

Calendar No. 186

116TH CONGRESS
1ST SESSION**S. 1085****[Report No. 116–83]**

To support research, development, and other activities to develop innovative vehicle technologies, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 9, 2019

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

SEPTEMBER 10, 2019

Reported by Ms. MURKOWSKI, without amendment

A BILL

To support research, development, and other activities to develop innovative vehicle technologies, and for other purposes.

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

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Vehicle Innovation Act
5 of 2019”.

1 **SEC. 2. DEFINITIONS.**

2 In this Act:

3 (1) DEPARTMENT.—The term “Department”
4 means the Department of Energy.

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

7 **SEC. 3. OBJECTIVES.**

8 The objectives of this Act are—

9 (1) to establish a consistent and consolidated
10 authority for the vehicle technology program at the
11 Department;

12 (2) to develop United States technologies and
13 practices that—

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

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

19 (3) to support domestic research, development,
20 engineering, demonstration, and commercial applica-
21 tion and manufacturing of advanced vehicles, en-
22 gines, and components;

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

1 (5) to develop cost-effective advanced tech-
2 nologies for wide-scale utilization throughout the
3 passenger, commercial, government, and transit ve-
4 hicle sectors;

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

7 (7) shorten technology development and inte-
8 gration cycles in the vehicle industry;

9 (8) to ensure a proper balance and diversity of
10 Federal investment in vehicle technologies; and

11 (9) to strengthen partnerships between Federal
12 and State governmental agencies and the private
13 and academic sectors.

14 **SEC. 4. COORDINATION AND NONDUPLICATION.**

15 The Secretary shall ensure, to the maximum extent
16 practicable, that the activities authorized by this Act do
17 not duplicate those of other programs within the Depart-
18 ment or other relevant research agencies.

19 **SEC. 5. AUTHORIZATION OF APPROPRIATIONS.**

20 There are authorized to be appropriated to the Sec-
21 retary for research, development, engineering, demonstra-
22 tion, and commercial application of vehicles and related
23 technologies in the United States, including activities au-
24 thorized under this Act—

25 (1) for fiscal year 2020, \$313,567,000;

- 1 (2) for fiscal year 2021, \$326,109,000;
2 (3) for fiscal year 2022, \$339,154,000;
3 (4) for fiscal year 2023, \$352,720,000; and
4 (5) for fiscal year 2024, \$366,829,000.

5 **SEC. 6. REPORTING.**

6 (a) **TECHNOLOGIES DEVELOPED.**—Not later than 18
7 months after the date of enactment of this Act and annu-
8 ally thereafter through 2024, the Secretary shall submit
9 to Congress a report regarding the technologies developed
10 as a result of the activities authorized by this Act, with
11 a particular emphasis on whether the technologies were
12 successfully adopted for commercial applications, and if
13 so, whether products relying on those technologies are
14 manufactured in the United States.

15 (b) **ADDITIONAL MATTERS.**—At the end of each fis-
16 cal year through 2024, the Secretary shall submit to the
17 relevant Congressional committees of jurisdiction an an-
18 nual report describing activities undertaken in the pre-
19 vious year under this Act, active industry participants, the
20 status of public-private partnerships, progress of the pro-
21 gram in meeting goals and timelines, and a strategic plan
22 for funding of activities across agencies.

23 **SEC. 7. VEHICLE RESEARCH AND DEVELOPMENT.**

24 (a) **PROGRAM.**—

1 (1) ACTIVITIES.—The Secretary shall conduct a
2 program of basic and applied research, development,
3 engineering, demonstration, and commercial applica-
4 tion activities on materials, technologies, and proc-
5 esses with the potential to substantially reduce or
6 eliminate petroleum use and the emissions of the
7 passenger and commercial vehicles of the United
8 States, including activities in the areas of—

9 (A) electrification of vehicle systems;

10 (B) batteries, ultracapacitors, and other
11 energy storage devices;

12 (C) power electronics;

13 (D) vehicle, component, and subsystem
14 manufacturing technologies and processes;

15 (E) engine efficiency and combustion opti-
16 mization;

17 (F) waste heat recovery;

18 (G) transmission and drivetrains;

19 (H) hydrogen vehicle technologies, includ-
20 ing fuel cells and internal combustion engines,
21 and hydrogen infrastructure, including hydro-
22 gen energy storage to enable renewables and
23 provide hydrogen for fuel and power;

24 (I) natural gas vehicle technologies;

1 (J) aerodynamics, rolling resistance (in-
2 cluding tires and wheel assemblies), and acces-
3 sory power loads of vehicles and associated
4 equipment;

5 (K) vehicle weight reduction, including
6 lightweighting materials and the development of
7 manufacturing processes to fabricate, assemble,
8 and use dissimilar materials;

9 (L) friction and wear reduction;

10 (M) engine and component durability;

11 (N) innovative propulsion systems;

12 (O) advanced boosting systems;

13 (P) hydraulic hybrid technologies;

14 (Q) engine compatibility with and optimi-
15 zation for a variety of transportation fuels in-
16 cluding natural gas and other liquid and gas-
17 eous fuels;

18 (R) predictive engineering, modeling, and
19 simulation of vehicle and transportation sys-
20 tems;

21 (S) refueling and charging infrastructure
22 for alternative fueled and electric or plug-in
23 electric hybrid vehicles, including the unique
24 challenges facing rural areas;

- 1 (T) gaseous fuels storage systems and sys-
- 2 tem integration and optimization;
- 3 (U) sensing, communications, and actu-
- 4 ation technologies for vehicle, electrical grid,
- 5 and infrastructure;
- 6 (V) efficient use, substitution, and recy-
- 7 cling of potentially critical materials in vehicles,
- 8 including rare earth elements and precious met-
- 9 als, at risk of supply disruption;
- 10 (W) aftertreatment technologies;
- 11 (X) thermal management of battery sys-
- 12 tems;
- 13 (Y) retrofitting advanced vehicle tech-
- 14 nologies to existing vehicles;
- 15 (Z) development of common standards,
- 16 specifications, and architectures for both trans-
- 17 portation and stationary battery applications;
- 18 (AA) advanced internal combustion en-
- 19 gines;
- 20 (BB) mild hybrid;
- 21 (CC) engine down speeding;
- 22 (DD) vehicle-to-vehicle, vehicle-to-pedes-
- 23 trian, and vehicle-to-infrastructure technologies;
- 24 and

1 (EE) other research areas as determined
2 by the Secretary.

3 (2) TRANSFORMATIONAL TECHNOLOGY.—The
4 Secretary shall ensure that the Department con-
5 tinues to support research, development, engineer-
6 ing, demonstration, and commercial application ac-
7 tivities and maintains competency in mid- to long-
8 term transformational vehicle technologies with po-
9 tential to achieve reductions in emissions, including
10 activities in the areas of—

11 (A) hydrogen vehicle technologies, includ-
12 ing fuel cells, hydrogen storage, infrastructure,
13 and activities in hydrogen technology validation
14 and safety codes and standards;

15 (B) multiple battery chemistries and novel
16 energy storage devices, including nonchemical
17 batteries and electromechanical storage tech-
18 nologies such as hydraulics, flywheels, and com-
19 pressed air storage;

20 (C) communication and connectivity among
21 vehicles, infrastructure, and the electrical grid;
22 and

23 (D) other innovative technologies research
24 and development, as determined by the Sec-
25 retary.

(3) INDUSTRY PARTICIPATION.—

(A) IN GENERAL.—To the maximum extent practicable, activities under this Act shall be carried out in partnership or collaboration with automotive manufacturers, heavy commercial, vocational, and transit vehicle manufacturers, qualified plug-in electric vehicle manufacturers, compressed natural gas vehicle manufacturers, vehicle and engine equipment and component manufacturers, manufacturing equipment manufacturers, advanced vehicle service providers, fuel producers and energy suppliers, electric utilities, universities, national laboratories, and independent research laboratories.

(B) REQUIREMENTS.—In carrying out this Act, the Secretary shall—

(i) 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 where possible, partner with such firms that conduct sig-

1 nificant and relevant research and develop-
2 ment activities in the United States;

3 (ii) leverage the capabilities and re-
4 sources of, and formalize partnerships
5 with, industry-led stakeholder organiza-
6 tions, nonprofit organizations, industry
7 consortia, and trade associations with ex-
8 pertise in the research and development of,
9 and education and outreach activities in,
10 advanced automotive and commercial vehi-
11 cle technologies;

12 (iii) develop more effective processes
13 for transferring research findings and tech-
14 nologies to industry;

15 (iv) support public-private partner-
16 ships, dedicated to overcoming barriers in
17 commercial application of transformational
18 vehicle technologies, that use such indus-
19 try-led technology development facilities of
20 entities with demonstrated expertise in
21 successfully designing and engineering pre-
22 commercial generations of such trans-
23 formational technology; and

24 (v) promote efforts to ensure that
25 technology research, development, engi-

1 neering, and commercial application activi-
2 ties funded under this Act are carried out
3 in the United States.

4 (4) INTERAGENCY AND INTRAAGENCY COORDI-
5 NATION.—To the maximum extent practicable, the
6 Secretary shall coordinate research, development,
7 demonstration, and commercial application activities
8 among—

9 (A) relevant programs within the Depart-
10 ment, including—

11 (i) the Office of Energy Efficiency
12 and Renewable Energy;

13 (ii) the Office of Science;

14 (iii) the Office of Electricity Delivery
15 and Energy Reliability;

16 (iv) the Office of Fossil Energy;

17 (v) the Advanced Research Projects
18 Agency—Energy; and

19 (vi) other offices as determined by the
20 Secretary; and

21 (B) relevant technology research and devel-
22 opment programs within other Federal agen-
23 cies, as determined by the Secretary.

24 (5) FEDERAL DEMONSTRATION OF TECH-
25 NOLOGIES.—The Secretary shall make information

1 available to procurement programs of Federal agen-
2 cies regarding the potential to demonstrate tech-
3 nologies resulting from activities funded through
4 programs under this Act.

5 (6) INTERGOVERNMENTAL COORDINATION.—

6 The Secretary shall seek opportunities to leverage
7 resources and support initiatives of State and local
8 governments in developing and promoting advanced
9 vehicle technologies, manufacturing, and infrastruc-
10 ture.

11 (7) CRITERIA.—In awarding grants under the

12 program under this subsection, the Secretary shall
13 give priority to those technologies (either individually
14 or as part of a system) that—

15 (A) provide the greatest aggregate fuel

16 savings based on the reasonable projected sales
17 volumes of the technology; and

18 (B) provide the greatest increase in United

19 States employment.

20 (8) SECONDARY USE APPLICATIONS.—

21 (A) IN GENERAL.—The Secretary shall

22 carry out a research, development, and dem-
23 onstration program that—

1 (i) builds on any work carried out
2 under section 915 of the Energy Policy Act
3 of 2005 (42 U.S.C. 16195);

4 (ii) identifies possible uses of a vehicle
5 battery after the useful life of the battery
6 in a vehicle has been exhausted;

7 (iii) conducts long-term testing to
8 verify performance and degradation pre-
9 dictions and lifetime valuations for sec-
10 ondary uses;

11 (iv) evaluates innovative approaches to
12 recycling materials from plug-in electric
13 drive vehicles and the batteries used in
14 plug-in electric drive vehicles;

15 (v)(I) assesses the potential for mar-
16 kets for uses described in clause (ii) to de-
17 velop; and

18 (II) identifies any barriers to the de-
19 velopment of those markets; and

20 (vi) identifies the potential uses of a
21 vehicle battery—

22 (I) with the most promise for
23 market development; and

1 (II) for which market develop-
2 ment would be aided by a demonstra-
3 tion project.

4 (B) REPORT.—Not later than 1 year after
5 the date of enactment of this Act, the Secretary
6 shall submit to the appropriate committees of
7 Congress an initial report on the findings of the
8 program described in subparagraph (A), includ-
9 ing recommendations for stationary energy stor-
10 age and other potential applications for bat-
11 teries used in plug-in electric drive vehicles.

12 (C) SECONDARY USE DEMONSTRATION.—

13 (i) IN GENERAL.—Based on the re-
14 sults of the program described in subpara-
15 graph (A), the Secretary shall develop
16 guidelines for projects that demonstrate
17 the secondary uses and innovative recycling
18 of vehicle batteries.

19 (ii) PUBLICATION OF GUIDELINES.—
20 Not later than 18 months after the date of
21 enactment of this Act, the Secretary
22 shall—

23 (I) publish the guidelines de-
24 scribed in clause (i); and

1 (II) solicit applications for fund-
2 ing for demonstration projects.

3 (iii) PILOT DEMONSTRATION PRO-
4 GRAM.—Not later than 21 months after
5 the date of enactment of this Act, the Sec-
6 retary shall select proposals for grant
7 funding under this subsection, based on an
8 assessment of which proposals are mostly
9 likely to contribute to the development of
10 a secondary market for batteries.

11 (b) MANUFACTURING.—The Secretary shall carry out
12 a research, development, engineering, demonstration, and
13 commercial application program of advanced vehicle man-
14 ufacturing technologies and practices, including innovative
15 processes—

16 (1) to increase the production rate and decrease
17 the cost of advanced battery and fuel cell manufac-
18 turing;

19 (2) to vary the capability of individual manufac-
20 turing facilities to accommodate different battery
21 chemistries and configurations;

22 (3) to reduce waste streams, emissions, and en-
23 ergy intensity of vehicle, engine, advanced battery,
24 and component manufacturing processes;

1 (4) to recycle and remanufacture used batteries
2 and other vehicle components for reuse in vehicles or
3 stationary applications;

4 (5) to develop manufacturing processes to effec-
5 tively fabricate, assemble, and produce cost-effective
6 lightweight materials such as advanced aluminum
7 and other metal alloys, polymeric composites, and
8 carbon fiber for use in vehicles;

9 (6) to produce lightweight high pressure storage
10 systems for gaseous fuels;

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

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

15 (9) to produce permanent magnets for advanced
16 vehicles.

17 **SEC. 8. MEDIUM- AND HEAVY-DUTY COMMERCIAL AND**
18 **TRANSIT VEHICLES PROGRAM.**

19 The Secretary, in partnership with relevant research
20 and development programs in other Federal agencies, and
21 a range of appropriate industry stakeholders, shall carry
22 out a program of cooperative research, development, dem-
23 onstration, and commercial application activities on ad-
24 vanced technologies for medium- to heavy-duty commer-

1 cial, vocational, recreational, and transit vehicles, includ-
2 ing activities in the areas of—

3 (1) engine efficiency and combustion research;

4 (2) onboard storage technologies for compressed
5 and liquefied natural gas;

6 (3) development and integration of engine tech-
7 nologies designed for natural gas operation of a vari-
8 ety of vehicle platforms;

9 (4) waste heat recovery and conversion;

10 (5) improved aerodynamics and tire rolling re-
11 sistance;

12 (6) energy and space-efficient emissions control
13 systems;

14 (7) mild hybrid, heavy hybrid, hybrid hydraulic,
15 plug-in hybrid, and electric platforms, and energy
16 storage technologies;

17 (8) drivetrain optimization;

18 (9) friction and wear reduction;

19 (10) engine idle and parasitic energy loss reduc-
20 tion;

21 (11) electrification of accessory loads;

22 (12) onboard sensing and communications tech-
23 nologies;

24 (13) advanced lightweighting materials and ve-
25 hicle designs;

- 1 (14) increasing load capacity per vehicle;
- 2 (15) thermal management of battery systems;
- 3 (16) recharging infrastructure;
- 4 (17) compressed natural gas infrastructure;
- 5 (18) advanced internal combustion engines;
- 6 (19) complete vehicle and power pack modeling,
- 7 simulation, and testing;
- 8 (20) hydrogen vehicle technologies, including
- 9 fuel cells and internal combustion engines, and hy-
- 10 drogen infrastructure, including hydrogen energy
- 11 storage to enable renewables and provide hydrogen
- 12 for fuel and power;
- 13 (21) retrofitting advanced technologies onto ex-
- 14 isting truck fleets;
- 15 (22) advanced boosting systems;
- 16 (23) engine down speeding; and
- 17 (24) integration of these and other advanced
- 18 systems onto a single truck and trailer platform.

19 **SEC. 9. CLASS 8 TRUCK AND TRAILER SYSTEMS DEM-**
 20 **ONSTRATION.**

21 (a) IN GENERAL.—The Secretary shall conduct a
 22 competitive grant program to demonstrate the integration
 23 of multiple advanced technologies on Class 8 truck and
 24 trailer platforms, including a combination of technologies
 25 listed in section 8.

1 (b) APPLICANT TEAMS.—Applicant teams may be
 2 comprised of truck and trailer manufacturers, engine and
 3 component manufacturers, fleet customers, university re-
 4 searchers, and other applicants as appropriate for the de-
 5 velopment and demonstration of integrated Class 8 truck
 6 and trailer systems.

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

8 The Secretary, in coordination with the partners of
 9 the interagency research program described in section 8—

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

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

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

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

24 The Secretary shall undertake a pilot program of re-
 25 search, development, demonstration, and commercial ap-

1 plications of technologies to improve total machine or sys-
 2 tem efficiency for nonroad mobile equipment including ag-
 3 ricultural, construction, air, and sea port equipment, and
 4 shall seek opportunities to transfer relevant research find-
 5 ings and technologies between the nonroad and on-high-
 6 way equipment and vehicle sectors.

7 **SEC. 12. REPEAL OF EXISTING AUTHORITIES.**

8 (a) IN GENERAL.—Sections 706, 711, 712, and 933
 9 of the Energy Policy Act of 2005 (42 U.S.C. 16051,
 10 16061, 16062, 16233) are repealed.

11 (b) ENERGY EFFICIENCY.—Section 911 of the En-
 12 ergy Policy Act of 2005 (42 U.S.C. 16191) is amended—

13 (1) in subsection (a)—

14 (A) in paragraph (1)(A), by striking “vehi-
 15 cles, buildings,” and inserting “buildings”; and

16 (B) in paragraph (2)—

17 (i) by striking subparagraph (A); and

18 (ii) by redesignating subparagraphs

19 (B) through (E) as subparagraphs (A)

20 through (D), respectively; and

21 (2) in subsection (c)—

22 (A) by striking paragraph (3);

23 (B) by redesignating paragraph (4) as

24 paragraph (3); and

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

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