

## FOR IMMEDIATE RELEASE

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### **\$1.4 BILLION TRANSMISSION UPGRADE DOES NOT PROTECT AGAINST SOLAR STORMS**

#### **BILL IN STATE LEGISLATURE WOULD REQUIRE FIX TO MAINE POWER RELIABILITY PROGRAM**

AUGUSTA ME—The \$1.4 Billion Maine Power Reliability Program (MPRP), a high voltage transmission line upgrade, would leave the citizens of Maine exposed to long-term electric grid blackout from solar storms, according to the nation's foremost expert on the effects of sunspot eruptions on power grids. A bill pending in the Maine State Legislature, "LD 131—An Act to Secure the Safety of Electrical Power Transmission Lines," sponsored by Representative Andrea Boland of Sanford, would require all new high voltage transmission lines to have protection against naturally occurring solar activity. Electric utilities could install equipment to protect the high voltage Maine power grid for an estimated cost of just \$4.2 million—a small fraction of the MPRP costs—according to the Foundation for Resilient Societies, a New Hampshire non-profit group that conducts scientific research and education on critical infrastructure protection.

When sunspots erupt, they send masses of charged particles toward the earth. These particles interact with the earth's magnetic field, inducing harmful currents in high voltage transmission lines. In March 1989, a relatively small solar storm plunged the Province of Quebec into a widespread grid blackout. According to multiple U.S. Government reports, a five to ten-times larger solar storm—a historical example being the Carrington Event of 1859—could cause a years-long blackout for the State of Maine and much of the eastern United States.

With the solar activity peaking in 2013, and expected to continue at high levels for several years, Representative Boland's bill is timely. Maine is particularly at risk for solar storm blackout due to its high latitude and granite bedrock that conducts electricity deep into the earth.

Recent research by the Foundation for Resilient Societies concluded that the State of Maine and the New England region have narrowly missed blackouts due to solar storms on several prior occasions. During the March 1989 solar storm, New England utilities reported over 30 system impacts, including a severe voltage drop at the Maine Yankee nuclear plant. Within one day of the April 28, 1991 solar storm, a [main transformer at the Maine Yankee plant exploded](#), causing an oil and hydrogen fire that burned for 12 hours. The high voltage direct current line that imports large amounts of power into New England from Quebec tripped off during a solar storm in the 1990s. A critical piece of equipment in the Chester, Maine substation tripped off also during a solar storm in the 1990's. During the October 29, 2003 solar storm, this same Chester substation reported, "Alarms locked with chattering." More recently, a small solar

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storm and generator problems caused the Seabrook nuclear power plant to lose 15-30% of power production on [July 15](#) and [July 16](#), 2012.

An official government report, "[Geomagnetic Storms and Their Impacts on the U.S. Power Grid](#)," sponsored by the U.S. Department of Homeland Security and other federal agencies, also showed that Maine is severely exposed to solar storms. According to the report, 45% of high voltage power in Maine would be at risk during a severe solar storm. For the subset of 345 kilovolt transmission lines commonly used in Maine, only two other states are more exposed—Washington State with 87% of power at risk and New Hampshire with 100% of power at risk. This same report found that the replacement time for damaged transformers would be several years, because nearly all high voltage transformers are custom-made in foreign countries, with long order backlogs.

John Kappenman, an internationally-recognized expert on the effects of solar storms, and principal investigator for the government report, "[Geomagnetic Storms and Their Impacts on the U.S. Power Grid](#)," conducted an examination of the routes for high voltage transmission lines planned for MPRP, using a [map provided by ISO-New England](#). Mr. Kappenman had previously performed a detailed examination of the Maine grid for the Oak Ridge National Laboratory. "While the new transmission lines add capacity, most of them parallel existing lines and terminate near existing substations. As a result, the redundant lines could result in a near-doubling of harmful currents induced by these storms in transmission lines in Maine. The antenna will be twice as big, and the storm impact to the power grid is likely to be twice as severe."

"We are fortunate to have a renowned expert such as Mr. Kappenman, who is familiar with the specifics of the Maine electric grid, to come to Augusta to provide information on my bill," said Representative Boland. "I look forward to his attendance at the March 21 work session for the bill and also appreciate the diligence of the Energy, Utilities, and Technology Committee on this timely and critical legislation."

Central Maine Power, the state's largest electric utility, is [on record as opposing the pending bill](#) to protect high voltage transmission lines against solar storms. Central Maine Power claims that their operating procedures, and the operating procedures of ISO-New England, are sufficient to protect against solar storms. ISO-New England is the electric grid reliability coordinator for all six of the New England states.

The last published [solar storm operating procedures of ISO-New England](#) require large reductions of power on some transmission lines—as much as 60%. The Foundation for Resilient Societies performed an analysis of reserve margins assumed in the New England ISO solar storm operating procedures. The analysis found that there is not enough real-time reserve capacity in

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New England to make up for plants and transmission lines that might be downrated or shut down entirely during solar storms—as a result, parts of New England, including Maine, could be forced into grid blackouts.

Mr. Kappenman, who also worked for Minnesota Power as head of transmission planning, examined the ISO-New England solar storm operating procedures and capacity planning documents for New England. “The ISO-New England operating procedures are not going to work in a severe solar storm because there will be insufficient time to bring reserves online,” observed Mr. Kappenman. “Moreover, New England cannot rely on extra power from Canada or New York because these areas will be simultaneously affected by the same solar storm. When the collapse comes, it comes quickly—the 1989 Quebec blackout happened in only 92 seconds. The resulting damage can take years to repair.”

Reports by the [Congressional EMP Commission](#) (2008), the [National Academy of Sciences](#) (2008), the North American Electric Reliability Corporation (“[High-Impact, Low-Frequency Event Risk to the North American Bulk Power System](#),” 2010), and the [Oak Ridge National Laboratory](#) of the U.S Department of Energy (2010) all conclude that a severe solar storm could result in a years-long blackout. As events at Fukushima in Japan amply showed, nuclear reactors without power can explode; spent fuel assemblies without power for cooling can emit radiation. New Hampshire, Vermont, Massachusetts, and Connecticut all have active nuclear power plants.

In March 2011, The Foundation for Resilient Societies submitted a petition for rulemaking, [PRM-50-96](#), to the Nuclear Regulatory Commission (NRC) that would require operators of nuclear power plants to install long-term backup power for cooling of spent fuel pools. In an action dated December 18, 2012, the NRC concluded, “Recent experience and associated analyses regarding space weather events suggest a potentially adverse outcome for today's infrastructure if a historically large geomagnetic storm should recur.”

Central Maine Power claims that no action is needed by the Maine State Legislature because an rule to protect the electric grid against solar storms is already pending in Washington with the Federal Energy Regulatory Commission (FERC), a federal rulemaking body. At the same time, electric utilities are [lobbying through their trade associations](#), such as Edison Electric Institute, for no rule to be passed. (Central Maine Power and Bangor Hydro Electric are members of Edison Electric Institute.) The electric utility self-regulatory organization, the North America Electric Reliability Corporation (NERC) has proposed [additional years of data collection](#) before any reliability rule on solar storms is set.

When it comes to forestalling grid reliability improvements, delay tactics in Washington are a proven game plan. At the federal level, even the simplest electric reliability rules take many years. The 2003 Northeast Blackout was caused by an overloaded transmission line sagging into

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a tree limb, but nearly ten years later a final rule on so-called “vegetation management” (a fancy term for tree-trimming) still has not been approved. Twenty-three years have passed since a solar storm caused a blackout in Quebec. Can the citizens of Maine who are dependent on continuous electric power—such as those in hospitals and nursing homes—wait another decade or two while electric utilities bog down the process in Washington with their endless legal filings?

Central Maine Power wants to get on with the already-approved MPRP, without stopping to design solar storm protection. At the February 19, 2013 hearing on the bill, the representative from Central Maine Power stated, “As I mentioned in my introduction to Central Maine Power Company a few weeks ago, we are in the process of building the largest construction project in Maine history in terms of dollars spent...Its design was approved in 2010. Redesigning the project at this point to some new standards would cost millions of dollars and cause potential delays costing tens of millions.”

The \$1.4 Billion MPRP transmission line upgrade is one of many [regional transmission line upgrades](#) proposed, planned, under construction, or in service in New England, with a total cost of approximately \$11 Billion. According to a [report by Environment Northeast](#), while Maine households will only pay 8% of the \$1.4 Billion cost of the MPRP, they will likewise pay 8% of the cost of transmission line upgrades in other New England states. The total cost of these transmission line upgrades average a hefty \$1,600 per Maine household. Already, starting in July 2012 Central Maine Power rates for federally-regulated transmission increased 20% and Bangor Hydro Electric rates increased 12%—these increased costs will be reflected in utility bills to consumers and businesses.

The allowed rate of return for transmission line investments by electric utilities is 11% per year, while publicly owned electric utilities can access financing for these massive projects for less than 4% per year. Meanwhile, the citizens of Maine have trouble finding a bank Certificate of Deposit that pays even 1% year.

Electric grids can be inexpensively protected against solar storms with devices that block harmful currents—so-called “series capacitors” and “neutral current blocking devices.” The Foundation for Resilient Societies performed a cost analysis of solar storm protection that was later presented to the Geomagnetic Disturbance Task Force of the North American Electric Reliability Corporation. The analysis found that electric utilities could install neutral current blocking devices for approximately \$300,000 per substation. With nine existing high voltage substations in Maine, and another five substations planned as part of the MPRP, the estimated cost to protect the Maine grid would be \$4.2 million, or only one-third of one percent of the MRPR cost.

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“Because solar storms affect the efficiency of generators and transmission lines, this solar storm protection could pay for itself,” commented Thomas Popik, chairman of the Foundation for Resilient Societies. “This equipment is commercially available and is already being installed by American Transmission Company, a large transmission operator in the American Midwest.”

One-third of one percent of the MPRP cost to protect the Maine electric grid and the citizens of Maine would be a very modest amount for an insurance policy. The cost to protect the Maine grid from solar storms would be an estimated \$1.52 per household per year.

"Most electric utilities have balked at any protection for solar storms other than so-called 'operating procedures,' which simply will not work for fast-moving and severe solar storms," commented Mr. Popik. "Their position makes sense only when blackout risks and potential repair costs are borne mostly by the public, not the utilities. When Central Maine Power and Bangor Hydro Electric fully consider the benefits of equipment to block currents caused by solar storms, we hope that they will conclude its prudent installation will protect both the public and their transmission systems."

A public work session of the Energy, Utilities, and Technology Committee will be held at approximately 1:30 pm on the afternoon of March 21 to answer questions about the bill. An audio feed of testimony of Maine utilities and ISO-New England will be available at:

[http://www.maine.gov/legis/audio/Utilities\\_cmte.html](http://www.maine.gov/legis/audio/Utilities_cmte.html)

(Use Internet Explorer web browser for most reliable audio.)

*John Kappenman of Storm Analysis Consultants will be available in Augusta for interviews before the March 21 work session. For scheduling and further info, email John at [jkappenma@aol.com](mailto:jkappenma@aol.com), phone 218-391-4015.*

*Thomas Popik of the Foundation for Resilient Societies will also be available in Augusta for interviews before the March 21 work session. For scheduling and further info, email Tom at [thomasp@resilientsocieties.org](mailto:thomasp@resilientsocieties.org), phone 603-321-1090.*

*The research report of the Foundation for Resilient Societies, "[Solar Storm Risks for Maine and the New England Electric Grid, and Potential Protective Measures](#)," can be found on the foundation's website, [www.resilientsocieties.org](http://www.resilientsocieties.org).*

*The Foundation for Resilient Societies does not endorse any specific proposed legislative action in the State of Maine, or in other states, or in the U.S. Congress.*

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