ysis, and power flow control. The Secretary shall seek to leverage existing smart grid deployments.''

Subsec. (b)(2)(F). Pub. L. 116–260, § 8001(2)(B), added subpar. (F).

2009—Subsec. (b)(3)(A). Pub. L. 111–5, § 405(1), amended subpar. (A) generally. Prior to amendment, text read as follows: ''In carrying out the initiative, the Secretary shall carry out smart grid demonstration projects in up to 5 electricity control areas, including rural areas and at least 1 area in which the majority of generation and transmission assets are controlled by a tax-exempt entity.''

Subsec. (b)(3)(C). Pub. L. 111–5, § 405(2), amended subpar. (C) generally. Prior to amendment, text read as follows: ''The Secretary shall provide to an electric utility described in subparagraph (B) financial assistance for use in paying an amount equal to not more than 50 percent of the cost of qualifying advanced grid technology investments made by the electric utility to carry out a demonstration project.''

Subsec. (b)(3)(E), (F). Pub. L. 111–5, § 405(3), added subpars. (E) and (F).

Subsec. (c)(2). Pub. L. 111–5, § 405(4), amended par. (2) generally. Prior to amendment, par. (2) read as follows: ''to carry out subsection (b), $100,000,000 for each of fiscal years 2008 through 2012.''

Statutory Notes and Related Subsidiaries

EFFECTIVE DATE

Section effective on the date that is 1 day after Dec. 19, 2007, see section 1601 of Pub. L. 110–140, set out as a note under section 1824 of Title 2, The Congress.

§ 17384a. Smart grid modeling, visualization, architecture, and controls

(a) In general

Not later than 180 days after December 27, 2020, the Secretary shall establish a program of research, development, demonstration, and commercial application on electric grid modeling, sensing, visualization, architecture development, and advanced operation and controls.

(b) Modeling research and development

The Secretary shall support development of models of emerging technologies and systems to facilitate the secure and reliable design, planning, and operation of the electric grid for use by industry stakeholders. In particular, the Secretary shall support development of—

(1) models to analyze and predict the effects of adverse physical and cyber events on the electric grid;

(2) coupled models of electrical, physical, and cyber systems;

(3) models of existing and emerging technologies being deployed on the electric grid due to projected changes in the electric generation mix and loads, for a variety of regional characteristics; and

(4) integrated models of the communications, transmission, distribution, and other interdependent systems for existing, new, and emerging technologies.

(c) Situational awareness research and development

(1) In general

The Secretary shall support development of computational tools and technologies to improve sensing, monitoring, and visualization of the electric grid for real-time situational awareness and decision support tools that enable improved operation of the power system, including utility, non-utility, and customer grid-connected assets, for use by industry partners.

(2) Data use

In developing visualization capabilities under this section, the Secretary shall develop tools for industry stakeholders to use to analyze data collected from advanced measurement and monitoring technologies, including data from phasor measurement units and advanced metering units.

(3) Severe events

The Secretary shall prioritize enhancing cyber and physical situational awareness of the electric grid during adverse manmade and naturally-occurring events.

(d) Operation and controls research and development

The Secretary shall conduct research to develop improvements to the operation and controls of the electric grid, in coordination with industry partners. Such activities shall include—

(1) a training facility or facilities to allow grid operators to gain operational experience with advanced grid control concepts and technologies;

(2) development of cost-effective advanced operation and control concepts and technologies, such as adaptive islanding, dynamic line rating systems, power flow controllers, network topology optimization, smart circuit breakers, intelligent load shedding, and fault-tolerant control system architectures;

(3) development of real-time control concepts using artificial intelligence and machine learning for improved electric grid resilience; and

(4) utilization of advanced data analytics including load forecasting, power flow modeling, equipment failure prediction, resource optimization, risk analysis, and decision analysis.

(e) Interoperability research and development

The Secretary shall conduct research and development on tools and technologies that improve the interoperability and compatibility of new and emerging components, technologies, and systems with existing electric grid infrastructure.

(f) Underground transmission and distribution lines

In carrying out the program under subsection (a), the Secretary shall support research and development on underground transmission and distribution lines. This shall include research on—

(1) methods for lowering the costs of underground transmission and distribution lines, including through novel installation techniques and materials considerations;

(2) techniques to improve the lifespan of underground transmission and distribution lines;

(3) wireless sensors to improve safety of underground transmission and distribution lines and to predict, identify, detect, and transmit information about degradation and faults; and

(4) methods for improving the resilience and reliability of underground transmission and

distribution lines, including technologies and techniques that can mitigate the impact of flooding, storm surge, and seasonal climate cycles on degradation of and damage to underground transmission and distribution lines.

(g) Grid architecture and scenario development

(1) In general

Subject to paragraph (3), the Secretary shall establish and facilitate a collaborative process to develop model grid architecture and a set of future scenarios for the electric grid to examine the impacts of different combinations of resources (including different quantities of distributed energy resources and large-scale, central generation) on the electric grid.

(2) Architecture

In supporting the development of model grid architectures, the Secretary shall—

(A) analyze a variety of grid architecture scenarios that range from minor upgrades to existing transmission grid infrastructure to scenarios that involve the replacement of significant portions of existing transmission grid infrastructure;

(B) analyze the effects of the increasing proliferation of renewable and other zero emissions energy generation sources, increasing use of distributed resources owned by non-utility entities, and the use of digital and automated controls not managed by grid operators;

(C) include a variety of new and emerging distribution grid technologies, including distributed energy resources, electric vehicle charging stations, distribution automation technologies, energy storage, and renewable energy sources;

(D) analyze the effects of local load balancing and other forms of decentralized control;

(E) analyze the effects of changes to grid architectures resulting from modernizing electric grid systems, including communications, controls, markets, consumer choice, emergency response, electrification, and cybersecurity concerns; and

(F) develop integrated grid architectures that incorporate system resilience for cyber, physical, and communications systems.

(3) Market structure

The grid architecture and scenarios developed under paragraph (1) shall, to the extent practicable, account for differences in market structure, including an examination of the potential for stranded costs in each type of market structure.

(h) Computing resources and data coordination research and development

In carrying out this section, the Secretary shall—

(1) leverage existing computing resources at the National Laboratories; and

(2) develop voluntary standards for data taxonomies and communication protocols in coordination with public and private sector stakeholders.

(i) Information sharing

None of the activities authorized in this section shall require private entities to share information or data with the Secretary.

(j) Resilience

In this section, the term ''resilience'' means the ability to withstand and reduce the magnitude or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, or rapidly recover from such an event, including from deliberate attacks, accidents, and naturally occurring threats or incidents.

(Pub. L. 110–140, title XIII, § 1304A, as added Pub. L. 116–260, div. Z, title VIII, § 8002, Dec. 27, 2020, 134 Stat. 2579.)

§ 17385. Smart grid interoperability framework

(a) Interoperability framework

The Director of the National Institute of Standards and Technology shall have primary responsibility to coordinate the development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems. Such protocols and standards shall further align policy, business, and technology approaches in a manner that would enable all electric resources, including demand-side resources, to contribute to an efficient, reliable electricity network. In developing such protocols and standards—

(1) the Director shall seek input and cooperation from the Commission, OEDER and its Smart Grid Task Force, the Smart Grid Advisory Committee, other relevant Federal and State agencies; and

(2) the Director shall also solicit input and cooperation from private entities interested in such protocols and standards, including but not limited to the Gridwise Architecture Council, the International Electrical and Electronics Engineers, the National Electric Reliability Organization recognized by the Federal Energy Regulatory Commission, and National Electrical Manufacturer's Association.

(b) Scope of framework

The framework developed under subsection (a) shall be flexible, uniform and technology neutral, including but not limited to technologies for managing smart grid information, and designed—

(1) to accommodate traditional, centralized generation and transmission resources and consumer distributed resources, including distributed generation, renewable generation, energy storage, energy efficiency, and demand response and enabling devices and systems;

(2) to be flexible to incorporate—

(A) regional and organizational differences; and

(B) technological innovations;

(3) to consider the use of voluntary uniform standards for certain classes of mass-produced electric appliances and equipment for homes and businesses that enable customers, at their election and consistent with applicable State and Federal laws, and are manufactured with the ability to respond to electric grid emergencies and demand response signals by curtailing all, or a portion of, the electrical power consumed by the appliances or equipment in response to an emergency or demand response signal, including through—