

114TH CONGRESS
1ST SESSION

H. R. 4106

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

IN THE HOUSE OF REPRESENTATIVES

NOVEMBER 19, 2015

Mrs. DINGELL (for herself, Mr. CARTWRIGHT, and Mr. POCAN) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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; TABLE OF CONTENTS.**

4 (a) SHORT TITLE.—This Act may be cited as the
5 “Vehicle Innovation Act of 2015”.

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

- Sec. 1. Short title; table of contents.
- Sec. 2. Findings.
- Sec. 3. Objectives.
- Sec. 4. Definitions.

Sec. 5. Authorization of appropriations.

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. 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.

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 21 percent of global oil demand.

8 (2) The United States transportation sector is
9 over 90-percent dependent on petroleum.

10 (3) United States heavy truck fuel consumption
11 will increase 27 percent by 2030.

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

16 (5) Vehicle, engine, and component manufactur-
17 ers are playing a more important role in vehicle

1 technology development, and should be better inte-
2 grated into Federal research efforts.

3 (6) Priorities for the vehicle technologies re-
4 search of the Department of Energy have shifted
5 drastically in recent years among diesel hybrids, hy-
6 drogen fuel cell vehicles, and plug-in electric hybrids,
7 with little continuity among them.

8 (7) The integration of vehicle, communication,
9 and infrastructure technologies has great potential
10 for efficiency gains through better management of
11 the total transportation system.

12 (8) The Federal Government should balance its
13 role in researching longer-term exploratory concepts
14 and developing nearer-term transformational tech-
15 nologies for vehicles.

16 **SEC. 3. OBJECTIVES.**

17 The objectives of this Act are—

18 (1) to develop United States technologies and
19 practices that—

20 (A) improve the fuel efficiency and emis-
21 sions of all vehicles produced in the United
22 States; and

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

1 (2) to support domestic research, development,
2 engineering, demonstration, and commercial applica-
3 tion and manufacturing of advanced vehicles, en-
4 gines, and components;

5 (3) to enable vehicles to move larger volumes of
6 goods and more passengers with less energy and
7 emissions;

8 (4) to develop cost-effective advanced tech-
9 nologies for wide-scale utilization throughout the
10 passenger, commercial, government, and transit ve-
11 hicle sectors;

12 (5) to allow for greater consumer choice of vehi-
13 cle technologies and fuels;

14 (6) to shorten technology development and inte-
15 gration cycles in the vehicle industry;

16 (7) to ensure a proper balance and diversity of
17 Federal investment in vehicle technologies; and

18 (8) to strengthen partnerships between Federal
19 and State governmental agencies and the private
20 and academic sectors.

21 **SEC. 4. DEFINITIONS.**

22 In this Act:

23 (1) DEPARTMENT.—The term “Department”
24 means the Department of Energy.

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

3 **SEC. 5. AUTHORIZATION OF APPROPRIATIONS.**

4 There are authorized to be appropriated to the Sec-
5 retary for research, development, engineering, demonstra-
6 tion, and commercial application of vehicles and related
7 technologies in the United States, including activities au-
8 thorized under this Act, such sums as may be necessary
9 for fiscal years 2016 through 2020.

10 **TITLE I—VEHICLE RESEARCH**
11 **AND DEVELOPMENT**

12 **SEC. 101. PROGRAM.**

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

20 (1) hybridization or full electrification of vehicle
21 systems;

22 (2) batteries and other energy storage devices;

23 (3) power electronics;

24 (4) vehicle, component, and subsystem manu-
25 facturing technologies and processes;

- 1 (5) engine efficiency and combustion optimiza-
- 2 tion;
- 3 (6) waste heat recovery;
- 4 (7) transmission and drivetrains;
- 5 (8) natural gas vehicle technologies;
- 6 (9) aerodynamics, rolling resistance (including
- 7 tires and wheel assemblies), and accessory power
- 8 loads of vehicles and associated equipment;
- 9 (10) vehicle weight reduction, including
- 10 lightweighting materials and the development of
- 11 manufacturing processes to fabricate, assemble, and
- 12 use dissimilar materials;
- 13 (11) friction and wear reduction;
- 14 (12) engine and component durability;
- 15 (13) innovative propulsion systems;
- 16 (14) advanced boosting systems;
- 17 (15) hydraulic hybrid technologies;
- 18 (16) engine compatibility with and optimization
- 19 for a variety of transportation fuels including nat-
- 20 ural gas and other liquid and gaseous fuels;
- 21 (17) predictive engineering, modeling, and sim-
- 22 ulation of vehicle and transportation systems;
- 23 (18) refueling and charging infrastructure for
- 24 alternative fueled and electric or plug-in electric hy-

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

3 (19) gaseous fuels storage systems and system
4 integration and optimization;

5 (20) sensing, communications, and actuation
6 technologies for vehicle, electrical grid, and infra-
7 structure;

8 (21) 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 (22) aftertreatment technologies;

13 (23) thermal management of battery systems;

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

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

19 (26) advanced internal combustion engines;

20 (27) mild hybrid;

21 (28) engine down speeding; and

22 (29) other research areas as determined by the
23 Secretary.

24 (b) TRANSFORMATIONAL TECHNOLOGY.—The Sec-
25 retary shall ensure that the Department continues to sup-

1 port research, development, engineering, demonstration,
2 and commercial application activities and maintains com-
3 petency in mid- to long-term transformational vehicle tech-
4 nologies with potential to achieve deep reductions in petro-
5 leum use and emissions, including activities in the areas
6 of—

7 (1) hydrogen vehicle technologies, including fuel
8 cells, hydrogen storage, infrastructure, and activities
9 in hydrogen technology validation and safety codes
10 and standards;

11 (2) multiple battery chemistries and novel en-
12 ergy storage devices, including nonchemical batteries
13 and electromechanical storage technologies such as
14 hydraulics, flywheels, and compressed air storage;

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

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

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

1 ers, manufacturing equipment manufacturers, advanced
2 vehicle service providers, fuel producers and energy sup-
3 pliers, electric utilities, universities, national laboratories,
4 and independent research laboratories. In carrying out
5 this Act the Secretary shall—

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

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

22 (3) develop more effective processes for trans-
23 ferring research findings and technologies to indus-
24 try;

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

4 (5) support public-private partnerships, dedi-
5 cated to overcoming barriers in commercial applica-
6 tion of transformational vehicle technologies, that
7 utilize such industry-led technology development fa-
8 cilities 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
13 research, development, engineering, and commercial
14 application activities funded under this Act are car-
15 ried 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,
19 and commercial application activities among—

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

22 (A) the Office of Energy Efficiency and
23 Renewable 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 develop-
9 ment programs within other Federal agencies, as de-
10 termined by the Secretary.

11 (e) COORDINATION AND NONDUPLICATION.—In co-
12 ordinating activities the Secretary shall ensure, to the
13 maximum extent practicable, that activities do not dupli-
14 cate those of other programs within the Department or
15 other relevant research agencies.

16 (f) FEDERAL DEMONSTRATION OF TECH-
17 NOLOGIES.—The Secretary shall make information avail-
18 able to procurement programs of Federal agencies regard-
19 ing the potential to demonstrate technologies resulting
20 from activities funded through programs under this Act.

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

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

4 (1) provide the greatest aggregate fuel savings
5 based on the reasonable projected sales volumes of
6 the technology; and

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

9 **SEC. 102. SENSING AND COMMUNICATIONS TECH-**
10 **NOLOGIES.**

11 The Secretary, in coordination with the relevant re-
12 search programs of other Federal agencies, shall conduct
13 research, development, engineering, demonstration, and
14 deployment activities on connectivity of vehicle roadway,
15 vulnerable road users, traffic control systems, and trans-
16 portation data systems, including on sensing, data, com-
17 putation, communication, cybersecurity, and actuation
18 technologies that allow for improved safety, reduced en-
19 ergy and fuel use, optimized traffic flow, and vehicle elec-
20 trification, including technologies for—

21 (1) onboard vehicle, engine, transmission and
22 component sensing, actuation, and calibration;

23 (2) vehicle-to-vehicle sensing and communica-
24 tion;

1 (3) vehicle-to-infrastructure sensing and com-
2 munication;

3 (4) vehicle-to-pedestrian and vehicle-to-bicyclist
4 sensing and communication; and

5 (5) vehicle integration with the electrical grid.

6 **SEC. 103. MANUFACTURING.**

7 The Secretary shall carry out a research, develop-
8 ment, engineering, demonstration, and commercial appli-
9 cation program of advanced vehicle manufacturing tech-
10 nologies and practices, including innovative processes—

11 (1) to increase the production rate and decrease
12 the cost of advanced battery and fuel cell manufac-
13 turing;

14 (2) to vary the capability of individual manufac-
15 turing facilities to accommodate different battery
16 chemistries and configurations;

17 (3) to reduce waste streams, emissions, and en-
18 ergy intensity of vehicle, engine, advanced battery
19 and component manufacturing processes;

20 (4) to recycle and remanufacture used batteries
21 and other vehicle components for reuse in vehicles or
22 stationary applications;

23 (5) to develop manufacturing processes to effec-
24 tively fabricate, assemble, and produce cost-effective
25 lightweight materials such as advanced aluminum

1 and other metal alloys, polymeric composites, and
2 carbon fiber for use in vehicles;

3 (6) to produce lightweight high pressure storage
4 systems for gaseous fuels;

5 (7) to design and manufacture purpose-built hy-
6 drogen fuel cell vehicles and components;

7 (8) to improve the calendar life and cycle life of
8 advanced batteries; and

9 (9) to produce permanent magnets for advanced
10 vehicles.

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

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

15 (1) testing or simulating interoperability of a
16 variety of vehicle components and systems, including
17 the technologies described in section 102;

18 (2) subjecting whole or partial vehicle platforms
19 to fully representative duty cycles and operating con-
20 ditions;

21 (3) developing and demonstrating a range of
22 chemistries and configurations for advanced vehicle
23 battery manufacturing;

1 (4) developing and demonstrating test cycles for
2 new and alternative fuels, and other advanced vehi-
3 cle technologies;

4 (5) developing and demonstrating methods to
5 charge electric vehicles and connect them to the elec-
6 tric grid; and

7 (6) developing, testing, and demonstrating hy-
8 drogen and natural gas refueling station tech-
9 nologies.

10 **SEC. 105. REPORTING.**

11 (a) TECHNOLOGIES DEVELOPED.—Not later than 18
12 months after the date of enactment of this Act and annu-
13 ally thereafter through 2020, the Secretary shall submit
14 to Congress a report regarding the technologies developed
15 as a result of the activities authorized by this title, with
16 a particular emphasis on whether the technologies were
17 successfully adopted for commercial applications, and if
18 so, whether products relying on those technologies are
19 manufactured in the United States.

20 (b) ADDITIONAL MATTERS.—At the end of each fis-
21 cal year through 2020 the Secretary shall submit to the
22 relevant Congressional committees of jurisdiction an an-
23 nual report describing activities undertaken in the pre-
24 vious year under this title, active industry participants, ef-
25 forts to recruit new participants committed to design, en-

1 gineering, and manufacturing of advanced vehicle tech-
2 nologies in the United States, progress of the program in
3 meeting goals and timelines, and a strategic plan for fund-
4 ing of activities across agencies.

5 **TITLE II—MEDIUM- AND HEAVY-**
6 **DUTY COMMERCIAL AND**
7 **TRANSIT VEHICLES**

8 **SEC. 201. PROGRAM.**

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

- 17 (1) engine efficiency and combustion research;
18 (2) onboard storage technologies for compressed
19 and liquefied natural gas;
20 (3) development and integration of engine tech-
21 nologies designed for natural gas operation of a vari-
22 ety of vehicle platforms;
23 (4) waste heat recovery and conversion;
24 (5) improved aerodynamics and tire rolling re-
25 sistance;

- 1 (6) energy and space-efficient emissions control
- 2 systems;
- 3 (7) mild hybrid, heavy hybrid, hybrid hydraulic,
- 4 plug-in hybrid, and electric platforms, and energy
- 5 storage technologies;
- 6 (8) drivetrain optimization;
- 7 (9) friction and wear reduction;
- 8 (10) engine idle and parasitic energy loss reduc-
- 9 tion;
- 10 (11) electrification of accessory loads;
- 11 (12) onboard sensing and communications tech-
- 12 nologies;
- 13 (13) advanced lightweighting materials and ve-
- 14 hicle designs;
- 15 (14) increasing load capacity per vehicle;
- 16 (15) thermal management of battery systems;
- 17 (16) recharging infrastructure;
- 18 (17) compressed natural gas infrastructure;
- 19 (18) advanced internal combustion engines;
- 20 (19) complete vehicle and power pack modeling,
- 21 simulation, and testing;
- 22 (20) hydrogen vehicle technologies, including
- 23 fuel cell and hydrogen storage technologies;
- 24 (21) retrofitting advanced technologies onto ex-
- 25 isting truck fleets;

1 (22) advanced boosting systems;
2 (23) engine down speeding; and
3 (24) integration of these and other advanced
4 systems onto a single truck and trailer platform.

5 (b) REPORTING.—At the end of each fiscal year
6 through fiscal year 2020, the Secretary shall submit to
7 Congress an annual report describing activities under-
8 taken in the previous year, active industry participants,
9 efforts to recruit new participants, progress of the pro-
10 gram in meeting goals and timelines, and a strategic plan
11 for funding of activities across agencies.

12 **SEC. 202. CLASS 8 TRUCK AND TRAILER SYSTEMS DEM-**
13 **ONSTRATION.**

14 (a) IN GENERAL.—The Secretary shall conduct a
15 competitive grant program to demonstrate the integration
16 of multiple advanced technologies on Class 8 truck and
17 trailer platforms, including a combination of technologies
18 listed in section 201(a).

19 (b) APPLICANT TEAMS.—Applicant teams may be
20 comprised of truck and trailer manufacturers, engine and
21 component manufacturers, fleet customers, university re-
22 searchers, and other applicants as appropriate for the de-
23 velopment and demonstration of integrated Class 8 truck
24 and trailer systems.

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

2 The Secretary, in coordination with the partners of
3 the interagency research program described in section
4 201(a)—

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

10 (2) shall evaluate heavy vehicle performance
11 using work performance-based metrics other than
12 those based on miles per gallon, including those
13 based on units of volume and weight transported for
14 freight applications, and appropriate metrics based
15 on the work performed by nonroad systems; and

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

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

19 The Secretary shall undertake a pilot program of re-
20 search, development, demonstration, and commercial ap-
21 plications of technologies to improve total machine or sys-
22 tem efficiency for nonroad mobile equipment including ag-
23 ricultural, construction, air, and sea port equipment, and
24 shall seek opportunities to transfer relevant research find-

- 1 ings and technologies between the nonroad and on-high-
- 2 way equipment and vehicle sectors.

