118TH CONGRESS
2D SESSION

S. 4144

To improve the reliability and adequacy of the bulk-power system by ensuring that key uncertainties in generation, transmission, energy storage systems, and loads are considered in resource adequacy modeling and integrated resource planning, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 17, 2024

Mr. HEINRICH (for himself, Mr. WYDEN, and Mr. PADILLA) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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A BILL

To improve the reliability and adequacy of the bulk-power system by ensuring that key uncertainties in generation, transmission, energy storage systems, and loads are considered in resource adequacy modeling and integrated resource planning, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Grid Modeling of Dynamic Energy Loads and Resources Act of 2024'' or the ''Grid MODEL Act of 2024''.

SEC. 2. DEFINITIONS.

In this Act:

(1) BULK-POWER SYSTEM.—The term ''bulk-power system'' has the meaning given the term in section 215(a) of the Federal Power Act (16 U.S.C. 824o(a)).

(2) COMMISSION.—The term ''Commission'' means the Federal Energy Regulatory Commission.

(3) EFFECTIVE LOAD CARRYING CAPABILITY; ELCC.—

(A) IN GENERAL.—The term ''effective load carrying capability'' or ''ELCC'' means the ability of a generating resource to produce electricity when the grid needs it, measured as the additional load (or perfect replacement capacity) that the system can supply with a particular generator of interest with no net change in reliability.

(B) CLARIFICATION.—The additional load (or perfect replacement capacity) referred to in subparagraph (A)—

(i) may be measured using LOLE, EUE, or other metrics; and

(ii) may be divided by the nameplate capacity of the generating resource to yield a percentage.

(4) ELECTRIC RELIABILITY ORGANIZATION.—The term ''Electric Reliability Organization'' has the meaning given the term in section 215(a) of the Federal Power Act (16 U.S.C. 824o(a)).

(5) ELECTRIC UTILITY.—The term ''electric utility'' has the meaning given the term in section 3 of the Federal Power Act (16 U.S.C. 796).

(6) EXPECTED UNSERVED ENERGY; EUE.—The term ''expected unserved energy'' or ''EUE'' means the cumulative amount of energy (in megawatt-hours) per year that is not provided to customers due to outages.

(7) INDEPENDENT SYSTEM OPERATOR.—The term ''Independent System Operator'' has the meaning given the term in section 3 of the Federal Power Act (16 U.S.C. 796).

(8) INTEGRATED RESOURCE PLANNING.—The term ''integrated resource planning'' means modeling and evaluating how projected long-term electricity demands (such as electricity demands over periods of 5, 10, 20, or more years) within a service area can be met with a combination of electric generation resources that best achieve desired metrics, such as metrics relating to reliability, resilience, and cost.

(9) LOSS OF LOAD EXPECTATION; LOLE.—

(A) IN GENERAL.—The term ''loss of load expectation'' or ''LOLE'' means the expected number of days per year that the available generation capacity is less than the system load for the applicable power grid region or service area.

(B) CLARIFICATION.—As of November 2023, a commonly acceptable value for loss of load expectation is 0.1 days per year, as described in the standard of the North American Electric Reliability Corporation entitled ''Planning Resource Adequacy Analysis, Assessment and Documentation'' and numbered BAL–502–RF–03.

(10) PLANNING RESERVE MARGIN.—

(A) IN GENERAL.—The term ''planning reserve margin'' means the quotient, expressed as a percentage, obtained by dividing—

(i) the difference between—

(I) deliverable electric system supply capacity for a power grid region or service area; and

(II) net demand in that power grid region or service area; by

(ii) net demand in that power grid region or service area.

(B) CLARIFICATION.—As of November 2023, a reserve margin falling within the range from 15 percent to 25 percent is typical for a power grid region or service area.

(11) POWER GRID.—The term ''power grid'' means that portion of an Interconnection (as defined in section 215(a) of the Federal Power Act (16 U.S.C. 824o(a))) that is located within the United States, including the relevant portion of each of the following:

(A) The Eastern Interconnection.

(B) The Western Interconnection.

(C) The Texas Interconnection.

(12) POWER GRID REGION.—The term ''power grid region'' means a geographic area—

(A) located within a power grid; and

(B) for which a regional entity (as defined in subsection (a) of section 215 of the Federal Power Act (16 U.S.C. 824o)) has enforcement authority under that section.

(13) PROBABILISTIC MODELING.—

(A) IN GENERAL.—The term ''probabilistic modeling'' means a modeling approach that

uses statistics to simulate and quantify the likelihood of achieving desired metrics, taking into consideration all modeled uncertainties, for determination of the optimal resource portfolio, such as a modeling approach consistent with the document of the North American Electric Reliability Corporation entitled ''Probabilistic Assessment Technical Guideline Document'' and dated August 2016, including the recommendations described in that document.

(B) INCLUSION.—The term ''probabilistic modeling'' includes modeling that can identify the most important parameters that impact a simulated metric for further characterization or optimization.

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

(15) RELIABILITY STANDARD.—The term ''reliability standard'' has the meaning given the term in section 215(a) of the Federal Power Act (16 U.S.C. 824o(a)).

(16) RESOURCE ADEQUACY.—The term ''resource adequacy'' means the adequate supply and

provision of electricity from various electric generation resources to meet projected electricity demands in a particular power grid region or service area.

(17) SERVICE AREA.—The term ''service area'' means the area or region served by—

(A) an electric utility;

(B) a Regional Transmission Organization; or

(C) an Independent System Operator.

(18) STATE REGULATORY AUTHORITY.—The term ''State regulatory authority'' has the meaning given the term in section 3 of the Federal Power Act (16 U.S.C. 796).

SEC. 3. PROBABILISTIC MODELING FOR BULK-POWER SYSTEM RESOURCE ADEQUACY MODELING AND INTEGRATED RESOURCE PLANNING.

(a) IN GENERAL.—The Commission, pursuant to section 215(d) of the Federal Power Act (16 U.S.C. 824o(d)), shall—

(1) as soon as practicable after the date of enactment of this Act, order the Electric Reliability Organization to submit to the Commission, not later than 18 months after the date of that order, or as soon as practicable thereafter, 1 or more proposed reliability standards or modifications to reliability

standards to require, and ensure consistent methods (based on best-practices) for, the use of probabilistic modeling that includes consideration of key uncertainties in generation, transmission, energy storage systems, and loads for resource adequacy modeling and integrated resource planning relating to the bulk-power system, reflecting the specific needs, resources, and attributes of a given power grid region or service area; and

(2) as soon as practicable after the submission of a proposed reliability standard or modification of a reliability standard under paragraph (1), approve the proposed reliability standard or modification in accordance with that section, if appropriate.

(b) REQUIREMENTS.—

(1) GENERATION.—With respect to generation, the reliability standards approved under subsection (a) shall require that probabilistic modeling for resource adequacy modeling and integrated resource planning shall include, to the maximum extent practicable, consideration of uncertainties relating to, as applicable for a given power grid region or service area—

(A) the impact of distributed generation resources;

(B) degradation from aging (such as soiling and degradation of photovoltaic modules and batteries);

(C) planned and unplanned outages;

(D) the impact of weather (such as solar irradiance, wind, precipitation, snowpack, and extreme temperatures) on conventional and distributed generation resources;

(E) correlated outages (such as correlated outages due to winter storms, extreme heat, wildfires, and other extreme weather events);

(F) costs of generation resources, including costs of acquired energy efficiency as a resource; and

(G) other relevant generation uncertainties, as determined by the relevant electric utility, Regional Transmission Organization, Independent System Operator, or State regulatory authority.

(2) TRANSMISSION.—With respect to transmission, the reliability standards approved under subsection (a) shall require that probabilistic modeling for resource adequacy modeling and integrated resource planning shall include, to the maximum extent practicable, consideration of uncertainties relat-

ing to, as applicable for a given power grid region or service area—

(A) the impact of weather (such as the impact of temperature on transmission facilities, including line ratings);

(B) congestion and thermal overload;

(C) costs of new or modified transmission infrastructure; and

(D) other relevant transmission uncertainties, as determined by the relevant electric utility, Regional Transmission Organization, Independent System Operator, or State regulatory authority.

(3) ENERGY STORAGE.—With respect to energy storage, the reliability standards approved under subsection (a) shall require that probabilistic modeling for resource adequacy modeling and integrated resource planning shall include, to the maximum extent practicable, consideration of uncertainties relating to, as applicable for a given power grid region or service area—

(A) round-trip efficiency;

(B) battery capacity fade;

(C) the impact of weather (such as the impact of drought on pumped hydrologic storage);

(D) the impact of distributed energy storage;

(E) costs of energy storage; and

(F) other relevant energy storage uncertainties, as determined by the relevant electric utility, Regional Transmission Organization, Independent System Operator, or State regulatory authority.

(4) LOADS.—With respect to loads, the reliability standards approved under subsection (a) shall require that probabilistic modeling for resource adequacy modeling and integrated resource planning shall include, to the maximum extent practicable, consideration of uncertainties relating to, as applicable for a given power grid region or service area—

(A) the impact of temperature and weather, including extreme weather events, on loads;

(B) the timing and changing mix of loads, including—

(i) increased electrification of transportation, including bidirectional charging and discharging of batteries used in electric vehicles;

(ii) increased electrification of home appliances, such as hot-water heaters and ovens, and space heating and cooling; and

(iii) increased electrification of industrial processes; and

(C) other relevant electric-load uncertainties, as determined by the relevant electric utility, Regional Transmission Organization, Independent System Operator, or State regulatory authority.

(c) USE OF MODELING.—The reliability standards approved under subsection (a) shall require probabilistic modeling to be used, at a minimum—

(1) to simulate and quantify desired metrics (such as loss of load expectation, expected unserved energy, effective load carrying capability (also known as ''capacity value''), planning reserve margin, and cost), taking into consideration the relevant uncertainties described in subsection (b), to assist in the determination of the optimal resource portfolio for the applicable power grid region or service area; and

(2) to identify the parameters and processes considered under subsection (b) that—

(A) are the most important, in that they have the most impact on the magnitude or un-

certainty of the applicable simulated metrics; and

(B) can be further characterized or optimized to improve the modeling and determination of the optimal resource portfolio for the applicable power grid region or service area.

(d) EXISTING APPROACHES; STATE REQUIREMENTS.—

(1) IN GENERAL.—The reliability standards approved under subsection (a)—

(A) shall take into consideration, and shall allow for the continued use of, any probabilistic modeling in use by an electric utility, a Regional Transmission Organization, or an Independent System Operator as of the date of enactment of this Act; and

(B) shall not preempt, or exempt any electric utility, Regional Transmission Organization, or Independent System Operator from compliance with, any probabilistic modeling requirement under State law.

(2) REQUIREMENTS.—To the maximum extent practicable, the reliability standards approved under subsection (a) shall allow for compliance with those reliability standards to be achieved—

(A) in a manner consistent with—

(i) the probabilistic modeling described in subparagraph (A) of paragraph (1); and

(ii) any requirements described in subparagraph (B) of that paragraph; and

(B) by demonstrating—

(i) the use of probabilistic modeling in accordance with subparagraph (A) or (B) of that paragraph; and

(ii) that the probabilistic modeling adequately reflects, or has been modified or used in a manner to adequately reflect, the requirements described in subsections (b) and (c).

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