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2D SESSION

S. 3543

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

IN THE SENATE OF THE UNITED STATES

FEBRUARY 1, 2022

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

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 2022”.

6 **SEC. 2. DEFINITIONS.**

7 In this Act:

8 (1) DEPARTMENT.—The term “Department”
9 means the Department of Energy.

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

3 **SEC. 3. OBJECTIVES.**

4 The objectives of this Act are—

5 (1) to establish a consistent and consolidated
6 authority for the vehicle technology program at the
7 Department;

8 (2) to develop United States technologies and
9 practices that improve the fuel efficiency and emis-
10 sions of all vehicles produced in the United States;

11 (3) to support domestic research, development,
12 engineering, demonstration, and commercial applica-
13 tion and manufacturing of advanced vehicles, en-
14 gines, and components;

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

18 (5) to develop cost-effective advanced tech-
19 nologies for wide-scale utilization throughout the
20 passenger, commercial, government, and transit ve-
21 hicle sectors;

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

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

1 (8) to ensure a proper balance and diversity of
2 Federal investment in vehicle technologies; and
3 (9) to strengthen partnerships between Federal
4 and State governmental agencies and the private
5 and academic sectors.

6 **SEC. 4. COORDINATION AND NONDUPLICATION.**

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

11 **SEC. 5. AUTHORIZATION OF APPROPRIATIONS.**

12 There are authorized to be appropriated to the Sec-
13 retary for research, development, engineering, demonstra-
14 tion, and commercial application of vehicles and related
15 technologies in the United States, including activities au-
16 thorized under this Act—

- 17 (1) for fiscal year 2023, \$313,567,000;
18 (2) for fiscal year 2024, \$326,109,000;
19 (3) for fiscal year 2025, \$339,154,000;
20 (4) for fiscal year 2026, \$352,720,000; and
21 (5) for fiscal year 2027, \$366,829,000.

22 **SEC. 6. REPORTING.**

23 (a) **TECHNOLOGIES DEVELOPED.**—Not later than 18
24 months after the date of enactment of this Act and annu-
25 ally thereafter through 2027, the Secretary shall submit

1 to Congress a report regarding the technologies developed
 2 as a result of the activities authorized by this Act, with
 3 a particular emphasis on whether the technologies were
 4 successfully adopted for commercial applications, and if
 5 so, whether products relying on those technologies are
 6 manufactured in the United States.

7 (b) **ADDITIONAL MATTERS.**—At the end of each fis-
 8 cal year through 2027, the Secretary shall submit to the
 9 relevant Congressional committees of jurisdiction an an-
 10 nual report describing activities undertaken in the pre-
 11 vious year under this Act, active industry participants, the
 12 status of public-private partnerships, progress of the pro-
 13 gram in meeting goals and timelines, and a strategic plan
 14 for funding of activities across agencies.

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

16 (a) **PROGRAM.**—

17 (1) **ACTIVITIES.**—The Secretary shall conduct a
 18 program of basic and applied research, development,
 19 engineering, demonstration, and commercial applica-
 20 tion activities on materials, technologies, and proc-
 21 esses with the potential to substantially reduce pe-
 22 troleum use and the emissions of the passenger and
 23 commercial vehicles of the United States, including
 24 activities in the areas of—

25 (A) electrification of vehicle systems;

- 1 (B) batteries, ultracapacitors, and other
- 2 energy storage devices;
- 3 (C) power electronics;
- 4 (D) vehicle, component, and subsystem
- 5 manufacturing technologies and processes;
- 6 (E) engine efficiency and combustion opti-
- 7 mization;
- 8 (F) waste heat recovery;
- 9 (G) transmission and drivetrains;
- 10 (H) hydrogen vehicle technologies, includ-
- 11 ing fuel cells and internal combustion engines,
- 12 and hydrogen infrastructure, including hydro-
- 13 gen energy storage to enable renewables and
- 14 provide hydrogen for fuel and power;
- 15 (I) natural gas vehicle technologies;
- 16 (J) aerodynamics, rolling resistance (in-
- 17 cluding tires and wheel assemblies), and acces-
- 18 sory power loads of vehicles and associated
- 19 equipment;
- 20 (K) vehicle weight reduction, including
- 21 lightweighting materials and the development of
- 22 manufacturing processes to fabricate, assemble,
- 23 and use dissimilar materials;
- 24 (L) friction and wear reduction;
- 25 (M) engine and component durability;

- 1 (N) innovative propulsion systems;
- 2 (O) advanced boosting systems;
- 3 (P) hydraulic hybrid technologies;
- 4 (Q) engine compatibility with and optimi-
5 zation for a variety of transportation fuels in-
6 cluding natural gas and other liquid and gas-
7 eous fuels;
- 8 (R) predictive engineering, modeling, and
9 simulation of vehicle and transportation sys-
10 tems;
- 11 (S) refueling and charging infrastructure
12 for alternative fueled and electric or plug-in
13 electric hybrid vehicles, including the unique
14 challenges facing rural areas;
- 15 (T) gaseous fuels storage systems and sys-
16 tem integration and optimization;
- 17 (U) sensing, communications, and actu-
18 ation technologies for vehicle, electrical grid,
19 and infrastructure;
- 20 (V) efficient use, substitution, and recy-
21 cling of potentially critical materials in vehicles,
22 including rare earth elements and precious met-
23 als, at risk of supply disruption;
- 24 (W) aftertreatment technologies;

1 (X) thermal management of battery sys-
 2 tems;

3 (Y) retrofitting advanced vehicle tech-
 4 nologies to existing vehicles;

5 (Z) development of common standards,
 6 specifications, and architectures for both trans-
 7 portation and stationary battery applications;

8 (AA) advanced internal combustion en-
 9 gines;

10 (BB) mild hybrid;

11 (CC) engine down speeding;

12 (DD) vehicle-to-vehicle, vehicle-to-pedes-
 13 trian, and vehicle-to-infrastructure technologies;
 14 and

15 (EE) other research areas as determined
 16 by the Secretary.

17 (2) TRANSFORMATIONAL TECHNOLOGY.—The
 18 Secretary shall ensure that the Department con-
 19 tinues to support research, development, engineer-
 20 ing, demonstration, and commercial application ac-
 21 tivities and maintains competency in mid- to long-
 22 term transformational vehicle technologies with po-
 23 tential to achieve reductions in emissions, including
 24 activities in the areas of—

1 (A) hydrogen vehicle technologies, includ-
2 ing fuel cells, hydrogen storage, infrastructure,
3 and activities in hydrogen technology validation
4 and safety codes and standards;

5 (B) multiple battery chemistries and novel
6 energy storage devices, including nonchemical
7 batteries and electromechanical storage tech-
8 nologies such as hydraulics, flywheels, and com-
9 pressed air storage;

10 (C) communication and connectivity among
11 vehicles, infrastructure, and the electrical grid;
12 and

13 (D) other innovative technologies research
14 and development, as determined by the Sec-
15 retary.

16 (3) INDUSTRY PARTICIPATION.—

17 (A) IN GENERAL.—To the maximum ex-
18 tent practicable, activities under this Act shall
19 be carried out in partnership or collaboration
20 with automotive manufacturers, heavy commer-
21 cial, vocational, and transit vehicle manufactur-
22 ers, qualified plug-in electric vehicle manufac-
23 turers, compressed natural gas vehicle manufac-
24 turers, vehicle and engine equipment and com-
25 ponent manufacturers, manufacturing equip-

1 ment manufacturers, advanced vehicle service
2 providers, fuel producers and energy suppliers,
3 electric utilities, universities, national labora-
4 tories, and independent research laboratories.

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

7 (i) determine whether a wide range of
8 companies that manufacture or assemble
9 vehicles or components in the United
10 States are represented in ongoing public-
11 private partnership activities, including
12 firms that have not traditionally partici-
13 pated in federally sponsored research and
14 development activities, and where possible,
15 partner with such firms that conduct sig-
16 nificant and relevant research and develop-
17 ment activities in the United States;

18 (ii) leverage the capabilities and re-
19 sources of, and formalize partnerships
20 with, industry-led stakeholder organiza-
21 tions, nonprofit organizations, industry
22 consortia, and trade associations with ex-
23 pertise in the research and development of,
24 and education and outreach activities in,

1 advanced automotive and commercial vehi-
2 cle technologies;

3 (iii) develop more effective processes
4 for transferring research findings and tech-
5 nologies to industry;

6 (iv) support public-private partner-
7 ships, dedicated to overcoming barriers in
8 commercial application of transformational
9 vehicle technologies, that use such indus-
10 try-led technology development facilities of
11 entities with demonstrated expertise in
12 successfully designing and engineering pre-
13 commercial generations of such trans-
14 formational technology; and

15 (v) promote efforts to ensure that
16 technology research, development, engi-
17 neering, and commercial application activi-
18 ties funded under this Act are carried out
19 in the United States.

20 (4) INTERAGENCY AND INTRAAGENCY COORDI-
21 NATION.—To the maximum extent practicable, the
22 Secretary shall coordinate research, development,
23 demonstration, and commercial application activities
24 among—

1 (A) relevant programs within the Depart-
2 ment, including—

3 (i) the Office of Energy Efficiency
4 and Renewable Energy;

5 (ii) the Office of Science;

6 (iii) the Office of Electricity Delivery
7 and Energy Reliability;

8 (iv) the Office of Fossil Energy;

9 (v) the Advanced Research Projects
10 Agency—Energy; and

11 (vi) other offices as determined by the
12 Secretary; and

13 (B) relevant technology research and devel-
14 opment programs within other Federal agen-
15 cies, as determined by the Secretary.

16 (5) FEDERAL DEMONSTRATION OF TECH-
17 NOLOGIES.—The Secretary shall make information
18 available to procurement programs of Federal agen-
19 cies regarding the potential to demonstrate tech-
20 nologies resulting from activities funded through
21 programs under this Act.

22 (6) INTERGOVERNMENTAL COORDINATION.—
23 The Secretary shall seek opportunities to leverage
24 resources and support initiatives of State and local
25 governments in developing and promoting advanced

1 vehicle technologies, manufacturing, and infrastruc-
2 ture.

3 (7) CRITERIA.—In awarding grants under the
4 program under this subsection, the Secretary shall
5 give priority to those technologies (either individually
6 or as part of a system) that—

7 (A) provide the greatest aggregate fuel
8 savings based on the reasonable projected sales
9 volumes of the technology; and

10 (B) provide the greatest increase in United
11 States employment.

12 (8) SECONDARY USE APPLICATIONS.—

13 (A) IN GENERAL.—The Secretary shall
14 carry out a research, development, and dem-
15 onstration program that—

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

19 (ii) identifies possible uses of a vehicle
20 battery after the useful life of the battery
21 in a vehicle has been exhausted;

22 (iii) conducts long-term testing to
23 verify performance and degradation pre-
24 dictions and lifetime valuations for sec-
25 ondary uses;

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

(v)(I) assesses the potential for markets for uses described in clause (ii) to develop; and

(II) identifies any barriers to the development of those markets; and

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

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

(II) for which market development would be aided by a demonstration project.

(B) REPORT.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to the appropriate committees of Congress an initial report on the findings of the program described in subparagraph (A), including recommendations for stationary energy storage and other potential applications for batteries used in plug-in electric drive vehicles.

(C) SECONDARY USE DEMONSTRATION.—

1 (i) IN GENERAL.—Based on the re-
2 sults of the program described in subpara-
3 graph (A), the Secretary shall develop
4 guidelines for projects that demonstrate
5 the secondary uses and innovative recycling
6 of vehicle batteries.

7 (ii) PUBLICATION OF GUIDELINES.—
8 Not later than 18 months after the date of
9 enactment of this Act, the Secretary
10 shall—

11 (I) publish the guidelines de-
12 scribed in clause (i); and

13 (II) solicit applications for fund-
14 ing for demonstration projects.

15 (iii) PILOT DEMONSTRATION PRO-
16 GRAM.—Not later than 21 months after
17 the date of enactment of this Act, the Sec-
18 retary shall select proposals for grant
19 funding under this subsection, based on an
20 assessment of which proposals are mostly
21 likely to contribute to the development of
22 a secondary market for batteries.

23 (b) MANUFACTURING.—The Secretary shall carry out
24 a research, development, engineering, demonstration, and
25 commercial application program of advanced vehicle man-

1 manufacturing technologies and practices, including innovative
2 processes—

3 (1) to increase the production rate and decrease
4 the cost of advanced battery and fuel cell manufac-
5 turing;

6 (2) to vary the capability of individual manufac-
7 turing facilities to accommodate different battery
8 chemistries and configurations;

9 (3) to reduce waste streams, emissions, and en-
10 ergy intensity of vehicle, engine, advanced battery,
11 and component manufacturing processes;

12 (4) to recycle and remanufacture used batteries
13 and other vehicle components for reuse in vehicles or
14 stationary applications;

15 (5) to develop manufacturing processes to effec-
16 tively fabricate, assemble, and produce cost-effective
17 lightweight materials such as advanced aluminum
18 and other metal alloys, polymeric composites, and
19 carbon fiber for use in vehicles;

20 (6) to produce lightweight high pressure storage
21 systems for gaseous fuels;

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

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

1 (9) to produce permanent magnets for advanced
2 vehicles.

3 **SEC. 8. MEDIUM- AND HEAVY-DUTY COMMERCIAL AND**
4 **TRANSIT VEHICLES PROGRAM.**

5 The Secretary, in partnership with relevant research
6 and development programs in other Federal agencies, and
7 a range of appropriate industry stakeholders, shall carry
8 out a program of cooperative research, development, dem-
9 onstration, and commercial application activities on ad-
10 vanced technologies for medium- to heavy-duty commer-
11 cial, vocational, recreational, and transit vehicles, includ-
12 ing activities in the areas of—

13 (1) engine efficiency and combustion research;

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

16 (3) development and integration of engine tech-
17 nologies designed for natural gas operation of a vari-
18 ety of vehicle platforms;

19 (4) waste heat recovery and conversion;

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

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

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

- 1 (21) retrofitting advanced technologies onto ex-
- 2 isting truck fleets;
- 3 (22) advanced boosting systems;
- 4 (23) engine down speeding; and
- 5 (24) integration of these and other advanced
- 6 systems onto a single truck and trailer platform.

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

9 (a) IN GENERAL.—The Secretary shall conduct a
 10 competitive grant program to demonstrate the integration
 11 of multiple advanced technologies on Class 8 truck and
 12 trailer platforms, including a combination of technologies
 13 listed in section 8.

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

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

21 The Secretary, in coordination with the partners of
 22 the interagency research program described in section 8—
 23 (1) shall develop standard testing procedures
 24 and technologies for evaluating the performance of
 25 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. 11. 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, construction, air, and sea port equipment, and
17 shall seek opportunities to transfer relevant research find-
18 ings and technologies between the nonroad and on-high-
19 way equipment and vehicle sectors.

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

21 (a) IN GENERAL.—Sections 706, 711, 712, and 933
22 of the Energy Policy Act of 2005 (42 U.S.C. 16051,
23 16061, 16062, 16233) are repealed.

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

1 (1) in subsection (a)—

2 (A) in paragraph (1)(A), by striking “vehic-
3 les, buildings,” and inserting “buildings”; and

4 (B) in paragraph (2)—

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

6 (ii) by redesignating subparagraphs
7 (B) through (E) as subparagraphs (A)
8 through (D), respectively; and

9 (2) in subsection (c)—

10 (A) by striking paragraph (3);

11 (B) by redesignating paragraph (4) as
12 paragraph (3); and

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

○