility is represented by the wind turbine itself. Therefore, lowering the cost of offshore wind requires additional focus on electrical grids, project operation and maintenance, and installation and staging costs. The bill's authorization language should include research aimed at optimizing installation methodology, electrical transmission design, operations and maintenance practices, installation vessel design, and manufacturing and assembly. With no offshore wind turbines currently deployed in U.S. waters, this type of government support will be integral to accelerating early-stage offshore wind development.

While the Department supports the establishment of a comprehensive national R&D program for offshore wind, Section 4 of the bill authorizing a national offshore wind energy center<sup>8</sup> [emphasis added] is overly prescriptive and duplicative of the Department's recently announced deep-water offshore wind R&D award to a consortium led by the University of Maine. Three examples of S. 2773's language can illustrate why such a prescriptive approach may overlook opportunities for offshore wind. First, Section 4(b)(4) requires each "center" to have access to the Atlantic Ocean, the Gulf of Mexico, or the Pacific Ocean. This language precludes the Department from funding a center on the Great Lakes, which have significant offshore wind energy potential and have begun to attract investment from developers, such as the Cuyahoga County Project in Lake Erie. Second, although R&D on offshore wind in shallow and transitional depths is authorized by the bill, the national center created by the bill is restricted to only deep-water offshore wind systems. This legislative treatment favors one offshore technology over the R&D needs of shallow and transitional depth waters, with little policy or technical justification. Finally, Section 4's language requiring that universities be designated as lead institutions may prove to be an unnecessary constraint on otherwise qualified consortia applying to establish offshore wind centers.

The Department supports establishing a comprehensive National Offshore Wind Energy R&D Program as contemplated by S. 2773 in which multiple research, development, and demonstration projects play a critical role. Such projects should be established through grants awarded on a competitive basis.

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<sup>8</sup>In short, the Wind Program supports the R&D section of the bill, but does not feel that it is appropriate to designate a national center at this time because the technology is new and committing to fund one or a small number of centers may "lock in" the technology development to the specific attributes of that location e.g. local technology expertise, physical attributes such as water depth of the nearest site for offshore development, turbine designs optimized for the wind speeds at that particular location, etc.

## H.R. 3246—ADVANCED VEHICLES TECHNOLOGY ACT OF 2009

Background.—Department-funded research has contributed heavily to the advancement of vehicle technologies. The advanced vehicle technologies in the Department's research portfolio can significantly reduce petroleum consumption, thereby strengthening our national energy security through both fuel substitution and energy efficiency. For example, plug-in hybrid electric vehicles with a 40-mile electric range using cellulosic E85 have the potential to reduce petroleum consumption by as much as 85% compared to conventional gasoline-powered internal combustion engine vehicles.<sup>9</sup> The Department is not only developing the technologies to make vehicles more energy efficient, but is also considering the full life cycle impact of cars on the environment. For example, the Department research produced a 40 percent weight savings on a per-part basis for a mid-sized automobile with the development of quick plastic forming aluminum. We have also developed technology to reduce commercial vehicles' engine cradle (structural element that supports the engine) weight by 65–70 percent using magnesium. Currently, the Department is involved in the commercialization of a process that can salvage nearly all of the plastic in a vehicle (approximately 10% of the average vehicle's weight), not only preventing landfill waste but also displacing oil and natural gas and reducing the cost of plastics through recycling.

Other examples of technologies developed by the Department and being used by Industry include:

Every U.S. hybrid vehicle sold has intellectual property from the Department's Nickel Metal Hydride battery research, and Chrysler plans to begin production on a Cummins engine incorporating the Department's technologies which make its internal combustion engine operate cleaner and more efficiently. Lastly, collaborating with New Flyer, the Department co-developed the technology for hybrid transit buses, technology which has migrated to other applications such as light trucks and crossover vehicles.

The Department supports H.R. 3246, as the current Vehicle Technologies Program funding authorization expires at the end of FY 2010. We believe the bill generally covers an appropriate technology portfolio, includes well-placed interest in heavy-duty vehicles, and is well aligned with prior year Program budgets.

Recommendations.—The Department agrees with the suite of technologies authorized in H.R. 3246. However, the inclusion of hydrogen and fuel cell activities in H.R. 3246 would result in duplicative authorizations and potential budgetary issues. Currently, Title VIII of the Energy Policy Act of 2005 (EPAAct 2005) serves as the authorizing language for the Department's hydrogen and fuel cell ac-

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<sup>9</sup>Argonne National Laboratory Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model. Emissions associated with direct and indirect land-use change are not considered in this analysis.

tivities, and does not sunset until FY 2020. It is likely that hydrogen and fuel cell activities were included in H.R. 3246's activity list only because several hydrogen activities were included in the Vehicle Technologies FY 2009 appropriation. However, these activities were moved back to the Fuel Cell Program for FY 2010, and are no longer part of Vehicle Technologies.

Therefore, the Department respectfully requests to continue to rely on EAct 2005's authorizations for the Department's Fuel Cell Program activities. The EAct 2005 authorizing language provides sufficient authorization for current DOE activities, and removing H.R. 3246's hydrogen and fuel cell reference would avoid any unintended complications that can result from duplicative authorizations.

H.R. 3246 would enable the Department to build on the Department's continuing efforts to improve existing vehicle technologies, as well as emphasizing other modes of transportation to significantly reduce passenger and commercial vehicle miles traveled. We look forward to working with the Committee and the Congress on this important legislation.

#### H.R. 3585—SOLAR TECHNOLOGY ROADMAP ACT

**Background.**—The goal of the Department's present Solar Energy Technologies Program is to make solar energy technologies cost-competitive with conventional grid electricity by 2015 and to enable a high penetration of solar generation energy within the U.S. This goal drives a number of projects and initiatives relating to photovoltaic (PV) and concentrating solar power (CSP) technologies and requires examination of critical issues relating to grid integration and the transformation of markets for solar technologies.

We appreciate the strong Congressional support shown for solar technology development. The Recovery Act provides \$118 million for solar initiatives. In October, the Advanced Research Projects Administration—Energy (ARPA-E) announced approximately \$17.7 million<sup>10</sup> in solar grants, and Congress recently appropriated \$225 million in FY 2010 for the Department's Solar Program. This funding enables the Department to make prudent investments in applied research to further reduce the costs of solar technologies. I'd like to highlight a few of the R&D efforts currently underway at the Department:

Innovations arising from Department-funded R&D in the areas of thin-film solar cells, high-efficiency single-crystal solar cells, and very high efficiency gallium arsenide solar cells have since been commercialized by companies such as First Solar in Ohio, Sunpower in California, and Boeing/Spectrolab, also in California. In August 2009, the Depart-

<sup>10</sup><http://arpa-e.energy.gov/news.html>.

ment announced over \$37 million<sup>11</sup> of awards for early-stage company investments—including those made through the Small Business Innovative Research program—and \$14 million in investment through the national laboratories. This includes \$5 million invested in CSP technologies. We are currently working on the next generation of solar technologies including kerfless wafering and atmospheric thin film processing, which can lead to broader market impact, lower manufacturing cost, and increased conversion efficiency.

The Department is also investing in balance-of-systems (BOS) technologies, the most significant cost barrier for PV. BOS technologies are necessary to support full solar electricity generation systems, but are separate from, for example, the actual PV panel. BOS costs include items like inverters that allow connection with the electric grid; they can account for as much as *half* the total installed cost of a solar electricity generation system, and so create substantial barriers to lowering the cost of solar energy. As an example of the Department's commitment in this area, the Department recently announced awards for up to \$11.8 million to five companies to develop new inverter technologies under our Solar Energy Grid Integration Systems program. Overall, we invested approximately \$122 million in this area in 2009, including \$16 million in CSP technologies. Some of these funds are going toward development of inverters with advanced nano-material transformers that provide lighter weight, longer life, and lower cost as well as advanced residential control systems that can effectively manage PV panels along with other household renewable and conventional power systems to maximize time-of-day energy use.

The Department is increasing its investment in large-scale demonstrations of integrated photovoltaics and CSP systems. As part of funding received through the Recovery Act, the Department recently announced \$37.5 million in high-penetration solar deployment projects. Carried out by universities, and utilities, with national laboratory partners to assess the technologies, these projects seek to assess the impacts of high levels of solar-energy penetration on the electric grid. Investigations will include both voltage and frequency behavior of the distribution and transmission feeder portions of the grid in the presence of clear and intermittent solar conditions. This information is important to defining a path for 10% or greater penetration levels of solar in the grid and also in defining the requirements for grid energy storage use.

H.R. 3585, the Solar Technology Roadmap Act, as currently drafted, significantly alters the form and function of the Department's solar energy RD&D. We would like to draw the Committee's attention to concerns we have with the consequences of this alteration. First, the bill in effect changes the governance of the Department's Solar Pro-

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<sup>11</sup><http://www.energy.gov/news2009/7824.htm>.

gram. Second, it changes the emphasis of the Program from cost effectiveness of technology to instead following a prescribed mix of solar demonstration projects.

H.R. 3585 provides the Department an authorization level of \$350 million in FY 2011, rising in \$50 million increments to \$550 million in FY 2015. The aggregate authorization would total \$2.25 billion over four years, far exceeding any previous authorization levels.

We note, however, that H.R. 3585 would supplant previous authorities except for two provisions of the Energy Independence and Security Act of 2007 (EISA). It would become the de facto authorizing language for the Department's solar activities.

Our first and greatest concern is that Sections 103 and 108 of the bill require the Department to form a semi-autonomous Committee that will largely govern the solar-energy activities at the Department. The proposed committee would be charged with producing a comprehensive analysis of recommendations for investing Federal RD&D dollars over near-, mid-, and long-term horizons based on current issues and barriers facing the industry. As written, the proposed legislation binds the Department's R&D efforts to the recommendations of the Roadmap Committee, requiring the Department to follow the Committee's recommendations for 75 percent of all appropriations by 2015. We urge the Congress instead to stipulate that the Committee would provide the kinds of non-binding advice and recommendations traditionally provided by publicly-chartered Federal advisory committees.

Our second concern is that Section 105 specifies a solar-technology demonstration plan that may not embody the most appropriate scale of projects encompassing the most effective mix of technologies, as might be determined by the Secretary.

As written, the proposed legislation prescribes a particular schedule of future solar demonstration projects, specified both with regard to project scale and with regard to technology mix. These particular project sizes and technology mixes may not provide the largest benefit to the Nation under future conditions which we are not likely to be able to foresee with any clarity.

While the Department welcomes the support that the proposed legislation would provide to solar research and development, the Department is concerned that the legislation as written may not maximize public benefits.

The existing Solar Program actively solicits and receives input from stakeholders in industry, the national laboratories, and academia, through its use of peer-review as well as from other formal and informal discussions over many years. For example, as part of an effort to develop a PV Manufacturing Initiative, the Solar Program worked this fall with the National Academies of Science to hold two day-long workshops with industry and other participants to discuss the needs of the industry and the role of

the Federal Government to promote the domestic industry and industry standards.

The Solar Program is also now working with industry representatives and others to develop a Solar Vision Study which will look at opportunities to achieve 10–20 percent of the Nation’s electricity generation from solar technologies by 2030. We intend to strengthen our external review process in the near future with an advisory board—which can be viewed as somewhat analogous to the Roadmap Committee envisioned in the draft bill—that will meet several times a year to review the entire solar program.

While we welcome additional industry input and funding for demonstration projects the Department is particularly concerned about this bill’s practical effects, which are to constrain the flexibility the Department has to respond to diverse sources of information and exploit new breakthroughs in technology development, such as those made through investment in ARPA-E grants and the HUBs.

Recommendations.—The Department strongly urges the Committee to consider the above concerns when reviewing the proposed legislation. Providing the most effective solar technology research and development programs requires the Secretary and The Department to make a series of constantly evolving judgments. It is important that we be allowed to call on multiple sources of information when we formulate our solar technology R&D priorities, and that we be responsive to provided information, even information that will only become available as R&D programs and national markets progress.

#### S. 737—BIOFUELS RD&D FOR NONROAD ENGINES

Background.—Through RD&D efforts geared toward the development of integrated biorefineries, the Biomass Program is helping transform the Nation’s renewable and abundant biomass resources into cost competitive, high performance biofuels, bioproducts, and biopower. To that end, the Biomass Program’s R&D efforts support the goal of the EISA’s Renewable Fuel Standard that requires 36 billion gallons of renewable fuel by 2022.

DOE is currently evaluating the impact of engine durability and emissions for use of higher ethanol blends in vehicles and small nonroad engines. The Department has completed emissions’ lifetime testing of hand-held lawn and garden equipment, including line trimmers, leaf blowers, and generators. These results are reported in *Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Nonroad Engines, Report 1—Updated*<sup>12</sup>, which is available online.

Over the past two years and pursuant to this small nonroad engine effort, the Department has coordinated with the engine industry to identify key issues, testing needs, and additional participants. Spearheaded by the

<sup>12</sup>The report is available online at <http://www.nrel.gov/docs/fy09osti/43543.pdf>.

small non-road industry's Engine Manufacturers Association and the automotive and oil industries' Coordinating Research Council, this effort will result shortly in a compilation of industry input and opinions.

S. 737 clarifies to the "Biofuels Distribution and Advanced Biofuels Infrastructure" Program authorization in EISA Section 248. The proposed legislation amends both the scope of the program in Section 248(a) to include the impact of biofuels on small engines, as well as requiring that impact on small engines be a focus area in Section 248(b). As enacted, the current program's authorization language does not preclude the Department from undertaking these activities, and the legislation's section 248(b)(9) provides an additional "catch-all" provision that the Secretary could use to implement such a program.

By supporting the investigation of problems associated with the use of biofuels in small nonroad efforts, S. 737 is in line with research needs already identified by the Department concerning use of higher renewable fuel blends necessary to meet Renewable Fuel Standard requirements.

The Department is already working on research in this area, under its existing authorizations in both its Biomass and Vehicle Technologies Programs. In particular, the Department is funding testing of chainsaws, motorcycles, snowmobiles, and marine engines. Thus, S. 737 may be useful only to the extent that it underscores Congress' explicit support for this effort.

It is also worth noting that EISA's original Section 248, which S. 737 amends, did not prescribe any authorization levels for the program, and specific authorizations to carry out this section have not been provided.

Recommendations.—The Department understands the need to investigate potential issues with the utilization of higher-biofuel blends in small nonroad engines and already funds a number of research projects on nonroad engines. As a result, the Department does not see a need for this amendment.

S. 1617—INVESTMENTS FOR MANUFACTURING PROCESS AND CLEAN TECHNOLOGY ACT OF 2009

Background.—The Department appreciates the committee's support to improve energy efficiency across the manufacturing sector. I am pleased to note that the Department is already working to carry out many of the bill's goals.

Through a variety of programs, the Department provides assistance to energy infrastructure investment to businesses of all sizes. The Loan Guarantee Program (LGPO), Energy Efficiency and Conservation Block Grants (EECBG), and Small Business Innovation Research (SBIR) Program all act as funding mechanisms to address the Nation's energy infrastructure and generation needs.

Structurally, the Office of Energy Efficiency's (EE) Block Grant program most closely resembles S. 1617's proposal to create revolving loan funds to the states. A portion of the EE block grant structure is specifically targeted to-

wards the creation of revolving loan funds and may be reinforced by recent House legislation.<sup>13</sup> Through the Recovery Act, \$37 million<sup>14</sup> was announced to support SBIR with an emphasis on near-term commercialization and job creation. And although current Loan Guarantee solicitations do not have special provisions to promote the award of loans to small businesses, LGPO is in the process of developing a Manufacturing Solicitation that would be open to Small and Medium Enterprises (SMEs) under our Financial Institutional Partnership Program (FIPP). Through the current solicitation, LGPO will continue to finance construction of manufacturing plants, as it did with its first loan guarantee award to Solyndra, Inc. of Fremont, CA, a SME.

Concerning Sec 137 (bb)(2), the Department, in consultation with the Department of Commerce, should make the determination of what is and is not an energy efficient product. Such a structure would be consistent with the longstanding positive working relationship between the two agencies on programs such as the EnergyStar rating system. We recommend changing the authority from the Secretary of Commerce to the Secretary of Energy, in consultation with the Secretary of Commerce.

Recommendations.—The Department has a track record of collaboration with other federal and State programs, including a Memorandum of Understanding between DOE's EERE and the Department of Commerce's Manufacturing Extension Partnership Program. The Department stands ready to work with this Committee and DOC to consider how the bill can be improved to draw upon the Department's deep domain knowledge and build off of the Department's existing programs.

#### S. 2744—CARBON DIOXIDE CAPTURE TECHNOLOGY ACT OF 2009

Background.—EPA 2005 authorized the Department to implement several prize competitions for breakthroughs in RD&D and commercial applications of energy technologies. Specifically, EPA 2005 authorized the Freedom Prize to reduce the country's dependence on foreign oil by rewarding innovative deployment of existing technologies in industry, the military, schools, governmental entities, and communities. EISA amended EPA 2005 to include additional prize competitions, including the Hydrogen Prize (H-Prize) and the Bright Tomorrow Lighting Prize (L-Prize). The H-Prize sought to provide incentives and reward advances in technologies, components, or systems related to hydrogen production, storage, distribution, and utilization, while the L-Prize seeks to spur the development of ultra-efficient solid-state lighting products. The proposed legislation would authorize another DOE competition in another area of research—carbon capture.

<sup>13</sup> H.R. 2936: Bill to Underwrite Increased Lending to Domestic (BUILD) Manufacturing Act <http://www.govtrack.us/congress/billtext.xpd?bill=h111-2936>.

<sup>14</sup> <http://www.energy.gov/news2009/7824.htm>.



S. 2744 would authorize the Department to create a new carbon dioxide capture technology prize, a “C-Prize,” to foster novel technologies that separate carbon dioxide from dilute sources.

The Department and the Administration consider carbon capture to be an essential tool in the mitigation of GHG emissions. A cost-effective technology that could significantly contribute to the mitigation of atmospheric carbon emissions would be consistent with the goals and objectives of the Administration.

While the bill provides authorization to establish a C-Prize, it sets no parameters for award amounts, which would of course be subject to appropriations.

The Board authorized in the bill may qualify as a Federal Advisory Committee, which would be subject to Federal Advisory Committee Act (FACA) requirements.

Under Section 7, the bill states that the “applicant will agree to vest the intellectual property of the application derived from the technology in 1 or more entities that are incorporated in the U.S.”. The S. 2744’s Intellectual Property language is a significant departure from previous prize legislation. The Department is concerned that the language will deter qualified applicants from entering the competition. The bill additionally requires C-Prize recipient(s) to vest patents in an entity or entities incorporated in the U.S., and it prohibits the transfer of title to other than U.S. incorporated entities until expiration of the first patent issued. However, the bill does little to protect U.S. technology investment because (1) any foreign company can incorporate a subsidiary in the U.S. for a nominal fee; and (2) the language does not prevent the U.S. corporation from licensing its patents to foreign companies or prevent the U.S. corporation from manufacturing outside the U.S. Furthermore, the vesting language, without clarification, may discourage existing U.S. companies from competing, for fear that their investment may be diluted by forced licensing and transfer or assignment of patent rights.

Recommendations.—The Department urges the Committee to consider these concerns when reviewing the proposed legislation. The recommendations of the Committee established in the legislation should not be prescriptive, but rather should serve as one of several sources of information the Department can call upon when formulating its carbon capture technology R&D prize.

Madam Chairman, this concludes my testimony. Again, I thank you for the opportunity to testify before this Committee, and I would be pleased to respond to your questions.

#### CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill S. 2843, as ordered reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is

printed in italic, existing law in which no change is proposed is shown in roman):

**ENERGY INDEPENDENCE AND SECURITY ACT OF 2007**

Public Law 110–140; 121 Stat. 1492

AN ACT To move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes.

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**TITLE I—ENERGY SECURITY THROUGH  
IMPROVED VEHICLE FUEL ECONOMY**

\* \* \* \* \*

**Subtitle B—Improved Vehicle Technology**

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**SEC. 136. ADVANCED VEHICLES MANUFACTURING INCENTIVE PROGRAM.**

(a) DEFINITIONS.—In this section:

(1) ADVANCED TECHNOLOGY VEHICLE.—The term “advanced technology vehicle” **means** an ultra efficient vehicle or light duty vehicle that meets—

*(A) an ultra efficient vehicle or a light duty vehicle that meets—*

**[(A)]** *(i)* the Bin 5 Tier II emission standard established in regulations issued by the Administrator of the Environmental Protection Agency under section 202(I) of the Clean Air Act (42 U.S.C. 7521(I)), or a lower-numbered Bin emission standard;

**[(B)]** *(ii)* any new emission standard in effect for fine particulate matter prescribed by the Administrator under that Act (42 U.S.C. 7401 et seq.); and

**[(C)]** *(iii)* at least 125 percent of the average base year combined fuel economy for vehicles with substantially similar attributes **[.]** or

*(B) a vehicle such as a medium-duty or heavy-duty work truck, bus, or rail transit vehicle that—*

*(i) is used on a public street, road, highway, or transitway;*

*(ii) meets each applicable emissions standard that is established as of the date of the application; and*

*(iii) as determined by the Secretary, the deployment of which will reduce consumption of motor fuels by 25 percent or more, as compared to current surface transportation technologies that perform a similar function, unless the Secretary determines that—*

*(I) the percentage is not achievable for a vehicle type or class; and*

(II) *an alternative percentage for that vehicle type or class will result in substantial reductions in motor fuel consumption.*

\* \* \* \* \*

(3) ENGINEERING INTEGRATION COSTS.—The term “engineering integration costs” includes the cost of engineering tasks relating to—

- (A) incorporating qualifying components into the design of advanced technology vehicles; and
- (B) designing tooling and [equipment and] *equipment* developing manufacturing processes and material suppliers *and manufacturing process equipment* for production facilities that produce qualifying components or advanced technology vehicles.

[(4) QUALIFYING COMPONENTS.—The term “qualifying components” means components that the Secretary determines to be—

- (A) designed for advanced technology vehicles; and
- (B) installed for the purpose of meeting the performance requirements of advanced technology vehicles.]

(4) QUALIFYING COMPONENTS.—*The term ‘qualifying components’ means components, systems, or groups of subsystems that the Secretary determines to—*

- (A) *be designed for improving fuel economy of advanced technology vehicles; and*
- (B) *contribute measurably to the overall fuel economy of the advanced technology vehicles.*

(b) ADVANCED VEHICLES MANUFACTURING FACILITY.—The Secretary shall provide facility funding awards under this section [to automobile] *to advanced technology vehicle* manufacturers, ultra efficient vehicle manufacturers, and component suppliers to pay not more than 30 percent of the cost of—

- (1) reequipping, expanding, or establishing a manufacturing facility in the United States to produce—

\* \* \* \* \*

(d) DIRECT LOAN PROGRAM.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, and subject to the availability of appropriated funds, the Secretary shall carry out a program to provide [a total of not more than \$25,000,000,000 in] loans to eligible individuals and entities (as determined by the Secretary) for the costs of activities described in subsection (b). The loans shall be made through the Federal Financing Bank, with the full faith and credit of the United States Government on the principal and interest. The full credit subsidy shall be paid by the Secretary using appropriated funds.

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(h) SET ASIDE FOR SMALL [AUTOMOBILE] ADVANCED TECHNOLOGY VEHICLE MANUFACTURERS AND COMPONENT SUPPLIERS.—

- (1) DEFINITION OF COVERED FIRM.—In this subsection, the term “covered firm” means a firm that—
  - (A) employs less than 500 individuals; and

(B) manufactures ultra efficient vehicles, **【automobiles】**  
*advanced technology vehicles*, or components of **【auto-**  
**mobiles】** *advanced technology vehicles*.

\* \* \* \* \*

(i) *Authorization of Appropriations*.—There are authorized to be  
appropriated such sums as are necessary to carry out this section  
for each of fiscal years 2008 through **【2012】** *2015*.

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