

117TH CONGRESS
1ST SESSION

S. 2659

To require the establishment of an advanced energy technology research initiative and an advanced energy technology and modeling grant program, and for other purposes.

IN THE SENATE OF THE UNITED STATES

AUGUST 5, 2021

Mr. WHITEHOUSE introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

A BILL

To require the establishment of an advanced energy technology research initiative and an advanced energy technology and modeling grant program, 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 “Advanced Energy
5 Technologies and Grid Efficiency Act of 2021”.

6 **SEC. 2. DEFINITIONS.**

7 In this Act:

1 (1) ADVANCED ENERGY TECHNOLOGY.—The
2 term “advanced energy technology” means any en-
3 ergy generation, monitoring or modifying trans-
4 mission loading, or storage technology with zero or
5 minimal greenhouse gas emissions that is con-
6 nected—

7 (A) to the distribution system;

8 (B) to the transmission system; or

9 (C) behind the meter.

10 (2) ADVISORY COMMITTEE.—The term “Advi-
11 sory Committee” means the advisory committee es-
12 tablished under section 3(a)(2)(A).

13 (3) COMMISSION.—The term “Commission”
14 means the Federal Energy Regulatory Commission.

15 (4) ELECTRIC UTILITY.—The term “electric
16 utility” has the meaning given the term in section
17 3 of the Federal Power Act (16 U.S.C. 796).

18 (5) GRID OPERATOR.—The term “grid oper-
19 ator” means—

20 (A) a Transmission Organization, includ-
21 ing—

22 (i) an Independent System Operator;

23 and

24 (ii) a Regional Transmission Organi-
25 zation;

1 (B) a public utility; and

2 (C) an electric utility.

3 (6) INDEPENDENT SYSTEM OPERATOR.—The
4 term “Independent System Operator” has the mean-
5 ing given the term in section 3 of the Federal Power
6 Act (16 U.S.C. 796).

7 (7) INITIATIVE.—The term “Initiative” means
8 the Advanced Energy Technology Research Initiative
9 established under section 3(a)(1).

10 (8) PUBLIC UTILITY.—The term “public util-
11 ity” has the meaning given the term in section
12 201(e) of the Federal Power Act (16 U.S.C. 824(e)).

13 (9) REGIONAL TRANSMISSION ORGANIZATION.—
14 The term “Regional Transmission Organization”
15 has the meaning given the term in section 3 of the
16 Federal Power Act (16 U.S.C. 796).

17 (10) SECRETARY.—The term “Secretary”
18 means the Secretary of Energy.

19 (11) TRANSMISSION ORGANIZATION.—The term
20 “Transmission Organization” has the meaning given
21 the term in section 3 of the Federal Power Act (16
22 U.S.C. 796).

1 **SEC. 3. POWER SYSTEM MODELING REFORM AND UPDATES**
2 **TO GRID SERVICES AND GRID OPERATOR**
3 **SOFTWARE.**

4 (a) **ADVANCED ENERGY TECHNOLOGY RESEARCH**
5 **INITIATIVE.**—

6 (1) **IN GENERAL.**—Not later than 90 days after
7 the date of enactment of this Act, the Commission,
8 in coordination with the Secretary, shall establish
9 within the Office of Energy Policy and Innovation of
10 the Commission an initiative, to be known as the
11 “Advanced Energy Technology Research Initiative”,
12 to research and provide recommendations on how to
13 improve the modeling, operational, and planning
14 practices used for the bulk electric system.

15 (2) **ADVISORY COMMITTEE.**—

16 (A) **IN GENERAL.**—Not later than 180
17 days after the date of enactment of this Act,
18 the Commission, in coordination with the Sec-
19 retary, shall establish an advisory committee to
20 research, report on, and provide recommenda-
21 tions on matters relating to the Initiative, in-
22 cluding—

23 (i) whether the existing modeling (in-
24 cluding power flow modeling) and long-
25 term and short-term planning practices
26 used by grid operators for power systems,

1 including power markets, adequately incor-
2 porate expected integration with respect to
3 advanced energy technologies;

4 (ii) whether the methods used to de-
5 termine future transmission and capacity
6 needs and make reliability-related deter-
7 minations use the right data to adequately
8 forecast and model the integration of ad-
9 vanced energy technology into electric
10 power systems;

11 (iii) whether the modeling and plan-
12 ning practices described in clause (i) and
13 the methods described in clause (ii) need to
14 be updated to better account for the inte-
15 gration of advanced energy technology into
16 electric power systems;

17 (iv) any undue barriers to the adop-
18 tion of advanced energy technology pre-
19 sented by—

20 (I) existing modeling, oper-
21 ational, and planning practices; and

22 (II) State estimation tools for
23 planning and reliability;

24 (v) any need to develop emerging
25 technologies or software for use in improv-

ing modeling, planning, and operations in
 wholesale electricity markets to resolve
 computational or technical barriers to the
 adoption of advanced energy technology,
 including software relating to—

(I) the use of big data, artificial
 intelligence, and probabilistic methods
 to predict, in near-real-time—

(aa) energy generation from
 variable and distributed re-
 sources;

(bb) load profiles; and

(cc) consumption and con-
 gestion; and

(II) the use of artificial intel-
 ligence to improve the responsiveness
 of energy system operations;

(vi) whether existing and future grid
 reliability service definitions and the mod-
 eling techniques, operational processes, and
 planning processes used to procure grid re-
 liability services—

(I) appropriately account for the
 technical and operational characteris-
 tics of advanced energy technologies;

1 (II) allow for the use of those ad-
 2 vanced energy technologies to provide
 3 grid reliability services when cost-ef-
 4 fective to do so; and

5 (III) include appropriate cyberse-
 6 curity safeguards; and

7 (vii) any rulemaking, technical con-
 8 ference, or policy statement that, in the de-
 9 termination of the Advisory Committee,
 10 the Commission should consider.

11 (B) COMPOSITION.—The Advisory Com-
 12 mittee shall consist of—

13 (i) not fewer than 1 representative
 14 from each of—

15 (I) the Commission;

16 (II) the Department of Energy;

17 (III) the Electric Reliability Or-
 18 ganization (as defined in section
 19 215(a) of the Federal Power Act (16
 20 U.S.C. 824o(a)));

21 (IV) an Independent System Op-
 22 erator or a Regional Transmission Or-
 23 ganization;

24 (V) an entity generating electric
 25 power that is not affiliated with a

1 transmission-owning public or non-
2 public utility;

3 (VI) an entity generating electric
4 power that provides power directly to
5 wholesale or retail customers and is
6 not affiliated with a transmission-own-
7 ing public or nonpublic utility;

8 (VII) an environmental organiza-
9 tion with expertise on the bulk electric
10 system; and

11 (VIII) an institution of higher
12 education with expertise on the bulk
13 electric system;

14 (ii) not fewer than 2 designees of the
15 National Association of Regulatory Utility
16 Commissioners;

17 (iii) not fewer than 4 representatives
18 from public utilities or electric utilities, re-
19 gardless of whether the utility is in an area
20 serviced by an Independent System Oper-
21 ator or a Regional Transmission Organiza-
22 tion; and

23 (iv) not fewer than 2 representatives
24 from private and nonprofit associations
25 with expertise in the development, deploy-

1 ment, and use of advanced energy tech-
2 nologies.

3 (C) REPORTS.—Not later than 18 months
4 after the date of enactment of this Act, and
5 every 2 years thereafter for 10 years, the Advi-
6 sory Committee shall submit to the Committee
7 on Energy and Natural Resources of the Senate
8 and the Committee on Energy and Commerce
9 of the House of Representatives a report on the
10 Initiative, including the findings or rec-
11 ommendations of the Advisory Committee with
12 respect to the matters described in clauses (i)
13 through (vii) of subparagraph (A).

14 (b) ADVANCED ENERGY TECHNOLOGY AND GRID
15 SERVICES PROGRAM.—

16 (1) IN GENERAL.—Not later than 180 days
17 after the date of enactment of this Act, the Sec-
18 retary shall establish a competitive financial assist-
19 ance program, to be known as the “Advanced En-
20 ergy Technology and Grid Services Program”, under
21 which the Secretary shall enter into Federal finan-
22 cial assistance agreements with eligible entities de-
23 scribed in paragraph (2) for the purpose of increas-
24 ing the market penetration of advanced energy tech-

nology through advanced research and development
and pilot demonstrations of—

(A) software upgrades, including upgrades
to the software platforms used to operate
wholesale energy markets;

(B) updated power system planning;

(C) new power system (including power
market) modeling platforms;

(D) cybersecurity and physical security up-
grades; and

(E) resilience upgrades.

(2) ELIGIBLE ENTITIES DESCRIBED.—An eligi-
ble entity referred to in paragraph (1) is—

(A) a grid operator;

(B) a State public utility commission;

(C) an energy cooperative;

(D) a municipality;

(E) an electric utility;

(F) a gas utility; or

(G) a State energy office.

(3) ELIGIBLE ACTIVITIES.—The Secretary may
enter into a financial assistance agreement under
this subsection for—

(A) software upgrades by grid operators;

1 (B) new power system (including power
2 market) modeling platforms;

3 (C) enhancements to cybersecurity safe-
4 guards; or

5 (D) updated power system (including
6 power market) planning, updated power system
7 (including power market) modeling, or updated
8 reliability planning and modeling by grid opera-
9 tors.

10 (4) COST SHARING.—In awarding Federal fi-
11 nancial assistance (including grants, loans, and any
12 other form of financial assistance) to fund eligible
13 activities under this subsection, the Secretary shall
14 require cost sharing in accordance with section 988
15 of the Energy Policy Act of 2005 (42 U.S.C.
16 16352).

17 (5) COORDINATION.—In carrying out the Ad-
18 vanced Energy Technology and Grid Services Pro-
19 gram established under this subsection, the Sec-
20 retary, to the maximum extent practicable, shall co-
21 ordinate with existing programs of the Department
22 of Energy that focus on grid modernization efforts.

23 **SEC. 4. ADVANCED ENERGY AND GRID EFFICIENCY STUD-**
24 **IES AND REPORT.**

25 (a) STUDIES.—

1 (1) ADVANCED ENERGY STUDY.—The Sec-
2 retary, in coordination with the Commission, shall
3 carry out a study of the costs and benefits to con-
4 sumers of updating power system planning, mod-
5 eling, and operational practices, including reliability-
6 related planning, and energy market participation
7 rules on advanced energy technologies and resources,
8 including distributed energy technologies and re-
9 sources, such as—

10 (A) energy storage technologies;

11 (B) energy efficiency and transmission effi-
12 ciency technologies;

13 (C) distributed solar and wind energy gen-
14 eration;

15 (D) fuel cells;

16 (E) smart thermostats and smart building
17 technologies;

18 (F) demand response technologies, includ-
19 ing natural gas demand response technologies;

20 (G) advanced metering technologies;

21 (H) electric vehicles and electric vehicle
22 charging infrastructure;

23 (I) any aggregation of the distributed en-
24 ergy technologies and resources described in
25 subparagraph (A) or (C); and

1 (J) any other advanced energy tech-
2 nologies, as determined by the Secretary.

3 (2) GRID EFFICIENCY STUDY.—

4 (A) IN GENERAL.—The Secretary, in co-
5 ordination with the Commission, shall carry out
6 a study of the barriers and opportunities for
7 advanced energy technologies that provide in-
8 creased, more efficient, or more effective deliv-
9 ery over the existing transmission network.

10 (B) REQUIREMENTS.—The study under
11 subparagraph (A) shall include—

12 (i) an examination of—

13 (I) the reliability, resilience, and
14 economic benefits of technologies such
15 as power flow control, topology opti-
16 mization, and dynamic line ratings;

17 (II) the costs, benefits, and chal-
18 lenges associated with deployment of
19 the advanced energy technologies de-
20 scribed in subparagraph (A); and

21 (III) the impact of grid efficiency
22 improvements on wholesale and retail
23 electricity rates; and

24 (ii) an analysis of the benefits of per-
25 formance-based financial and regulatory

1 incentives in the deployment of advanced
2 energy technologies relative to the cost-of-
3 service of those advanced energy tech-
4 nologies, as determined by the Secretary.

5 (b) REPORT.—Not later than 18 months after the
6 date of enactment of this Act, the Secretary shall submit
7 to the Committee on Energy and Natural Resources of
8 the Senate and the Committee on Energy and Commerce
9 of the House of Representatives a report describing the
10 results of the studies under paragraphs (1) and (2) of sub-
11 section (a).

12 **SEC. 5. INTERCONNECTION PROCESSES AND TRANS-**
13 **MISSION UPGRADES.**

14 (a) PRIORITY OF FINANCIAL ASSISTANCE.—

15 (1) IN GENERAL.—The Secretary shall use the
16 existing grant funding provided through relevant
17 funding streams and programs of the Office of Elec-
18 tricity of the Department of Energy—

19 (A) to give priority to transmission and
20 distribution utilities seeking to conduct pilot
21 programs aimed at integrating advanced energy
22 technologies into the bulk electric system; and

23 (B) to focus on escalating demand for ad-
24 vanced energy technology interconnections.

1 (2) REQUIREMENT.—In carrying out paragraph
2 (1), the Secretary shall develop the design of and
3 method for carrying out any funding opportunities
4 identified pursuant to that paragraph.

5 (b) TRANSMISSION PLANNING AND SITING.—

6 (1) INDEPENDENT REPORT.—The Commission
7 shall offer to enter into an agreement with the Na-
8 tional Academy of Sciences to prepare a report on
9 whether—

10 (A) existing regional and interregional
11 transmission planning and siting processes are
12 effectively supporting State resource planning
13 objectives; and

14 (B) Federal regulators have the tools to ef-
15 fectively regulate the planning and siting of
16 interregional transmission lines.

17 (2) REQUIREMENTS.—The report under para-
18 graph (1) shall examine whether—

19 (A) there are deficiencies in transmission
20 planning and siting that affect resource devel-
21 opment for—

22 (i) interregional and regional energy
23 generation;

24 (ii) interconnection queues; and

25 (iii) advanced energy technologies;

1 (B) the Commission has the programmatic
2 and regulatory structure necessary to facilitate
3 continued improvements in transmission plan-
4 ning, including planning with respect to trans-
5 mission—

6 (i) across the boundaries of Inde-
7 pendent System Operators and Regional
8 Transmission Organizations; and

9 (ii) across boundaries that are not as-
10 sociated with Independent System Opera-
11 tors or Regional Transmission Organiza-
12 tions;

13 (C) State resource planning requirements
14 are addressed in existing transmission planning
15 processes;

16 (D) the Commission lacks tools with re-
17 spect to the siting of transmission lines that
18 could help States improve transmission plan-
19 ning to meet State resource planning objectives;
20 and

21 (E) there are barriers to the inclusion and
22 integration in the grid of any technology—

23 (i) to reduce transmission losses;

24 (ii) to improve the efficiency of the
25 transmission and distribution systems;

1 (iii) that is connected to the distribu-
2 tion system and may—

3 (I) increase reliability or resil-
4 ience; and

5 (II) avoid transmission and dis-
6 tribution system costs; and

7 (iv) to better understand the role of
8 Federal regulators in the siting of tech-
9 nologies not directly connected to the grid.

10 (3) DEADLINE.—The report under paragraph
11 (1) shall be submitted to the Commission, the Sec-
12 retary, and the relevant committees of Congress not
13 later than 1 year after the date of enactment of this
14 Act.

15 (c) AUTHORIZATION OF APPROPRIATIONS.—There is
16 authorized to be appropriated to the Secretary to provide
17 grants through relevant programs of the Office of Elec-
18 tricity of the Department of Energy, in accordance with
19 subparagraphs (A) and (B) of subsection (a)(1),
20 \$50,000,000 for each of fiscal years 2022 through 2026.

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