

Foundation for Resilient Societies
52 Technology Way
Nashua NH 03060

Thursday, April 23, 2015

To the Members of the Colorado State Legislature:

The Foundation for Resilient Societies is a non-profit research and education organization that seeks to strengthen the resilience of critical infrastructures in 21st century societies.

We commend the State of Colorado for considering legislative initiatives to improve the reliability, safety, and resiliency of the Colorado electric grid. In Colorado, as elsewhere, all the other critical infrastructures depend upon reliable electricity; and the electric grid depends upon a system of appropriate regulation at the federal and state level.

As a 501(c)(3) non-profit, Resilient Societies does not endorse any specific legislation. Nonetheless, we routinely participate in reliability standard-setting proceedings at the federal level relating to: mitigation of solar storms; protection against man-made electromagnetic pulse (EMP) hazards; protection of communication networks and industrial control systems against cybersecurity threats; and physical security protection of critical infrastructure.

Should the State of Colorado anticipate that federal reliability standards will suffice to protect critical infrastructure in Colorado? We attach a letter dated April 20, 2015 from Resilient Societies to the Energy and Natural Resources Committee of the U.S. Senate that explains our concerns with the inadequacy of reliability standard-setting at the federal level. If the State of Colorado determines to proceed with state initiatives within a system of federalism, legislators should take notice of the “savings provisions” of the Energy Policy Act of 2005 which preserve state rights to ensure the *safety, adequacy, and reliability of electric service* within any state.

The “savings provisions” of the Federal Power Act are found at Title 16 U.S.C. §824o(i)(3):

“(3) Nothing in this section shall be construed to preempt any authority of any State to take action to ensure the safety, adequacy, and reliability of electric service within that State, as long as such action is not inconsistent with any reliability standard, except that the State of New York may establish rules that result in greater reliability within that State, as long as such action does not result in lesser reliability outside the State than that provided by the reliability standards.”

Colorado needs to consider assessing and protecting not only the critical facilities of public utilities in the state but also independent power producer facilities as well. The independent power producers have increased their net generation from 21 percent (2013) to 24 percent (2014) of Colorado's total annual net electric generation. These non-utility generators can also contribute to grid restoration in the event of prolonged blackout. So any state assessment should consider all components of electric generation and transmission, not just the regulated utilities.

Colorado's high dependency upon coal-fired electric generation, combined with rapid retirement or conversion to natural gas as a fuel source, increases risk of long-term blackout. What are the consequences of increasing dependence upon just-in-time delivery of natural gas or intermittent renewables? Will there be sufficient residual baseload power to perform essential "black start" restoration for Colorado residents, businesses, and key military facilities in Colorado upon which the nation depends? What can be done to protect against gas-electric interdependencies, including use of electric compressor pumps for gas pipelines? What are cost-effective investments to mitigate severe solar storms or man-made EMP hazards? These are key questions that the State Legislature should address.

Our group stands ready to provide our research and previous docket filings to state and federal regulators as the State of Colorado develops initiatives to improve the resilience of its critical infrastructures.

Sincerely,



William R. (Bill) Harris
Secretary, and



Thomas S. Popik
Chairman, for the
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Attachment:

Letter, Thomas Popik to the U.S. Senate Committee on Energy and Natural Resources, April 20, 2015, 6 pp.

Foundation for Resilient Societies
52 Technology Way
Nashua NH 03060

April 20, 2015

The Honorable Lisa Murkowski, Chairman
The Honorable Maria Cantwell, Ranking Member
Senate Energy and Natural Resources Committee
304 Dirksen Office Building
Washington DC 20510

Subject: Reform of Regulation for Electric Grid Reliability

Dear Chairman Murkowski and Ranking Member Cantwell:

We urge the Senate Energy Committee to consider steps to reform the system for regulation of electric grid reliability. The current Section 215 system¹ is badly broken and serves the interests of electric utilities, but not the public. Setup of a new agency dedicated solely to electric grid reliability would substantially improve government focus and ensure regulatory authority necessary to prevent long-term outages.

Who We Are

Our non-profit group, the Foundation for Resilient Societies, has the mission of scientific study and education on critical infrastructures such as the electric grid. We have spent extensive time participating in the regulatory system for electric grid reliability. Resilient Societies is a frequent commenter on Federal Energy Regulatory Commission (FERC) dockets for electric reliability; our work is well-known to FERC staff and Commissioners. Our docket filings are available on our website: www.resilientsocieties.org.

Growing Public Recognition of Electric Grid Vulnerabilities

While the United States has not yet experienced a long-term, wide-area outage covering all or most of a large regional Interconnection, the public is growing increasingly aware of threats to the electric grid, including physical attack, cyber-attack, solar storms, and electromagnetic pulse.

On April 7, 2015 Washington D.C. experienced an outage caused by a falling bulk transmission line dozens of miles away in the suburbs of Maryland. Two reactors at the Calvert Cliffs nuclear plant tripped off and a critical backup diesel generator at that plant malfunctioned. This outage was inconvenient and embarrassing, but not a disaster. Nonetheless, it demonstrated that the electric grid around our nation's capital and elsewhere remains vulnerable to cascading outages, despite federal efforts to establish a system of mandatory reliability standards since the 2003

¹ Section 215 of the Federal Power Act, 16 U.S.C. §824o.

Northeast Blackout. Additionally, the incident showed that poor grid reliability presents safety issues for nuclear reactors.

On March 25, 2015 USA Today ran a front-page feature article titled, "[Bracing for a big power grid attack: 'One is too many'](#)" that included reporting from local Gannett Company affiliates on dozens of power grid attacks over the past several years. Gannett has the largest daily circulation of any print newspaper publisher. (Resilient Societies was quoted as an authoritative source in the USA Today article.)

In October 2014, Pew Research conducted a survey of Internet experts with the question, "By 2025, will a major cyber-attack have caused widespread harm to a nation's security and capacity to defend itself and its people?" Sixty-four percent of expert respondents answered, "Yes."

On November 20, 2014 Admiral Mike Rogers, Director of the National Security Agency, testified before House Permanent Select Committee on Intelligence. Admiral Rogers said that China and other countries could shut down the U.S. electric grid by cyber-attack and that this threat was "not theoretical." He continued, "It is only a matter of the when, not the if, that we are going to see something dramatic."

As far back as 2004, the Congressional Electromagnetic Pulse Commission concluded that electromagnetic pulse (EMP) could take down the U.S. electric grid, with catastrophic consequences. No action has been taken by Congress on this commission's recommendations:

EMP is one of a small number of threats that can hold our society at risk of catastrophic consequences. EMP will cover the wide geographic region within line of sight to the nuclear weapon. It has the capability to produce significant damage to critical infrastructures and thus to the very fabric of US society, as well as to the ability of the United States and Western nations to project influence and military power.

Seeing persistent government inaction over many years, some members of the public have lost faith in reliability of the commercial electric grid and are storing large quantities of food and water to prepare for a long-term grid outage. We estimate that the number of these so-called "preppers" has grown to become at least 1% of the U.S. population. More affluent citizens also increasingly invest in backup generators; but these have uncertain reliability and limited fuel supplies.

In a long-term outage, low-income populations will be the first to lack basic necessities for life. We urge your committee to remedy this lack of basic societal resilience by promptly considering reforms to improve grid reliability and security.

Dysfunction of Current FERC/NERC Regulatory System

The North American Electric Reliability Corporation (NERC), the designated Electric Reliability Organization (ERO) under Section 215 of the Federal Power Act, is an organization dominated and effectively controlled by electric utility interests. Seventy percent of NERC members are electric utilities. NERC members regularly vote to place representatives from large investor-owned utilities in key committee positions. While the NERC Board of Trustees is nominally independent, their election is also controlled by NERC members. With this membership and governance structure it should be no surprise that NERC acts to further the goals of for-profit electric utilities.

From our perspective as an advocate for the public, NERC persistently conducts its business to limit financial liability of utilities for cascading outages or long-term regional blackouts. In practice, this leads NERC to delay proposing reliability standards, or to propose weak reliability standards that will protect its utility members but not protect the public interest.

How does NERC bury a standards project that has become inconvenient? Twenty-three days after a sophisticated assault on 17 transformers at the Metcalf, California substation in April 2013, a key NERC committee recommended to eliminate the physical security standard in development, with the rationale “No longer needed: EOP-004-2 addressed FERC’s directives for sabotage and reporting of physical threats, while CIP version 5 addressed cyber security.” The NERC Standards Committee then unanimously ratified this action 50 days after the Metcalf attack by vote on June 5, 2013. The NERC Board of Trustees, also unanimously, ratified the cancellation of the physical security project in October 2013. But for press accounts in year 2014 and a FERC mandate for NERC to develop within 90 days a reliability directive in March 2014, there would be no physical security standard at all.

What recourse does the public have when NERC approves a defective “reliability standard,” such as the standard for protection against solar storms that is currently under consideration at FERC and NERC? Under Section 215 of the Federal Power Act, FERC has no authority to correct defects or substitute a better standard. FERC can accept the inadequate standard. FERC can reject the inadequate standard. Or FERC can remand the inadequate standard to NERC for revisions. When FERC remands a standard, delays for revisions at NERC can take years.

NERC makes no bones about its desire to block legislative improvement to the standard-setting system it now controls. For example, NERC CEO Gerry Cauley testified during the May 5, 2011 hearing of your committee:

FERC has the authority now under FPA Sec. 215(d)(5) to direct NERC to prepare a proposed standard to address a specific vulnerability or other matter, and to do so by a certain date. Thus, it is not clear to NERC that the vulnerability section (proposed new FPA Section 224(b) is needed.

During the May 31, 2011 hearing of the House Energy and Commerce Committee, “Protecting the Electric Grid: The Grid Reliability and Infrastructure Defense Act,” Mr. Cauley testified:

Additional authority to address grid security vulnerabilities is not necessary. FERC already has authority under FPA Sec. 215(d)(5) to direct NERC to prepare a standard to address a specific vulnerability. Proposed new FPA Section 215A(c) is not needed.

NERC operations are funded by fees imposed on electric utilities, which are in turn funded by ratepayers. Via Section 215 of the Federal Power Act the Congress has created the ironic situation of American ratepayers being forced to pay for lobbying against laws which could improve electric grid reliability and better protect the public.

Subversion of the Specific Intent of Congress on Grid Cybersecurity

NERC has set five sequential sets of cyber-protection standards over the past seven years. The Energy Policy Act of 2005 specifically requires protection of utility “communication networks” against “cybersecurity incidents.” Although none of the NERC cybersecurity standards cover this requirement, FERC has approved the NERC standards as “in the public interest.”

Increasingly, engineers at electric utilities have decided to use the public internet as a cheap means of sending control signals to equipment dispersed over large geographic areas. Because the public internet will never be completely secure, using it to transmit operational data and instructions to industrial control systems is fraught with peril. Adversaries that may include sophisticated foreign governments can shut down transmission lines, turn off generation facilities, cause permanent damage to critical grid equipment, or disconnect large customers. This remains a profoundly dangerous practice. Nonetheless, utilities have opted to improve their bottom lines by using the internet instead of more expensive dedicated telecommunication lines.

Unfortunately, existing NERC cybersecurity standards for the electric grid do not adequately protect our electric grid and the critical infrastructures that depend upon that grid. And FERC has looked the other way, despite specific Congressional mandates in the 2005 law to protect “communication networks” and grant of FERC authority to compel NERC initiation of a cybersecurity reliability standard or to require revisions to reliability standards.²

² See 16 U.S.C. §824o(a)(2) and (a)(3), defining cybersecurity and communication networks; and §824o(d)(5), providing FERC the authority, *sua sponte*, to require initiation of or revision of a reliability standard.

Liability Protection for Electric Utilities through FERC/NERC Standard-Setting

As a balloting participant in NERC standard-setting, we have directly observed how NERC turns the process on its head, providing liability protection for electric utilities while providing little protection for the North American public. Characteristics of the NERC standard-setting process include:

1. **Minimization of entities subject to mandatory standards.** For example, the current physical security exempts Reliability Coordinators, the highest-level operators of grid control rooms. As another example, generator operators, who have the greatest ability to detect and quickly minimize harm from electric currents during solar storms, are exempted from mandatory participation in the NERC standard for solar storm “operating procedures.”
2. **Self-directed plans by utilities as a substitute for specific requirements and measures.** As an example, no specific measures are required in the NERC standard for physical security, only self-directed security plans. Force-on-force exercises have been beneficial to strengthen security practices at nuclear power plants with oversight by the Nuclear Regulatory Commission (NRC), but FERC requires no force-on-force exercises for the equally important electric grid facilities that remain vulnerable to sabotage or terrorist attack. As another example, under the NERC-approved standard for operating procedures during solar storms there are no specific requirements for mitigative procedures during storms, only self-directed plans and studies.
3. **Exemption of large portions of the Bulk Electric System.** For example, the approved standards on vegetation management and transmission relay loadability can exempt transmission lines operating between 100 kV and 200 kV, despite the inclusion of these lines in the FERC-approved definition of the Bulk Electric System.
4. **Cancellation of projects where the standard-setting process might result in real requirements upon utilities or cause public scrutiny.** We again give the example of the NERC Standards Committee cancelling in June 2013 the standards project for physical protection of critical grid facilities, including transmission substations. At the same June 2013 meeting, the Standards Committee voted to cancel a standards project for monitoring of critical equipment, including monitoring transformers for overheating, despite the important role of equipment monitoring in mitigating the Metcalf attack.
5. **Rubber-stamping of standards by the NERC Board of Trustees.**

In support of its defectively drafted standards, from time to time NERC releases pseudo-scientific studies and white papers. Characteristics of NERC studies and white papers include non-collection of real-world data and omission of bulk power system operating data inconsistent with the NERC policy position.

In summary, delaying and watering-down of standards are integral elements of the NERC standard-setting process. Legal liability of utilities is minimized and risks are transferred to the public.

Recommended Reform Action: Electric Reliability Commission

We propose that Congress establish a new independent commission modeled after the Nuclear Regulatory Commission (NRC) with the sole mission of ensuring electric grid reliability. The commission could have five or more Presidentially-appointed and Senate-confirmed commissioners. Some proportion of the commissioners should have science or engineering backgrounds, unlike the present FERC appointees who have legal or political backgrounds and therefore lack technical expertise to evaluate and challenge industry positions.

The new “Electric Reliability Commission” should have authority to propose, implement, and enforce regulations for the reliability and security of the interstate bulk power system. The electric utility industry could, along with all others, have input to grid reliability standards under the Administrative Procedures Act, but no monopoly rights on standard development should be provided. Nor should the Electric Reliability Commission be compelled to provide “due weight” to the alleged “technical expertise” of NERC, or any alternative Electric Reliability Organization, as compared to other sources of relevant expertise.³ This Electric Reliability Commission should operate in parallel with the NRC.

Should your committee staff have questions about our reform proposal or require additional information, please do not hesitate to contact me by email at thomasp@resilientsocieties.org or at our toll-free number 855-Outage-0 (855-688-2430).

Sincerely,



Thomas S. Popik
Chairman
Foundation for Resilient Societies

cc: Members of the Senate Energy and Natural Resources Committee

³ The Energy Policy Act of 2005, 16 U.S.C. §824o(d)(2), after industry lobbying, presently mandates that FERC “shall give due weight” to the technical expertise of the designated Electric Reliability Organization.