

Calendar No. 150

112TH CONGRESS
1ST SESSION

S. 734

[Report No. 112-70]

To provide for a program of research, development, demonstration, and commercial application in vehicle technologies at the Department of Energy.

IN THE SENATE OF THE UNITED STATES

APRIL 6 (legislative day, APRIL 5), 2011

Ms. STABENOW (for herself, Mr. LEVIN, and Mr. WYDEN) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

SEPTEMBER 6, 2011

Reported by Mr. BINGAMAN, with an amendment

[Strike out all after the enacting clause and insert the part printed in italic]

A BILL

To provide for a program of research, development, demonstration, and commercial application in vehicle technologies at the Department of Energy.

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

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Advanced Vehicle
5 Technology Act of 2011”.

1 **SEC. 2. FINDINGS.**

2 Congress finds the following:

3 (1) According to the Energy Information Ad-
4 ministration, the transportation sector accounts for
5 approximately 28 percent of the United States pri-
6 mary energy demand and greenhouse gas emissions,
7 and 24 percent of global oil demand.

8 (2) The United States transportation sector is
9 over 95 percent dependent on petroleum, and over
10 60 percent of petroleum demand is met by imported
11 supplies.

12 (3) United States heavy truck fuel consumption
13 will increase 23 percent by 2030, while overall trans-
14 portation energy use will decline by 1 percent.

15 (4) The domestic automotive and commercial
16 vehicle manufacturing sectors have increasingly lim-
17 ited resources for research, development, and engi-
18 neering of advanced technologies.

19 (5) Vehicle, engine, and component manufactur-
20 ers are playing a more important role in vehicle
21 technology development, and should be better inte-
22 grated into Federal research efforts.

23 (6) Priorities for the Department of Energy's
24 vehicle technologies research have shifted drastically
25 in recent years among diesel hybrids, hydrogen fuel

1 cell vehicles, and plug-in electric hybrids, with little
2 continuity among them.

3 (7) The integration of vehicle, communication,
4 and infrastructure technologies has great potential
5 for efficiency gains through better management of
6 the total transportation system.

7 (8) The Federal Government should balance its
8 role in researching longer-term exploratory concepts
9 and developing nearer-term transformational tech-
10 nologies for vehicles.

11 **SEC. 3. OBJECTIVES.**

12 The objectives of this Act are to—

13 (1) develop United States technologies and
14 practices that—

15 (A) improve the fuel efficiency and emis-
16 sions of all vehicles produced in the United
17 States; and

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

20 (2) support domestic research, development, en-
21 gineering, demonstration, and commercial applica-
22 tion and manufacturing of advanced vehicles, en-
23 gines, and components;

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

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

7 (5) allow for greater consumer choice of vehicle
8 technologies and fuels;

9 (6) shorten technology development and inte-
10 gration cycles in the vehicle industry;

11 (7) ensure a proper balance and diversity of
12 Federal investment in vehicle technologies; and

13 (8) strengthen partnerships between Federal
14 and State governmental agencies and the private
15 and academic sectors.

16 **SEC. 4. DEFINITIONS.**

17 For the purposes of this Act:

18 (1) DEPARTMENT.—The term “Department”
19 means the Department of Energy.

20 (2) SECRETARY.—The term “Secretary” means
21 the Secretary of Energy.

22 **SEC. 5. AUTHORIZATION OF APPROPRIATIONS.**

23 There are authorized to be appropriated to the Sec-
24 retary for United States research, development, engineer-
25 ing, demonstration, and commercial application of vehicles

1 and related technologies, including activities authorized
2 under this Act, such sums as may be necessary for each
3 of fiscal years 2012 through 2016.

4 **TITLE I—VEHICLE RESEARCH** 5 **AND DEVELOPMENT**

6 **SEC. 101. PROGRAM.**

7 (a) **ACTIVITIES.**—The Secretary shall conduct a pro-
8 gram of basic and applied research, development, engi-
9 neering, demonstration, and commercial application activi-
10 ties on materials, technologies, and processes with the po-
11 tential to substantially reduce or eliminate petroleum use
12 and the emissions of the Nation’s passenger and commer-
13 cial vehicles, including activities in the areas of—

- 14 (1) hybridization or full electrification of vehicle
15 systems;
- 16 (2) batteries and other energy storage devices;
- 17 (3) power electronics;
- 18 (4) vehicle, component, and subsystem manu-
19 facturing technologies and processes;
- 20 (5) engine efficiency and combustion optimiza-
21 tion;
- 22 (6) waste heat recovery;
- 23 (7) transmission and drivetrains;

- 1 (8) hydrogen vehicle technologies, including fuel
2 cells and internal combustion engines, and hydrogen
3 infrastructure;
- 4 (9) compressed natural gas vehicle technologies;
- 5 (10) aerodynamics, rolling resistance, and ac-
6 cessory power loads of vehicles and associated equip-
7 ment;
- 8 (11) vehicle weight reduction, including
9 lightweighting materials;
- 10 (12) friction and wear reduction;
- 11 (13) engine and component durability;
- 12 (14) innovative propulsion systems;
- 13 (15) advanced boosting systems;
- 14 (16) hydraulic hybrid technologies;
- 15 (17) engine compatibility with and optimization
16 for a variety of transportation fuels including nat-
17 ural gas and other liquid and gaseous fuels;
- 18 (18) predictive engineering, modeling, and sim-
19 ulation of vehicle and transportation systems;
- 20 (19) refueling and charging infrastructure for
21 alternative fueled and electric or plug-in electric hy-
22 brid vehicles, including the unique challenges facing
23 rural areas;
- 24 (20) gaseous fuels storage systems and system
25 integration and optimization;

1 (21) sensing, communications, and actuation
2 technologies for vehicle, electrical grid, and infra-
3 structure;

4 (22) efficient use, substitution, and recycling of
5 potentially critical materials in vehicles, including
6 rare earth elements and precious metals, at risk of
7 supply disruption;

8 (23) aftertreatment technologies;

9 (24) thermal management of battery systems;

10 (25) retrofitting advanced vehicle technologies
11 to existing vehicles;

12 (26) development of common standards, speci-
13 fications, and architectures for both transportation
14 and stationary battery applications;

15 (27) advanced internal combustion engines; and

16 (28) other research areas as determined by the
17 Secretary.

18 (b) TRANSFORMATIONAL TECHNOLOGY.—The Sec-
19 retary shall ensure that the Department continues to sup-
20 port research, development, engineering, demonstration,
21 and commercial application activities and maintains com-
22 petency in mid- to long-term transformational vehicle tech-
23 nologies with potential to achieve deep reductions in petro-
24 leum use and emissions, including activities in the areas
25 of—

1 (1) hydrogen vehicle technologies, including fuel
2 cells, internal combustion engines, hydrogen storage,
3 infrastructure, and activities in hydrogen technology
4 validation and safety codes and standards;

5 (2) multiple battery chemistries and novel en-
6 ergy storage devices, including nonchemical batteries
7 and electromechanical storage technologies such as
8 hydraulics, flywheels, and compressed air storage;

9 (3) communication and connectivity among ve-
10 hicles, infrastructure, and the electrical grid; and

11 (4) other innovative technologies research and
12 development, as determined by the Secretary.

13 (e) **INDUSTRY PARTICIPATION.**—To the maximum
14 extent practicable, activities under this Act shall be carried
15 out in partnership or collaboration with automotive manu-
16 facturers, heavy commercial, vocational, and transit vehi-
17 cle manufacturers, qualified plug-in electric vehicle manu-
18 facturers, compressed natural gas vehicle manufacturers,
19 vehicle and engine equipment and component manufactur-
20 ers, manufacturing equipment manufacturers, advanced
21 vehicle service providers, fuel producers and energy sup-
22 pliers, electric utilities, universities, national laboratories,
23 and independent research laboratories. In carrying out
24 this Act the Secretary shall—

1 (1) determine whether a wide range of compa-
2 nies that manufacture or assemble vehicles or com-
3 ponents in the United States are represented in on-
4 going public private partnership activities, including
5 firms that have not traditionally participated in fed-
6 erally sponsored research and development activities,
7 and where possible, partner with such firms that
8 conduct significant and relevant research and devel-
9 opment activities in the United States;

10 (2) leverage the capabilities and resources of,
11 and formalize partnerships with, industry-led stake-
12 holder organizations, nonprofit organizations, indus-
13 try consortia, and trade associations with expertise
14 in the research and development of, and education
15 and outreach activities in, advanced automotive and
16 commercial vehicle technologies;

17 (3) develop more efficient processes for trans-
18 ferring research findings and technologies to indus-
19 try;

20 (4) give consideration to conversion of existing
21 or former vehicle technology development or manu-
22 facturing facilities for the purposes of this Act;

23 (5) establish and support public-private part-
24 nerships, dedicated to overcoming barriers in com-
25 mercial application of transformational vehicle tech-

1 nologies, that utilize such industry-led technology de-
2 velopment facilities of entities with demonstrated ex-
3 pertise in successfully designing and engineering
4 pre-commercial generations of such transformational
5 technology; and

6 (6) promote efforts to ensure that technology
7 research, development, engineering, and commercial
8 application activities funded under this Act are ear-
9 ried out in the United States.

10 (d) INTERAGENCY AND INTRAAGENCY COORDINA-
11 TION.—To the maximum extent practicable, the Secretary
12 shall coordinate research, development, demonstration,
13 and commercial application activities among—

14 (1) relevant programs within the Department,
15 including—

16 (A) the Office of Energy Efficiency and
17 Renewable Energy;

18 (B) the Office of Science;

19 (C) the Office of Electricity Delivery and
20 Energy Reliability;

21 (D) the Office of Fossil Energy;

22 (E) the Advanced Research Projects Agen-
23 cy—Energy; and

24 (F) other offices as determined by the Sec-
25 retary; and

1 (2) relevant technology research and develop-
2 ment programs within other Federal agencies, as de-
3 termined by the Secretary.

4 (e) COORDINATION AND NONDUPLICATION.—In co-
5 ordinating activities the Secretary shall ensure, to the
6 maximum extent practicable, that activities do not dupli-
7 cate those of other programs within the Department or
8 other relevant research agencies.

9 (f) FEDERAL DEMONSTRATION OF TECH-
10 NOLOGIES.—The Secretary shall make information avail-
11 able to procurement programs of Federal agencies regard-
12 ing the potential to demonstrate technologies resulting
13 from activities funded through programs under this Act.

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

19 (h) CRITERIA.—When awarding grants under this
20 program, the Secretary shall give priority to those tech-
21 nologies (either individually or as part of a system) that—

22 (1) provide the greatest aggregate fuel savings
23 based on the reasonable projected sales volumes of
24 the technology; and

1 (2) provide the greatest increase in United
2 States employment.

3 **SEC. 102. SENSING AND COMMUNICATIONS TECH-**
4 **NOLOGIES.**

5 The Secretary, in coordination with the relevant re-
6 search programs of other Federal agencies, shall conduct
7 research, development, engineering, and demonstration ac-
8 tivities on connectivity of vehicle and transportation sys-
9 tems, including on sensing, computation, communication,
10 and actuation technologies that allow for reduced fuel use,
11 optimized traffic flow, and vehicle electrification, including
12 technologies for—

13 (1) onboard vehicle, engine, and component
14 sensing and actuation;

15 (2) vehicle-to-vehicle sensing and communica-
16 tion;

17 (3) vehicle-to-infrastructure sensing and com-
18 munication; and

19 (4) vehicle integration with the electrical grid.

20 **SEC. 103. MANUFACTURING.**

21 The Secretary shall carry out a research, develop-
22 ment, engineering, demonstration, and commercial appli-
23 cation program of advanced vehicle manufacturing tech-
24 nologies and practices, including innovative processes to—

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

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

2 Activities under this Act may include construction,
3 expansion, or modification of new and existing vehicle, en-
4 gine, and component research and testing facilities for—

5 (1) testing or simulating interoperability of a
6 variety of vehicle components and systems;

7 (2) subjecting whole or partial vehicle platforms
8 to fully representative duty cycles and operating con-
9 ditions;

10 (3) developing and demonstrating a range of
11 chemistries and configurations for advanced vehicle
12 battery manufacturing; and

13 (4) developing and demonstrating test cycles for
14 new and alternative fuels, and other advanced vehi-
15 cle technologies.

16 **SEC. 105. REPORTING.**

17 (a) **TECHNOLOGIES DEVELOPED.**—Not later than 18
18 months after the date of enactment of this Act and annu-
19 ally thereafter through 2017, the Secretary of Energy
20 shall transmit to Congress a report regarding the tech-
21 nologies developed as a result of the activities authorized
22 by this title, with a particular emphasis on whether the
23 technologies were successfully adopted for commercial ap-
24 plications, and if so, whether products relying on those
25 technologies are manufactured in the United States.

1 (b) *ADDITIONAL MATTERS.*—At the end of each fis-
 2 cal year through 2017 the Secretary shall submit to the
 3 relevant Congressional committees of jurisdiction an an-
 4 nual report describing activities undertaken in the pre-
 5 vious year under this title, active industry participants, ef-
 6 forts to recruit new participants committed to design, en-
 7 gineering, and manufacturing of advanced vehicle tech-
 8 nologies in the United States, progress of the program in
 9 meeting goals and timelines, and a strategic plan for fund-
 10 ing of activities across agencies.

11 **TITLE II—MEDIUM AND HEAVY**
 12 **DUTY COMMERCIAL AND**
 13 **TRANSIT VEHICLES**

14 **SEC. 201. PROGRAM.**

15 (a) *IN GENERAL.*—The Secretary, in partnership
 16 with relevant research and development programs in other
 17 Federal agencies, and a range of appropriate industry
 18 stakeholders, shall carry out a program of cooperative re-
 19 search, development, demonstration, and commercial ap-
 20 plication activities on advanced technologies for medium-
 21 to heavy-duty commercial, vocational, recreational, and
 22 transit vehicles, including activities in the areas of—

- 23 (1) engine efficiency and combustion research;
 24 (2) onboard storage technologies for compressed
 25 and liquefied natural gas;

- 1 (3) development and integration of engine tech-
- 2 nologies designed for natural gas operation of a vari-
- 3 ety of vehicle platforms;
- 4 (4) waste heat recovery and conversion;
- 5 (5) improved aerodynamics and tire rolling re-
- 6 sistance;
- 7 (6) energy and space-efficient emissions control
- 8 systems;
- 9 (7) heavy hybrid, hybrid hydraulic, plug-in hy-
- 10 brid, and electric platforms, and energy storage
- 11 technologies;
- 12 (8) drivetrain optimization;
- 13 (9) friction and wear reduction;
- 14 (10) engine idle and parasitic energy loss reduc-
- 15 tion;
- 16 (11) electrification of accessory loads;
- 17 (12) onboard sensing and communications tech-
- 18 nologies;
- 19 (13) advanced lightweighting materials and ve-
- 20 hicle designs;
- 21 (14) increasing load capacity per vehicle;
- 22 (15) thermal management of battery systems;
- 23 (16) recharging infrastructure;
- 24 (17) compressed natural gas infrastructure;
- 25 (18) advanced internal combustion engines;

1 (19) complete vehicle modeling and simulation;

2 (20) hydrogen vehicle technologies, including
3 fuel cells and internal combustion engines, and hy-
4 drogen infrastructure;

5 (21) retrofitting advanced technologies onto ex-
6 isting truck fleets; and

7 (22) integration of these and other advanced
8 systems onto a single truck and trailer platform.

9 (b) LEADERSHIP.—The Secretary shall appoint a
10 full-time Director to coordinate research, development,
11 demonstration, and commercial application activities in
12 medium- to heavy-duty commercial, recreational, and tran-
13 sit vehicle technologies. Responsibilities of the Director
14 shall be to—

15 (1) improve coordination and develop consensus
16 between government agency and industry partners,
17 and propose new processes for program management
18 and priority setting to better align activities and
19 budgets among partners;

20 (2) regularly convene workshops, site visits,
21 demonstrations, conferences, investor forums, and
22 other events in which information and research find-
23 ings are shared among program participants and in-
24 terested stakeholders;

1 (3) develop a budget for the Department's ac-
2 tivities with regard to the interagency program, and
3 provide consultation and guidance on vehicle tech-
4 nology funding priorities across agencies;

5 (4) determine a process for reviewing program
6 technical goals, targets, and timetables and, where
7 applicable, aided by life-cycle impact and cost anal-
8 ysis, propose revisions or elimination based on pro-
9 gram progress, available funding, and rate of tech-
10 nology adoption;

11 (5) evaluate ongoing activities of the program
12 and recommend project modifications, including the
13 termination of projects, where applicable;

14 (6) recruit new industry participants to the
15 interagency program, including truck, trailer, and
16 component manufacturers who have not traditionally
17 participated in federally sponsored research and
18 technology development activities; and

19 (7) other responsibilities as determined by the
20 Secretary, in consultation with interagency and in-
21 dustry partners.

22 (c) REPORTING.—At the end of each fiscal year, the
23 Secretary shall submit to the Congress an annual report
24 describing activities undertaken in the previous year, ac-
25 tive industry participants, efforts to recruit new partici-

1 pants, progress of the program in meeting goals and
 2 timelines, and a strategic plan for funding of activities
 3 across agencies.

4 **SEC. 202. CLASS 8 TRUCK AND TRAILER SYSTEMS DEM-**
 5 **ONSTRATION.**

6 The Secretary shall conduct a competitive grant pro-
 7 gram to demonstrate the integration of multiple advanced
 8 technologies on Class 8 truck and trailer platforms with
 9 a goal of improving overall freight efficiency, as measured
 10 in tons and volume of freight hauled or other work per-
 11 formance-based metrics, by 50 percent, including a com-
 12 bination of technologies listed in section 201(a). Applicant
 13 teams may be comprised of truck and trailer manufactur-
 14 ers, engine and component manufacturers, fleet cus-
 15 tomers, university researchers, and other applicants as ap-
 16 propriate for the development and demonstration of inte-
 17 grated Class 8 truck and trailer systems.

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

19 The Secretary, in coordination with the partners of
 20 the interagency research program described in section
 21 201(a)—

22 (1) shall develop standard testing procedures
 23 and technologies for evaluating the performance of
 24 advanced heavy vehicle technologies under a range of

1 representative duty cycles and operating conditions,
 2 including for heavy hybrid propulsion systems;

3 ~~(2)~~ shall evaluate heavy vehicle performance
 4 using work performance-based metrics other than
 5 those based on miles per gallon, including those
 6 based on units of volume and weight transported for
 7 freight applications, and appropriate metrics based
 8 on the work performed by nonroad systems; and

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

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

12 The Secretary shall undertake a pilot program of re-
 13 search, development, demonstration, and commercial ap-
 14 plications of technologies to improve total machine or sys-
 15 tem efficiency for nonroad mobile equipment including ag-
 16 ricultural and construction equipment, and shall seek op-
 17 portunities to transfer relevant research findings and tech-
 18 nologies between the nonroad and on-highway equipment
 19 and vehicle sectors.

20 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

21 *(a) SHORT TITLE.—This Act may be cited as the “Ad-
 22 vanced Vehicle Technology Act of 2011”.*

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

Sec. 1. Short title; table of contents.

Sec. 2. Objectives.

Sec. 3. Definitions.

Sec. 4. *Coordination and nonduplication.*

TITLE I—VEHICLE RESEARCH AND DEVELOPMENT

Sec. 101. *Program.*

Sec. 102. *Sensing and communications technologies.*

Sec. 103. *Manufacturing.*

Sec. 104. *Reporting.*

*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.*

Sec. 205. *Repeal of existing authorities.*

1 SEC. 2. OBJECTIVES.

2 *The objectives of this Act are—*

3 *(1) to reform and reorient the vehicle tech-*
4 *nologies programs of the Department;*

5 *(2) to establish a clear and consistent authority*
6 *for vehicle technologies programs of the Department;*

7 *(3) to develop United States technologies and*
8 *practices that—*

9 *(A) improve the fuel efficiency and emis-*
10 *sions of all vehicles produced in the United*
11 *States; and*

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

14 *(4) to support domestic research, development,*
15 *engineering, demonstration, and commercial applica-*
16 *tion and manufacturing of advanced vehicles, engines,*
17 *and components;*

1 (5) *to enable vehicles to move larger volumes of*
2 *goods and more passengers with less energy and emis-*
3 *sions;*

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

7 (7) *to allow for greater consumer choice of vehi-*
8 *cle technologies and fuels;*

9 (8) *to shorten technology development and inte-*
10 *gration cycles in the vehicle industry;*

11 (9) *to ensure a proper balance and diversity of*
12 *Federal investment in vehicle technologies and among*
13 *vehicle classes; and*

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

17 **SEC. 3. DEFINITIONS.**

18 *In this Act:*

19 (1) *DEPARTMENT.*—*The term “Department”*
20 *means the Department of Energy.*

21 (2) *SECRETARY.*—*The term “Secretary” means*
22 *the Secretary of Energy.*

23 **SEC. 4. COORDINATION AND NONDUPLICATION.**

24 (a) *COORDINATION.*—*The Secretary shall ensure that*
25 *activities authorized by this Act do not duplicate activities*

1 *of other programs within the Department or other relevant*
2 *agencies.*

3 (b) *COST-SHARING REQUIREMENT.*—*The activities*
4 *carried out under this Act shall be subject to the cost-shar-*
5 *ing requirements of section 988 of the Energy Policy Act*
6 *of 2005 (42 U.S.C. 16352).*

7 ***TITLE I—VEHICLE RESEARCH***
8 ***AND DEVELOPMENT***

9 ***SEC. 101. PROGRAM.***

10 (a) *ACTIVITIES.*—*The Secretary shall conduct a pro-*
11 *gram of basic and applied research, development, engineer-*
12 *ing, demonstration, and commercial application activities*
13 *on materials, technologies, and processes with the potential*
14 *to substantially reduce or eliminate petroleum use and the*
15 *emissions of the Nation’s passenger and commercial vehi-*
16 *cles, including activities in the areas of—*

17 (1) *hybridization or full electrification of vehicle*
18 *systems;*

19 (2) *batteries, ultracapacitors, and other energy*
20 *storage devices;*

21 (3) *power electronics;*

22 (4) *vehicle, component, and subsystem manufac-*
23 *turing technologies and processes;*

24 (5) *engine efficiency and combustion optimiza-*
25 *tion;*

- 1 (6) *waste heat recovery;*
- 2 (7) *transmission and drivetrains;*
- 3 (8) *hydrogen vehicle technologies, including fuel*
4 *cells and internal combustion engines, and hydrogen*
5 *infrastructure;*
- 6 (9) *compressed natural gas and liquefied petro-*
7 *leum gas vehicle technologies;*
- 8 (10) *aerodynamics, rolling resistance, and acces-*
9 *sory power loads of vehicles and associated equip-*
10 *ment;*
- 11 (11) *vehicle weight reduction, including*
12 *lightweighting materials;*
- 13 (12) *friction and wear reduction;*
- 14 (13) *engine and component durability;*
- 15 (14) *innovative propulsion systems;*
- 16 (15) *advanced boosting systems;*
- 17 (16) *hydraulic hybrid technologies;*
- 18 (17) *engine compatibility with and optimization*
19 *for a variety of transportation fuels including natural*
20 *gas and other liquid and gaseous fuels;*
- 21 (18) *predictive engineering, modeling, and sim-*
22 *ulation of vehicle and transportation systems;*
- 23 (19) *refueling and charging infrastructure for al-*
24 *ternative fueled and electric or plug-in electric hybrid*

1 *vehicles, including the unique challenges facing rural*
2 *areas;*

3 *(20) gaseous fuels storage systems and system in-*
4 *tegration and optimization;*

5 *(21) sensing, communications, and actuation*
6 *technologies for vehicle, electrical grid, and infrastruc-*
7 *ture;*

8 *(22) efficient use, substitution, and recycling of*
9 *potentially critical materials in vehicles, including*
10 *rare earth elements and precious metals, at risk of*
11 *supply disruption;*

12 *(23) aftertreatment technologies;*

13 *(24) thermal management of battery systems;*

14 *(25) retrofitting advanced vehicle technologies to*
15 *existing vehicles;*

16 *(26) development of common standards, speci-*
17 *fications, and architectures for both transportation*
18 *and stationary battery applications;*

19 *(27) advanced internal combustion engines; and*

20 *(28) other research areas as determined by the*
21 *Secretary.*

22 *(b) TRANSFORMATIONAL TECHNOLOGY.—The Sec-*
23 *retary shall ensure that the Department continues to sup-*
24 *port research, development, engineering, demonstration,*
25 *and commercial application activities and maintains com-*

1 *petency in mid- to long-term transformational vehicle tech-*
2 *nologies with potential to achieve deep reductions in petro-*
3 *leum use and emissions, including activities in the areas*
4 *of—*

5 *(1) hydrogen vehicle technologies, including fuel*
6 *cells, internal combustion engines, hydrogen storage,*
7 *infrastructure, and activities in hydrogen technology*
8 *validation and safety codes and standards;*

9 *(2) multiple battery chemistries and novel energy*
10 *storage devices, including nonchemical batteries,*
11 *ultracapacitors and electromechanical storage tech-*
12 *nologies such as hydraulics, flywheels, and compressed*
13 *air storage;*

14 *(3) communication, connectivity, and power flow*
15 *among vehicles, infrastructure, and the electrical grid;*
16 *and*

17 *(4) other innovative technologies research and de-*
18 *velopment, as determined by the Secretary.*

19 *(c) INDUSTRY PARTICIPATION.—To the maximum ex-*
20 *tent practicable, activities under this Act shall be carried*
21 *out in partnership or collaboration with automotive manu-*
22 *facturers, heavy commercial, vocational, and transit vehicle*
23 *manufacturers, qualified plug-in electric vehicle manufac-*
24 *turers, compressed natural gas and liquefied petroleum gas*
25 *vehicle manufacturers, vehicle and engine equipment and*

1 *component manufacturers, manufacturing equipment man-*
2 *ufacturers, advanced vehicle service providers, fuel pro-*
3 *ducers and energy suppliers, electric utilities, universities,*
4 *national laboratories, and independent research labora-*
5 *tories. In carrying out this Act the Secretary shall—*

6 (1) *determine whether a wide range of companies*
7 *that manufacture or assemble vehicles or components*
8 *in the United States are represented in ongoing pub-*
9 *lic private partnership activities, including firms that*
10 *have not traditionally participated in federally spon-*
11 *sored research and development activities, and where*
12 *possible, partner with such firms that conduct signifi-*
13 *cant and relevant research and development activities*
14 *in the United States;*

15 (2) *leverage the capabilities and resources of, and*
16 *formalize partnerships with, industry-led stakeholder*
17 *organizations, nonprofit organizations, industry con-*
18 *sortia, and trade associations with expertise in the re-*
19 *search and development of, and education and out-*
20 *reach activities in, advanced automotive and commer-*
21 *cial vehicle technologies;*

22 (3) *develop more efficient processes for transfer-*
23 *ring research findings and technologies to industry;*

1 (4) *give consideration to conversion of existing or*
2 *former vehicle technology development or manufac-*
3 *turing facilities for the purposes of this Act;*

4 (5) *establish and support public-private partner-*
5 *ships, dedicated to overcoming barriers in commercial*
6 *application of transformational vehicle technologies,*
7 *that utilize such industry-led technology development*
8 *facilities of entities with demonstrated expertise in*
9 *successfully designing and engineering pre-commer-*
10 *cial generations of such transformational technology;*
11 *and*

12 (6) *promote efforts to ensure that technology re-*
13 *search, development, engineering, and commercial ap-*
14 *plication activities funded under this Act are carried*
15 *out in the United States.*

16 (d) *INTERAGENCY AND INTRAAGENCY COORDINA-*
17 *TION.—To the maximum extent practicable, the Secretary*
18 *shall coordinate research, development, demonstration, and*
19 *commercial application activities among—*

20 (1) *relevant programs within the Department,*
21 *including—*

22 (A) *the Office of Energy Efficiency and Re-*
23 *newable Energy;*

24 (B) *the Office of Science;*

1 (C) *the Office of Electricity Delivery and*
2 *Energy Reliability;*

3 (D) *the Office of Fossil Energy;*

4 (E) *the Advanced Research Projects Agen-*
5 *cy—Energy; and*

6 (F) *other offices as determined by the Sec-*
7 *retary; and*

8 (2) *relevant technology research and development*
9 *programs within the Department of Transportation*
10 *and other Federal agencies, as determined by the Sec-*
11 *retary.*

12 (e) *FEDERAL DEMONSTRATION OF TECHNOLOGIES.—*
13 *The Secretary shall make information available to procure-*
14 *ment programs of Federal agencies regarding the potential*
15 *to demonstrate technologies resulting from activities funded*
16 *through programs under this Act.*

17 (f) *INTERGOVERNMENTAL COORDINATION.—The Sec-*
18 *retary shall seek opportunities to leverage resources and*
19 *support initiatives of State and local governments in devel-*
20 *oping and promoting advanced vehicle technologies, manu-*
21 *facturing, and infrastructure.*

22 (g) *CRITERIA.—When awarding cost-shared grants*
23 *under this program, the Secretary shall give priority to*
24 *those technologies (either individually or as part of a sys-*
25 *tem) that—*

1 (1) *provide the greatest aggregate fuel savings*
2 *based on the reasonable projected sales volumes of the*
3 *technology; and*

4 (2) *provide the greatest increase in United States*
5 *employment.*

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

7 (a) *IN GENERAL.*—*The Secretary, in coordination*
8 *with the Secretary of Transportation and the relevant re-*
9 *search programs of other Federal agencies, shall conduct re-*
10 *search, development, engineering, and demonstration activi-*
11 *ties on connectivity of vehicle and transportation systems,*
12 *including on sensing, computation, communication, and*
13 *actuation technologies that allow for reduced fuel use, opti-*
14 *mized traffic flow, and vehicle electrification, including*
15 *technologies for—*

16 (1) *onboard vehicle, engine, and component sens-*
17 *ing and actuation;*

18 (2) *vehicle-to-vehicle sensing and communica-*
19 *tion;*

20 (3) *vehicle-to-infrastructure sensing and commu-*
21 *nication; and*

22 (4) *vehicle integration with the electrical grid,*
23 *including communications to provide grid services.*

24 (b) *COORDINATION.*—*The activities carried out under*
25 *this section shall supplement (and not supplant) activities*

1 *under the intelligent transportation system research pro-*
2 *gram of the Department of Transportation.*

3 **SEC. 103. MANUFACTURING.**

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

8 *(1) increase the production rate and decrease the*
9 *cost of advanced battery manufacturing;*

10 *(2) vary the capability of individual manufac-*
11 *turing facilities to accommodate different battery*
12 *chemistries and configurations;*

13 *(3) reduce waste streams, emissions, and energy-*
14 *intensity of vehicle, engine, advanced battery and*
15 *component manufacturing processes;*

16 *(4) recycle and remanufacture used batteries and*
17 *other vehicle components for reuse in vehicles or sta-*
18 *tionary applications;*

19 *(5) produce cost-effective lightweight materials*
20 *such as advanced metal alloys, polymeric composites,*
21 *and carbon fiber;*

22 *(6) produce lightweight high pressure storage*
23 *systems for gaseous fuels;*

24 *(7) design and manufacture purpose-built hydro-*
25 *gen and fuel cell vehicles and components;*

1 (8) *improve the calendar life and cycle life of ad-*
2 *vanced batteries; and*

3 (9) *produce permanent magnets for advanced ve-*
4 *hicles.*

5 **SEC. 104. REPORTING.**

6 (a) *TECHNOLOGIES DEVELOPED.*—*Not later than 18*
7 *months after the date of enactment of this Act and annually*
8 *thereafter through 2017, the Secretary of Energy shall*
9 *transmit to Congress a report regarding the technologies de-*
10 *veloped as a result of the activities authorized by this title,*
11 *with a particular emphasis on whether the technologies were*
12 *successfully adopted for commercial applications, and if so,*
13 *whether products relying on those technologies are manufac-*
14 *tured in the United States.*

15 (b) *ADDITIONAL MATTERS.*—*At the end of each fiscal*
16 *year through 2017 the Secretary shall submit to the relevant*
17 *Congressional committees of jurisdiction an annual report*
18 *describing activities undertaken in the previous year under*
19 *this title, active industry participants, efforts to recruit new*
20 *participants committed to design, engineering, and manu-*
21 *facturing of advanced vehicle technologies in the United*
22 *States, progress of the program in meeting goals and*
23 *timelines, and a strategic plan for funding of activities*
24 *across agencies.*

1 **TITLE II—MEDIUM AND HEAVY**
2 **DUTY COMMERCIAL AND**
3 **TRANSIT VEHICLES**

4 **SEC. 201. PROGRAM.**

5 (a) *IN GENERAL.*—The Secretary, in partnership with
6 relevant research and development programs in other Fed-
7 eral agencies, and a range of appropriate industry stake-
8 holders, shall carry out a program of cooperative research,
9 development, demonstration, and commercial application
10 activities on advanced technologies for medium- to heavy-
11 duty commercial, vocational, recreational, and transit vehi-
12 cles, including activities in the areas of—

13 (1) *engine efficiency and combustion research;*

14 (2) *onboard storage technologies for compressed*
15 *natural gas and liquefied petroleum gas;*

16 (3) *development and integration of engine tech-*
17 *nologies designed for compressed natural gas and liq-*
18 *uefied petroleum gas operation of a variety of vehicle*
19 *platforms;*

20 (4) *waste heat recovery and conversion;*

21 (5) *improved aerodynamics and tire rolling re-*
22 *sistance;*

23 (6) *energy and space-efficient emissions control*
24 *systems;*

- 1 (7) *heavy hybrid, hybrid hydraulic, plug-in hybrid,*
2 *and electric platforms, and energy storage technologies;*
3
4 (8) *drivetrain optimization;*
5 (9) *friction and wear reduction;*
6 (10) *engine idle and parasitic energy loss reduction;*
7
8 (11) *electrification of accessory loads;*
9 (12) *onboard sensing and communications technologies;*
10
11 (13) *advanced lightweighting materials and vehicle designs;*
12
13 (14) *increasing load capacity per vehicle;*
14 (15) *thermal management of battery systems;*
15 (16) *recharging infrastructure;*
16 (17) *compressed natural gas and liquefied petroleum gas infrastructure;*
17
18 (18) *advanced internal combustion engines;*
19 (19) *complete vehicle modeling and simulation;*
20 (20) *hydrogen vehicle technologies, including fuel cells and internal combustion engines, and hydrogen infrastructure;*
21
22 (21) *retrofitting advanced technologies onto existing truck fleets; and*
23
24

1 (22) *integration of these and other advanced sys-*
2 *tems onto a single truck and trailer platform.*

3 (b) *LEADERSHIP.—The Secretary shall appoint a full-*
4 *time Director to coordinate research, development, dem-*
5 *onstration, and commercial application activities in*
6 *medium- to heavy-duty commercial, recreational, and tran-*
7 *sit vehicle technologies. Responsibilities of the Director shall*
8 *be to—*

9 (1) *improve coordination and develop consensus*
10 *between government agency and industry partners,*
11 *and propose new processes for program management*
12 *and priority setting to better align activities and*
13 *budgets among partners;*

14 (2) *regularly convene workshops, site visits, dem-*
15 *onstrations, conferences, investor forums, and other*
16 *events in which information and research findings*
17 *are shared among program participants and inter-*
18 *ested stakeholders;*

19 (3) *develop a budget for the Department’s activi-*
20 *ties with regard to the interagency program, and pro-*
21 *vide consultation and guidance on vehicle technology*
22 *funding priorities across agencies;*

23 (4) *determine a process for reviewing program*
24 *technical goals, targets, and timetables and, where ap-*
25 *plicable, aided by life-cycle impact and cost analysis,*

1 *propose revisions or elimination based on program*
2 *progress, available funding, and rate of technology*
3 *adoption;*

4 *(5) evaluate ongoing activities of the program*
5 *and recommend project modifications, including the*
6 *termination of projects, where applicable;*

7 *(6) recruit new industry participants to the*
8 *interagency program, including truck, trailer, and*
9 *component manufacturers who have not traditionally*
10 *participated in federally sponsored research and tech-*
11 *nology development activities; and*

12 *(7) other responsibilities as determined by the*
13 *Secretary, in consultation with interagency and in-*
14 *dustry partners.*

15 *(c) REPORTING.—At the end of each fiscal year, the*
16 *Secretary shall submit to the Congress an annual report*
17 *describing activities undertaken in the previous year, active*
18 *industry participants, efforts to recruit new participants,*
19 *progress of the program in meeting goals and timelines, and*
20 *a strategic plan for funding of activities across agencies.*

21 **SEC. 202. CLASS 8 TRUCK AND TRAILER SYSTEMS DEM-**
22 **ONSTRATION.**

23 *The Secretary shall conduct a competitive grant pro-*
24 *gram to demonstrate the integration of multiple advanced*
25 *technologies on Class 8 truck and trailer platforms with a*

1 *goal of improving overall freight efficiency, as measured in*
2 *tons and volume of freight hauled or other work perform-*
3 *ance-based metrics, by 50 percent, including a combination*
4 *of technologies listed in section 201(a). Applicant teams*
5 *may be comprised of truck and trailer manufacturers, en-*
6 *gine and component manufacturers, fleet customers, univer-*
7 *sity researchers, and other applicants as appropriate for*
8 *the development and demonstration of integrated Class 8*
9 *truck and trailer systems.*

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

11 *The Secretary, in coordination with the partners of the*
12 *interagency research program described in section 201(a)—*

13 *(1) shall develop standard testing procedures and*
14 *technologies for evaluating the performance of ad-*
15 *vanced heavy vehicle technologies under a range of*
16 *representative duty cycles and operating conditions,*
17 *including for heavy hybrid propulsion systems;*

18 *(2) shall evaluate heavy vehicle performance*
19 *using work performance-based metrics other than*
20 *those based on miles per gallon, including those based*
21 *on units of volume and weight transported for freight*
22 *applications, and appropriate metrics based on the*
23 *work performed by nonroad systems; and*

24 *(3) may construct heavy duty truck and bus test-*
25 *ing facilities.*

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

2 *The Secretary shall undertake a pilot program of re-*
3 *search, development, demonstration, and commercial appli-*
4 *cations of technologies to improve total machine or system*
5 *efficiency for nonroad mobile equipment including agricul-*
6 *tural and construction equipment, and shall seek opportu-*
7 *nities to transfer relevant research findings and technologies*
8 *between the nonroad and on-highway equipment and vehicle*
9 *sectors.*

10 **SEC. 205. REPEAL OF EXISTING AUTHORITIES.**

11 *(a) IN GENERAL.—Sections 706, 711, 712, and 933 of*
12 *the Energy Policy Act of 2005 (42 U.S.C. 16051, 16061,*
13 *16062, 16233) are repealed.*

14 *(b) ENERGY EFFICIENCY.—Section 911 of the Energy*
15 *Policy Act of 2005 (42 U.S.C. 16191) is amended—*

16 *(1) in subsection (a)—*

17 *(A) in paragraph (1)(A), by striking “vehi-*
18 *cles, buildings,” and inserting “buildings”; and*

19 *(B) in paragraph (2)—*

20 *(i) by striking subparagraph (A); and*

21 *(ii) by redesignating subparagraphs*

22 *(B) through (E) as subparagraphs (A)*

23 *through (D), respectively; and*

24 *(2) in subsection (c)—*

25 *(A) by striking paragraph (3);*

1 (B) by redesignating paragraph (4) as
2 paragraph (3); and

3 (C) in paragraph (3) (as so redesignated),
4 by striking “(a)(2)(D)” and inserting
5 “(a)(2)(C)”.

6 (c) *ENERGY STORAGE COMPETITIVENESS*.—Section
7 641 of the Energy Independence and Security Act of 2007
8 (42 U.S.C. 17231) is amended—

9 (1) by striking subsection (j);

10 (2) by redesignating subsections (k) through (p)
11 as subsections (j) through (o), respectively; and

12 (3) in subsection (o) (as so redesignated)—

13 (A) in paragraph (2), by striking “and;”
14 after the semicolon at the end;

15 (B) in paragraph (4), by inserting “and”
16 after the semicolon at the end;

17 (C) by striking paragraph (5);

18 (D) by redesignating paragraph (6) as
19 paragraph (5); and

20 (E) in paragraph (5) (as so redesignated),
21 by striking “subsection (k)” and inserting “sub-
22 section (j)”.

Calendar No. 150

112TH CONGRESS
1ST Session

S. 734

[Report No. 112-70]

A BILL

To provide for a program of research, development, demonstration, and commercial application in vehicle technologies at the Department of Energy.

SEPTEMBER 6, 2011

Reported with an amendment