

1746

General Information

Assigned Office: NRR
Other Assignees:
OEDO Due Date: 02/01/2013
SECY Due Date: 02/01/2013
Date Response
Requested by Originator:

Other Parties:
Subject: Rulemaking to Address Solar Activity - Thomas Popik Petition

Description:

CC Routing:
ADAMS Accession Numbers - Incoming: Response / Package:

Other Information

Cross Reference No: LTR-12-0070, LTR-13-0002 SRM/Other: No

Process Information

Action Type: Letter
Signature Level: NRR
Special Instructions:
OEDO Concurrence: No
OCM Concurrence: No
OCA Concurrence: No

Document Information

Originator Name: Farouk Baxter
Originator Org: Nuclear Power Plant
Electrical Systems
Date of Incoming: 12/21/2012
Document Received by OEDO Date: 01/03/2013
Addressee: SECY
Incoming Task: E-mail
OEDO POC: Dan Merzke

Remsburg, Kristy

From: RulemakingComments Resource
Sent: Wednesday, January 02, 2013 8:56 AM
To: Remsburg, Kristy; Lewis, Antoinette; Mike, Linda
Subject: FW: Rulemaking to Address Solar Activity - Thomas Popik Petition
Attachments: General Design Criterion.doc; Dr. Jaczko.docx

-----Original Message-----

From: Farouk Baxter [<mailto:faroukbax@gmail.com>]
Sent: Friday, December 21, 2012 2:50 PM
To: RulemakingComments Resource
Subject: Rulemaking to Address Solar Activity - Thomas Popik Petition

Please note for the record, on August 28, 2010, I wrote a letter to Mr. William Ruland, NRC Director, Division of Safety Systems, identifying that GDC 2 failed to identify Terrestrial Solar Activity as a natural phenomenon required to be considered to protect safety systems in nuclear power plants. The full letter is provided as an attachment.

E-mail correspondence followed with Mr. Russell Sydnor, NRC Branch Chief, with his conclusion that NRC did not have any plans to update GDC 2. (Copies of all correspondence are available).

Based on the above negative response, a letter was sent to Dr. Jaczko, on February 8, 2012 (attached). No acknowledgement was ever received from Dr. Jaczko.

These documents are being forwarded to you for re-consideration by the NRC in view of your deliberation of Mr Popik's petition addressing the same subject.

Kindly acknowledge receipt of this e-mail. Thank you.

Farouk D. Baxter, PE
Expert/Specialist, Nuclear Power Plant Electrical Systems
23 Pilgrims Path
Sudbury, MA 01776
978 443-2914

FAROUK D. BAXTER
23 Pilgrims Path
Sudbury, MA 01776

(978) 443-2914
faroukbax@gmail.com

February 8, 2012

Dr. Gregory B. Jaczko
Chairman
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC 20555-0001

Subject: Need for NRC to Address Solar Activity as a Natural Phenomenon

Dear Dr. Jaczko,

There is an urgent need for the NRC to revise General Design Criterion 2 of 10 CFR Part 50, Appendix A, to recognize Solar Activity as a natural phenomenon because of the potential adverse effects to the safety of nuclear plants. The need for such action, and its applicability to all US nuclear plants, should be immediate.

General Design Criterion 2 of 10 CFR Part 50, Appendix A, requires that structures, systems and components (SSCs) important to safety be designed to withstand the effects of natural phenomenon such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions; however, the GDC fails to include consideration of Terrestrial Solar Activity which is also a natural phenomenon having a potential impact on safety.

Terrestrial Solar Activity may prevent SSCs from performing their safety functions in the event the SSCs are not hardened or designed to withstand these effects. No nuclear plants in the US have been designed to mitigate the effects of solar activity because GDC 2 does not specifically identify solar activity as one of the natural phenomenon to be considered. SSCs that may become susceptible to solar activity include offsite and onsite power systems, buried or surface piping and storage tanks, cooling towers, security systems, communication systems, GPS linked controls and communications. SSCs totally contained within buildings, and with no links to the outside, may be less susceptible.

Solar Activity is recognized as a non-hypothetical phenomenon that occurs cyclically every 11 years, with peak periods of varying intensity and duration. NASA's Solar Dynamic Observatory recently detected massive eruptions consisting of plasma bursts from the sun in early August 2010, thus signaling the commencement of a new 11-year cycle. The plasma bursts associated with this solar activity are expected to intensify and peak sometime in the 2012/2013 time frame, and NASA has predicted the activity will be the most intense since 1958. Very little is known on how intense solar activity can interfere and interact with nuclear plant safety systems because such activity has not been experienced for over 50 years. Note that NRC's SOARCA (State-of-the-Art Reactor Consequence Analysis) does not consider solar activity as a scenario

leading to accidents. One must question if there was a valid basis for its omission?

One of the more common consequences of solar storms is the induction of direct current (dc) ground currents known as Geomagnetic Induced Currents (GIC) in the earth's surface and waters. These GICs flow in loops and make use of low resistance metallic structures like transmission lines, and oil and water pipelines to complete their circuits; but in the process these structures may be destroyed or prevented from performing their safety functions. Today, because of our unprecedented dependence on electronics, solar activity also has the potential for effecting communications, navigation, security, and critical electrical and electronic systems as well, by direct interaction or through GICs. There is a definite concern for the safety of US nuclear plants which do not recognize or consider solar activity as a potentially adverse natural phenomenon.

On August 28, 2010, I wrote to Mr. William Ruland, Director, Division of Safety Systems, identifying my concerns, and specifically urging consideration of:

- the safety consequences of solar activity on existing and new nuclear power plants, and recognition that SSCs and their supporting systems may be disrupted in ways that could not be envisioned in the past.
- why solar activity is not specifically listed as one of the natural phenomena of General Design Criterion 2 of 10 CFR Part 50, Appendix A. And whether solar activity should be specifically incorporated into regulations for both new and existing plants henceforth.

Mr. Russell Syndor responded, indicating that the NRC had concluded that solar induced GICs would have no impact on SSCs, and that the NRC did not currently have plans to update the GDC to consider Solar Activity as a natural phenomenon.

It's time for the NRC to reassess the consequences of its failure to recognize solar activity as a natural phenomenon. Similar to Fukushima, any accidents from Solar Activity will have few similarities to the text book and simulator accidents evaluated at present; it would behoove NRC to be prepared to the extent possible from a "Solar Tsunami", we cannot afford not to act with urgency.

Sincerely,

Farouk D. Baxter, PE
Expert-Specialist, Nuclear Power Plant Electrical Systems

FAROUK D. BAXTER
23 Pilgrims Path
Sudbury, MA 01776
978 443-2914
faroukbax@gmail.com

August 28, 2010

Mr. William Ruland
Director, Division of Safety Systems
Mailstop 10 A1
U.S. Nuclear Regulatory Commission,
Washington, DC 20555-0001

**Subject: DESIGN BASIS FOR PROTECTION AGAINST NATURAL PHENOMENA OMITTS
CONSIDERATION OF SOLAR ACTIVITY ON SSCs IMPORTANT TO SAFETY**

Dear Mr. Ruland:

General Design Criterion 2 of 10 CFR Part 50, Appendix A, requires that structures, systems, and components (SSCs) important to safety are designed to withstand the effects of natural phenomenon such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions. GDC 2 makes no mention of Terrestrial Solar Activity in the list of phenomenon.

Terrestrial Solar Activity may prevent SSCs from performing their safety functions in the event the SSCs are not designed to withstand these effects. NO nuclear plants in the US have been designed to mitigate the effects of solar activity because GDC 2 does not specifically identify solar activity as one of the natural phenomenon.

Solar Activity is recognized as a non-hypothetical phenomenon that occurs cyclically every 11 years with peak periods of varying intensity and duration. NASA's Solar Dynamic Observatory recently detected massive eruptions consisting of plasma bursts from the sun in early August 2010, thus signaling the commencement of a new 11-year cycle. The plasma bursts associated with this solar activity are expected to intensify and peak sometime in the 2012/2013 time frame, and NASA has predicted the activity will be the most intense since 1958.

One of the more common consequences of solar storms is the induction of dc ground currents known as Geomagnetic Induced Currents (GIC) in the earth's surface and waters. These GICs flow in loops and make use of low resistance transmission lines, pipelines, and the like, whenever convenient to complete their circuits. Based on past experience GICs have played havoc with transmission and distribution systems, surface/buried oil and gas pipelines, and surface/buried transportation systems. NRC Information Notice 1990-42 relates some of the transmission system problems experienced in Northern latitude plants the US and Canada during the 1989 solar activity. Today, because of our unprecedented dependence on electronics, solar activity has the potential for also effecting communications, navigation, security, and

critical electrical and electronic systems as well, by direct interaction or through GICs.

Solar activity of the intensity predicted by NASA has not been experienced for the past 50 years, so very little is known of its penetrating effects and consequences to nuclear plant SSCs and supporting systems, both outdoors and within buildings. Also, because of the predicted higher intensity, the effects may be spread over a wider geographical area than previously experienced, and may not necessarily be limited to Northern latitudes. Since the NRC and the nuclear industry knows so little of the effects of intense solar storms on SSCs, nothing can be assumed regarding the consequences, and to adopt a "wait-and-see" approach would therefore be unconscionable based on the potential safety consequences.

As Dr. Richard Fisher, Director of NASA's Heliophysics Division, said: "We know it's coming but we don't know how bad its going to be. It will disrupt communication devices such as satellites and car navigations, air travel, the banking system, our computers, everything that is electronic. It will cause major problems for the world."

There is an urgent need for the NRC to consider:

- the safety consequences of solar activity on existing and new nuclear power plants, and to recognize that SSCs and their supporting systems may be disrupted in ways that could not be envisioned in the past.
- why solar activity is not specifically listed as one of the natural phenomena of General Design Criterion 2 of 10 CFR Part 50, Appendix A. And whether solar activity should be specifically incorporated into regulations for both new and existing plants henceforth.

I would be glad to have an opportunity to meet with you or your staff to offer guidance in formulating a comprehensive action plan to address the effects of Terrestrial Solar Activity on structures, systems, and components important to safety.

Sincerely,

Farouk D. Baxter, PE
Expert-Specialist, Nuclear Power Plant Electrical Systems

Resources:

1. <http://www.nasa.gov/topics/solarsystem/sunearthsystem/main/News080210-cme.html>
2. http://www.theregister.co.uk/2010/06/16/solar_storms/
3. http://www.theregister.co.uk/2010/08/03/solar_aurora_storm/
4. <http://solar.physics.montana.edu/press/WashPost/Horizon/196I-031099-idx.html>
5. <http://www.swpc.noaa.gov/SWN/index.html>
6. http://www.nasa.gov/mission_pages/sdo/news/first-light.html
7. White Paper advising selected NRC staff and IEEE-NPEC Chair of concerns: "Potential Loss of Offsite Power Due to Intense Solar Activity," by Farouk D. Baxter, Issued August 4, 2010.