

## Consideration of Comments

<b>Project Name:</b>	2013-03 Geomagnetic Disturbance Mitigation White Papers
<b>Comment Period Start Date:</b>	5/12/16
<b>Comment Period End Date:</b>	6/13/16

There were 14 responses, including comments from 7 people as shown in the table on the following pages.

All comments submitted can be reviewed in their original format on the [project page](#).

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process. If you feel there has been an error or omission, you can contact the Director of Standards, [Howard Gugel](#) (via email) or at (404) 446-9693.

## Questions

**1. The SDT has corrected Figure 1 and revised related sections in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper (*Screening Criterion* white paper). The SDT has also made related revisions to other Project 2013-03 white papers. Do you agree with the revisions? If not, please provide specific recommendation(s) and technical justification.**

### The Industry Segments are:

- 1 — Transmission Owners
- 2 — RTOs, ISOs
- 3 — Load-serving Entities
- 4 — Transmission-dependent Utilities
- 5 — Electric Generators
- 6 — Electricity Brokers, Aggregators, and Marketers
- 7 — Large Electricity End Users
- 8 — Small Electricity End Users
- 9 — Federal, State, Provincial Regulatory or other Government Entities
- 10 — Regional Reliability Organizations, Regional Entities

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
ACES Power Marketing	Brian Van Gheem	6	NA - Not Applicable	ACES Standards Collaborators	Bob Solomon	Hoosier Energy Rural Electric Cooperative, Inc.	1	RF
					Ginger Mercier	Prairie Power, Inc.	1,3	SERC
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Shari Heino	Brazos Electric Power Cooperative, Inc.	1,5	Texas RE
					Bill Hutchison	Southern Illinois Power Cooperative	1	SERC
					Mark Ringhausen	Old Dominion Electric Cooperative	3,4	SERC
					Chip Koloini	Golden Spread Electric Cooperative, Inc.	5	SPP RE

					Ellen Watkins	Sunflower Electric Power Corporation	1	SPP RE
					Ryan Strom	Buckeye Power, Inc.	4	RF
					Scott Brame	North Carolina Electric Membership Corporation	3,4,5	SERC
					Kevin Lyons	Central Iowa Power Cooperative	1	MRO
Duke Energy	Colby Bellville	1,3,5,6	FRCC,RF,SERC	Duke Energy	Doug Hils	Duke Energy	1	RF
					Lee Schuster	Duke Energy	3	FRCC
					Dale Goodwine	Duke Energy	5	SERC
					Greg Cecil	Duke Energy	6	RF
Southern Company - Southern Company Services, Inc.	Katherine Prewitt	1		Southern Company	Scott Moore	Alabama Power Company	3	SERC
					Bill Shultz	Southern Company Generation	5	SERC
					Jennifer Sykes	Southern Company Generation and Energy Marketing	6	SERC

Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7	NPCC	RSC	Paul Malozewski	Hydro One.	1	NPCC
					Guy Zito	Northeast Power Coordinating Council	NA - Not Applicable	NPCC
					Rob Vance	New Brunswick Power	1	NPCC
					Mark J. Kenny	Eversource Energy	1	NPCC
					Gregory A. Campoli	NY-ISO	2	NPCC
					Randy MacDonald	New Brunswick Power	2	NPCC
					Wayne Sipperly	New York Power Authority	4	NPCC
					David Ramkalawan	Ontario Power Generation	4	NPCC
					Glen Smith	Entergy Services	4	NPCC
					Brian Robinson	Utility Services	5	NPCC
Bruce Metruck	New York Power Authority	6	NPCC					



					Brian O'Boyle	Con-Edison	5	NPCC
Southwest Power Pool, Inc. (RTO)	Shannon Mickens	2	SPP RE	SPP Standards Review Group	Shannon Mickens	Southwest Power Pool Inc.	2	SPP RE
					Jason Smith	Southwest Power Pool Inc	2	SPP RE
					Kim VanBrimer	Southwest Power Pool Inc	2	SPP RE
					kevin Giles	Westar Energy	1,3,5,6	SPP RE
					Jonathan Hayes	Southwest Power Pool Inc	2	SPP RE
					J.Scott Williams	City Utilities of Springfield	1,4	SPP RE

1. The SDT has corrected Figure 1 and revised related sections in the Screening Criterion white paper. The SDT has also made related revisions to other Project 2013-03 white papers. Do you agree with the revisions? If not, please provide specific recommendation(s) and technical justification.

Brian Van Gheem - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer

No

Comment

We commend the SDT for revising the Screening Criterion and associated Project 2013-03 white papers. These revisions provide additional clarification on why 75 A per phase was chosen as the maximum effective geomagnetically-induced currents (GIC) value for the thermal impact assessment of applicable BES power transformers.

However, based on these clarifications, we believe this after-the-fact exercise to maintain accuracy misses the opportunity to revise the proposed TPL-007-1 reliability standard. The SDT should have justified its actions to revise these documents through the issuance of a SAR, as part of the standards development process. From these clarifications, it's further obvious that the 75 A per phase, while a step in the right direction away from the 15 A per phase value identified in the last draft revision of the standard, still misses the intent of why an overly conservative GIC value was chosen. Based on the information identified within the Screening Criterion and following the revised Table 2, it seems 130 A per phase is a better and more accurate selection for the GIC value.

We recommend the SDT develop a SAR, as part of the standards development process, with the intent to revise Requirement R6 of the standard and remove the maximum effective GIC value reference entirely. We suggest rephrasing the requirement to "each TO and GO shall conduct a thermal impact assessment for its solely and jointly owned applicable BES power transformers based on information provided in Requirement R5. The thermal impact assessment shall consist of [sub-requirements]." These documents could then be updated as part of the standards development process.

**Response.** Thank you for your comment. The SDT analyzed the corrected figure 1 in the *Screening Criterion* white paper and determined that the 75 A per phase threshold for thermal impact assessment remains a valid criterion. Consequently, a SAR to revise the proposed standard is not necessary. The SDT recognizes that 75 A per phase is a conservative screening criterion with a degree of margin, as

discussed on pages 2 and 3 of the *Screening Criterion* white paper. The criterion is used to identify transformers that must undergo a thermal impact assessment as specified in proposed TPL-007-1 Requirement R6 (i.e. 75 A per phase is a screening threshold and not a thermal impact assessment 'pass/fail' indication). The SDT believes it is appropriate to perform thermal impact assessments on transformers that meet or exceed the 75 A per phase threshold for the benchmark GMD event because the potential hot-spot heating in the transformer could exceed thermal limits. Factors such as transformer age and condition could lower the hot-spot heating limit from the 200° C value found in IEEE Std C57-91, so it is appropriate for the screening criterion to provide margin. The SDT does not believe revisions in the white paper support changes to Requirement R6 or removal of the thermal screening criterion as suggested by the commenter.

**Andrew Pusztai – On Behalf of: American Transmission Company, LLC - 1**

**Answer** Yes

**Comment**

ATC is fine with the changes to the GMD white papers and have no comments.

**Response.** Thank you for your comment.

**Thomas Foltz – On Behalf of: AEP - 3,5**

**Answer** Yes

**Comment**

Though AEP has no objections to the revisions themselves, we do have a question regarding Figure 5 (formally Figure 4) in the document entitled “Screening Criterion for Transformer Thermal Impact Assessment”. In short, what data source was used for this particular chart? Was it perhaps from the research conducted in Finland by ABB? If so, the plot does not appear to correlate correctly with this study’s data. If this chart is *not* associated with the ABB study, please provide the data source used. In general, we would suggest that data sources be explicitly cited for all charts in the documents.

**Response.** Thank you for your comment. Figure 5 in the *Screening Criterion* white paper is based on tests of a 400 kV 400 MVA five-leg core-type fully-wound transformer in Finland. The test results are published in the April 2002 IEEE Transactions paper noted as reference [3] in the *Screening Criterion* white paper. Figure 5 is derived from the temperature measurements plotted in reference [3], figure 8 (see Ch 14 plot), for the neutral dc step current profile in reference [3], figure 5.

**Larisa Loyferman – On Behalf of: CenterPoint Energy Houston Electric, LLC, Texas RE -1**

**Answer** Yes

**Comment**

CenterPoint Energy agrees with the revisions. CenterPoint Energy does not see any major impact with the SDT's proposed changes to the Screening Criterion White Paper, Thermal Impact Assessment, and Benchmark GMD Event White Paper. The changes were made based on the actual data received from the 2003 GMD Halloween storm, which clarified data shown by Figure 1. The SDT consisted of widely-recognized, knowledgeable experts. The Company believes that the members of the SDT are the most qualified to make justified adjustments to the white papers. The Company commends them for their open, thorough, and deliberative process, as well as careful consideration of the full range of technical issues and on the consistency of aligning all the documents at the same time.

CenterPoint Energy greatly appreciates the SDT's effort in developing this Standard.

**Response.** Thank you for your comment.

**Chris Scanlon – On Behalf of: Exelon - 1,3,5,6**

**Answer** Yes

**Comment**

Responding on behalf of the Exelon Utilities and Generation companies.

Exelon agrees with the revisions made to the Project 2013-03 white papers; we believe, however, that the drafting team missed the opportunity to include in these revisions any reference to the recently approved IEEE Std C57.163, *Guide for Establishing Power*

*Transformer Capability while under Geomagnetic Disturbances*. At a minimum this IEEE Guide should be referenced on page 4 of the *Transformer Thermal Impact Assessment White Paper* as the source of IEEE guidance on conducting a detailed thermal impact assessment. The IEEE Guide also gives detailed information on thermal response of transformers to GIC, evaluation of transformer susceptibility to the effects of GIC, and recommendations regarding transformer specifications and monitoring. The IEEE Guide was developed in an open and collaborative process by more than 150 transformer experts composed of manufacturers, users and consultants from around the globe. Exelon recommends future revisions of the Project 2013-03 white papers should make a point to reference IEEE Std C57.163.

**Response.** Thank you for your comment. The SDT added a footnote to page 4 of the *Thermal Impact Assessment* white paper referencing IEEE Std C57.163-2015 *Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances*.

**Ruida Shu – Northeast Power Coordinating Council - 1,2,3,4,5,6,7 - NPCC, Group Name RSC**

**Answer** Yes

**Comment**

The figure on page 3 of the Screening Criterion for Transformer Thermal Impact Assessment does not have a description. Should it be part of Figure 1? Is just the figure shown on page 4 Figure 1?

**Response.** Thank you for your comment. The figure on page 3 of the *Screening Criterion* white paper (redline version) is the deleted plot of figure 1 which is being replaced by the plot on page 4. The description for figure 1 is "Metallic hot spot temperatures calculated using the benchmark GMD event."

**Shannon Mickens - 2 - SPP RE, Group Name SPP Standards Review Group**

**Answer** Yes

**Comment**

Our review group didn't see any major impacts with the drafting teams proposed changes to the three (3) White Papers. We commend them on the consistency of correcting all the documents at the same time. Thank you for all your efforts.

**Response.** Thank you for your comment.

**Katherine Prewitt - 1, Group Name** Southern Company

Answer	Yes
--------	-----

**Nick Vtyurin – On Behalf of: Manitoba Hydro - 1,3,5,6 - MRO**

Answer	Yes
--------	-----

**RoLynda Shumpert – On Behalf of: SCANA – South Carolina Electric and Gas Co. -1,3,5,6 - SERC**

Answer	Yes
--------	-----

**Colby Bellville – Duke Energy - 1,3,5,6 - FRCC,SERC,RF, Group Name** Duke Energy

Answer	Yes
--------	-----

**Sean Erickson – On Behalf of: Western Area Power Administration -1,6**

Answer	Yes
--------	-----

**Rachel Coyne – On Behalf of: Texas Reliability Entity, Inc. -10**

Answer	Yes
--------	-----

**Chris Gowder – On Behalf of: Florida Municipal Power Agency - 3,4,5,6 - FRCC**

Answer	Yes
--------	-----

