

114TH CONGRESS
1ST SESSION

S. _____

To facilitate modernizing the electric grid, and for other purposes.

IN THE SENATE OF THE UNITED STATES

Ms. CANTWELL (for herself and Ms. HIRONO) introduced the following bill;
which was read twice and referred to the Committee on

A BILL

To facilitate modernizing the electric grid, 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 “Grid Modernization
5 Act of 2015”.

TITLE I—GENERAL PROVISIONS

7 **SEC. 101. STATEMENT OF POLICY ON GRID MODERNIZA-**
8 **TION.**

9 It is the policy of the United States to promote and
10 advance—

1 (1) the modernization of the energy delivery in-
2 frastructure of the United States, including bol-
3 stering the reliability, affordability, diversity, effi-
4 ciency, security, and resilience of domestic energy
5 supplies, through advanced grid technologies;

6 (2) the modernization of the electric grid—

7 (A) to continue facilitating the develop-
8 ment of a Smart Grid as characterized in sec-
9 tion 1301 of the Energy Independence and Se-
10 curity Act of 2007 (42 U.S.C. 17381);

11 (B) to enable a robust multidirectional
12 power flow that leverages distributed energy re-
13 sources; and

14 (C) to facilitate the alignment of business
15 and regulatory models to achieve a grid that op-
16 timizes—

17 (i) the entire electric delivery system;

18 and

19 (ii) a sustainable, reliable, and resil-
20 ient energy future;

21 (3) relevant research and development in ad-
22 vanced grid technologies, including—

23 (A) energy storage;

1 (B) predictive tools and requisite real-time
2 data to enable the dynamic optimization of grid
3 operations;

4 (C) power electronics that ease the chal-
5 lenge of intermittent and distributed genera-
6 tion;

7 (D) real-time data and situational aware-
8 ness tools and systems; and

9 (E) tools to increase data security, physical
10 security, and cybersecurity awareness and pro-
11 tection;

12 (4) the leadership of the United States in basic
13 and applied sciences to develop a systems approach
14 to innovation and invention of cybersecure advanced
15 grid technologies, architectures, and control para-
16 digms capable of managing diverse supplies and
17 loads;

18 (5) the safeguarding of the critical energy deliv-
19 ery infrastructure of the United States and the en-
20 hanced resilience of the infrastructure to all hazards,
21 including—

22 (A) extreme weather events;

23 (B) cyber and physical threats; and

24 (C) other factors that affect energy deliv-
25 ery;

1 (6) the coordination of goals, investments to op-
2 timize the grid, and other measures for energy effi-
3 ciency, advanced grid technologies, interoperability,
4 and demand response resources;

5 (7) partnerships with States and the private
6 sector—

7 (A) to facilitate advanced grid capabilities
8 and strategies; and

9 (B) to provide technical assistance, tools,
10 or other related information necessary to en-
11 hance grid integration, particularly in connec-
12 tion with the development at the State and local
13 levels of strategic energy, energy surety and as-
14 surance, and emergency preparedness, response,
15 and restoration planning;

16 (8) the deployment of information and commu-
17 nications technologies at all levels of the electric sys-
18 tem;

19 (9) opportunities to provide consumers with
20 timely information and advanced control options;

21 (10) sophisticated or advanced control options
22 to integrate distributed energy resources and associ-
23 ated ancillary services;

24 (11) open-source communications, database ar-
25 chitectures, and common information model stand-

1 ards, guidelines, and protocols that enable interoper-
2 ability to maximize efficiency gains and associated
3 benefits among—

4 (A) the grid;

5 (B) energy and building management sys-
6 tems; and

7 (C) residential, commercial, and industrial
8 equipment;

9 (12) private sector investment in the energy de-
10 livery infrastructure of the United States through
11 targeted demonstration and validation of advanced
12 grid technologies; and

13 (13) establishment of common valuation meth-
14 ods and tools for cost-benefit analysis of grid inte-
15 gration paradigms.

16 **SEC. 102. GRID STORAGE PROGRAM.**

17 (a) IN GENERAL.—The Secretary of Energy (acting
18 through the Assistant Secretary of the Office of Electricity
19 Delivery and Energy Reliability) (referred to in this Act
20 as the “Secretary”) shall conduct a program of research
21 and development of electric grid energy storage that ad-
22 dresses the principal challenges identified in the 2013 De-
23 partment of Energy Strategic Plan for Grid Energy Stor-
24 age.

1 (b) AREAS OF FOCUS.—The program under this sec-
2 tion shall focus on—

3 (1) materials and electrochemical systems re-
4 search;

5 (2) power conversion technologies research;

6 (3) other fundamental and applied research
7 critical to widespread deployment of storage;

8 (4) device development that builds on results
9 from research described in paragraphs (1) through
10 (3), including combinations of power electronics, ad-
11 vanced optimizing controls, and energy storage as a
12 general purpose element of the electric grid;

13 (5) grid-scale testing and analysis of storage
14 devices, including test-beds and field trials;

15 (6) cost-benefit analyses that inform capital ex-
16 penditure planning for regulators and owners and
17 operators of components of the electric grid;

18 (7) storage device safety and reliability, includ-
19 ing potential failure modes, mitigation measures,
20 and operational guidelines; and

21 (8) standards for storage device performance,
22 control interface, grid interconnection, and inter-
23 operability.

24 (c) ASSISTANCE TO STATES.—The Secretary may
25 provide technical and financial assistance to States, Indian

1 tribes, or units of local government to participate in or
2 use research, development, or deployment of technology
3 developed under this section.

4 **SEC. 103. ELECTRIC SYSTEM GRID ARCHITECTURE, SCE-**
5 **NARIO DEVELOPMENT, AND MODELING.**

6 (a) GRID ARCHITECTURE AND SCENARIO DEVELOP-
7 MENT.—

8 (1) IN GENERAL.—Subject to paragraph (2),
9 the Secretary shall establish and facilitate a collabo-
10 rative process to develop model grid architecture and
11 a set of future scenarios for the electric system to
12 examine the impacts of different combinations of re-
13 sources (including different quantities of distributed
14 energy resources and large-scale, central generation)
15 on the electric grid.

16 (2) MARKET STRUCTURE.—The grid architec-
17 ture and scenarios developed under paragraph (1)
18 shall account for differences in market structure, in-
19 cluding an examination of the potential for stranded
20 costs in each type of market structure.

21 (3) FINDINGS.—Based on the findings of grid
22 architecture developed under paragraph (1), the Sec-
23 retary shall make recommendations regarding addi-
24 tional standards that may be required, if any, to en-

1 sure the interoperability of grid systems and associ-
2 ated communications networks.

3 (b) MODELING.—Subject to subsection (c), the Sec-
4 retary shall—

5 (1) conduct modeling based on the scenarios de-
6 veloped under subsection (a); and

7 (2) analyze and evaluate the technical and fi-
8 nancial impacts of the models to assist States, utili-
9 ties, and other stakeholders in—

10 (A) enhancing strategic planning efforts;

11 (B) avoiding stranded investments; and

12 (C) maximizing the cost-effectiveness of fu-
13 ture grid-related investments.

14 (c) INPUT.—The Secretary shall develop the sce-
15 narios and conduct the modeling and analysis under sub-
16 sections (a) and (b) with participation or input, as appro-
17 priate, from—

18 (1) the National Laboratories;

19 (2) States;

20 (3) State regulatory authorities;

21 (4) transmission organizations;

22 (5) representatives of the electric industry;

23 (6) academic institutions;

24 (7) independent research institutes; and

25 (8) other entities.

1 **TITLE II—DEMONSTRATION**
2 **PROGRAMS**

3 **SEC. 201. TECHNOLOGY DEMONSTRATION ON THE DIS-**
4 **TRIBUTION SYSTEM.**

5 (a) IN GENERAL.—The Secretary shall conduct 6
6 demonstration projects to expand the application of tech-
7 nologies to improve observability, advanced controls, and
8 prediction of system performance on the distribution sys-
9 tem.

10 (b) PARTICIPATION.—The demonstration projects
11 conducted under subsection (a) shall include the participa-
12 tion of a diverse selection of relevant owners and operators
13 of distribution systems, including—

- 14 (1) a utility;
15 (2) a political subdivision of a State; and
16 (3) an electric cooperative.

17 (c) CYBERSECURITY PLAN.—Each demonstration
18 project conducted under subsection (a) shall include the
19 development of a cybersecurity plan.

20 **SEC. 202. RESILIENT COMMUNITIES PROGRAM.**

21 (a) IN GENERAL.—The Secretary shall establish a
22 program for the development and promotion of grid-scale
23 energy storage with microgrids to enhance the resilience
24 of critical infrastructure.

1 (b) COLLABORATION.—The program established
2 under subsection (a) shall provide for the collaboration of
3 relevant stakeholders in the program, including—

- 4 (1) States;
- 5 (2) Indian tribes;
- 6 (3) regional entities and regulators;
- 7 (4) units of local government;
- 8 (5) institutions of higher education; and
- 9 (6) private sector entities.

10 (c) PHASES.—The program established under sub-
11 section (a) shall be divided into the following phases:

12 (1) Phase I, which shall consist of the develop-
13 ment of a feasibility assessment.

14 (2) Phase II, which shall consist of cost-shared
15 demonstration projects that include the development
16 of physical and cybersecurity plans to take appro-
17 priate measures to protect and secure the electric
18 grid.

19 (3) Phase III, which shall establish a benefits
20 analysis plan to help inform regulators, policy-
21 makers, and industry stakeholders about the value
22 of the resilience investments of Phase II.

1 “(iii) adaptation to climate change-re-
2 lated extreme weather disruptions;

3 “(iv) support provided to inter-
4 dependent critical infrastructures reliant
5 on energy services to operate;

6 “(v) reduced costs under normal oper-
7 ating conditions;

8 “(vi) enhanced distributed generation
9 and microgrid functionality to operate as
10 an integrated energy system in intentional
11 islanding mode;

12 “(vii) localized energy generation that
13 avoids incurrence of transmission and dis-
14 tribution losses;

15 “(viii) system operational flexibility;
16 and

17 “(ix) ancillary environmental benefits,
18 including greenhouse gas reductions.”.

19 (b) COMPLIANCE.—

20 (1) TIME LIMITATIONS.—Section 112(b) of the
21 Public Utility Regulatory Policies Act of 1978 (16
22 U.S.C. 2622(b)) is amended by adding at the end
23 the following:

24 “(7)(A) Not later than 1 year after the date of
25 enactment of this paragraph, each State regulatory

1 authority (with respect to each electric utility for
2 which it has ratemaking authority), and each non-
3 regulated electric utility, shall—

4 “(i) commence the consideration referred
5 to in section 111; or

6 “(ii) set a hearing date for such consider-
7 ation, with respect to the standard established
8 by paragraph (20) of section 111(d).

9 “(B) Not later than 2 years after the date of
10 enactment of this paragraph, each State regulatory
11 authority (with respect to each electric utility for
12 which it has ratemaking authority), and each non-
13 regulated electric utility, shall—

14 “(i) complete the consideration required
15 under subparagraph (A); and

16 “(ii) make the determination referred to in
17 section 111 with respect to the standard estab-
18 lished by paragraph (20) of section 111(d).”.

19 (2) FAILURE TO COMPLY.—Section 112(c) of
20 the Public Utility Regulatory Policies Act of 1978
21 (16 U.S.C. 2622(c)) is amended by adding at the
22 end the following: “In the case of the standard es-
23 tablished by paragraph (20) of section 111(d), the
24 reference contained in this subsection to the date of

1 enactment of this Act shall be deemed to be a ref-
2 erence to the date of enactment of that paragraph.”.

3 **SEC. 302. VOLUNTARY MODEL PATHWAYS.**

4 (a) ESTABLISHMENT OF VOLUNTARY MODEL PATH-
5 WAYS.—

6 (1) FINDING.—Congress finds that a set of vol-
7 untary model pathways for modernizing the electric
8 grid would provide policymakers and regulators with
9 valuable and flexible options to consider in adapting
10 policy or regulatory mechanisms to match the needs
11 of an evolving electric grid.

12 (2) ESTABLISHMENT.—Not later than 90 days
13 after the date of enactment of this Act, the Sec-
14 retary shall initiate the development of voluntary
15 model pathways for modernizing the electric grid
16 through a collaborative, public-private effort that—

17 (A) produces illustrative policy pathways
18 that can be adapted for State and regional ap-
19 plications by regulators and policymakers;

20 (B) facilitates the modernization of the
21 electric grid to achieve the objectives described
22 in paragraph (3);

23 (C) ensures a reliable, resilient, affordable,
24 safe, and secure electric system; and

1 (D) acknowledges and provides for dif-
2 ferent priorities, electric systems, and rate
3 structures across States and regions.

4 (3) OBJECTIVES.—The pathways established
5 under paragraph (2) shall facilitate achievement of
6 the following objectives:

7 (A) Near real-time situational awareness of
8 the electric system.

9 (B) Data visualization.

10 (C) Advanced monitoring and control of
11 the advanced electric grid.

12 (D) Enhanced certainty for private invest-
13 ment in the electric system.

14 (E) Increased innovation.

15 (F) Greater consumer empowerment.

16 (G) Enhanced grid resilience, reliability,
17 and robustness.

18 (H) Improved—

19 (i) integration of distributed energy
20 resources;

21 (ii) interoperability of the electric sys-
22 tem; and

23 (iii) predictive modeling and capacity
24 forecasting.

1 (4) STEERING COMMITTEE.—Not later than 90
2 days after the date of enactment of this Act, the
3 Secretary shall establish a steering committee to fa-
4 cilitate the development of the pathways under para-
5 graph (2), to be composed of members appointed by
6 the Secretary, consisting of persons with appropriate
7 expertise representing a diverse range of interests in
8 the public, private, and academic sectors, including
9 representatives of—

10 (A) the Smart Grid Task Force; and

11 (B) the Smart Grid Advisory Committee.

12 (b) TECHNICAL AND FINANCIAL ASSISTANCE.—

13 (1) IN GENERAL.—The Secretary may provide
14 technical and financial assistance to States, Indian
15 tribes, or units of local government to adopt 1 or
16 more elements of the pathways developed under sub-
17 section (a)(2).

18 (2) DISTRIBUTION OF FINANCIAL ASSIST-
19 ANCE.—Any financial assistance provided to a State
20 under paragraph (1) may be distributed by the State
21 to units of local government in the State for pur-
22 poses of implementing the pathways developed under
23 subsection (a)(2).

1 **SEC. 303. PERFORMANCE METRICS FOR ELECTRICITY IN-**
2 **FRASTRUCTURE PROVIDERS.**

3 (a) IN GENERAL.—Not later than 2 years after the
4 date of enactment of this Act, the Secretary shall—

5 (1) develop baseline, voluntary model perform-
6 ance metrics to facilitate and promote the adoption
7 of best practices and processes for electricity infra-
8 structure providers to design, build, and implement
9 a modernized electric grid and maximize opportuni-
10 ties to enhance progress in grid technologies and ca-
11 pabilities, consumer engagement, and policy;

12 (2) quantify the potential performance improve-
13 ments that could be achieved through deployment of
14 new grid technologies and systems; and

15 (3) distribute through appropriate channels a
16 report describing the findings under paragraph (1).

17 (b) CONSIDERATIONS.—In developing the perform-
18 ance metrics under subsection (a)(1), the Secretary shall
19 consider—

20 (1) standard methodologies for calculating im-
21 provements or deteriorations in the performance
22 metrics, such as reliability, grid efficiency, power
23 quality, consumer satisfaction, sustainability, and fi-
24 nancial incentives;

25 (2) standard methodologies for calculating value
26 to ratepayers, including broad economic and related

1 impacts from improvements to the performance
2 metrics;

3 (3) appropriate ownership and operating roles
4 for electric utilities that would enable improved per-
5 formance through the adoption of emerging, com-
6 mercially available or advanced grid technologies or
7 solutions, including—

8 (A) multicustomer microgrids;

9 (B) distributed energy resources;

10 (C) energy storage;

11 (D) electric vehicles;

12 (E) electric vehicle charging infrastructure;

13 (F) integrated information and commu-
14 nications systems; and

15 (G) advanced demand management sys-
16 tems; and

17 (4) with respect to States, the role of the grid
18 operator in enabling a robust future electric system
19 to ensure that—

20 (A) electric utilities remain financially via-
21 ble;

22 (B) electric utilities make the needed in-
23 vestments that ensure a reliable, secure, and re-
24 siliant grid; and

1 (C) costs incurred to transform to an inte-
2 grated grid are allocated and recovered respon-
3 sibly, efficiently, and equitably.

4 **SEC. 304. DISTRIBUTION PLANNING.**

5 (a) IN GENERAL.—Upon the request of a State or
6 regional organization, the Secretary shall partner with
7 States and regional organizations to facilitate the develop-
8 ment of State and regional distribution plans by—

9 (1) conducting a resource assessment and anal-
10 ysis of future demand and distribution requirements;
11 and

12 (2) developing open source tools for State and
13 regional planning and operations.

14 (b) EXISTING TOOLS.—The tools developed under
15 subsection (a)(2) shall build on existing tools used or de-
16 veloped by the Department of Energy.

17 (c) RISK AND SECURITY ANALYSIS.—The assessment
18 under subsection (a)(1) shall include—

19 (1) the evaluation of the physical and cyberse-
20 curity needs of an advanced distribution manage-
21 ment system and the integration of distributed en-
22 ergy resources; and

23 (2) advanced use of grid architecture to analyze
24 risks in a holistic all-hazards approach that includes

1 communications infrastructure, control systems ar-
2 chitecture, and power systems architecture.

3 (d) TECHNICAL ASSISTANCE.—For the purpose of
4 developing electricity distribution plans, the Secretary
5 shall provide technical assistance to—

6 (1) States;

7 (2) regional reliability entities; and

8 (3) other distribution asset owners and opera-
9 tors.

10 **TITLE IV—AUTHORIZATION OF** 11 **APPROPRIATIONS**

12 **SEC. 401. AUTHORIZATION OF APPROPRIATIONS.**

13 There is authorized to be appropriated to the Sec-
14 retary carry out this Act (including the amendments made
15 by this Act) and other related activities \$200,000,000 for
16 each of fiscal years 2017 through 2021.