

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

This form must be used to submit comments on the proposed Relay Loadability standard. Comments must be submitted by **September 29, 2006**. You must submit the completed form by e-mail to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words "Relay Loadability Comments" in the subject line. If you have questions please contact Richard Schneider at [richard.schneider@nerc.net](mailto:richard.schneider@nerc.net) or 609-452-8060.

<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Don Raveling</b>	
Organization:	<b>Montana-Dakota Utilities Co.</b>	
Telephone:	<b>701-222-7680</b>	
E-mail:	<b>don.raveling@mdu.com</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
<input type="checkbox"/> MAIN	<input type="checkbox"/>	5 — Electric Generators
<input checked="" type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	<input type="checkbox"/>	
<input type="checkbox"/> NA — Not Applicable	<input type="checkbox"/>	



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the "NERC Recommendation 8a Review" and the "Protection System Review Program – Beyond Zone 3". Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The reference provides additional explanations for the standard. It may be possible to comply with the standard without compliance to the reference, although I don't know how that would be done. To me this doesn't matter too much, but it perhaps would to a lawyer. What about the other reference documents on "out-of-step" and "3-terminal lines"? Would they be left as reference documents or become part of the standard too? Again they are helpful documents and provide good and helpful informations but I think "Reference For Standard PRC-0230-1" is appropriate.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

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6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

R2, 2.1, 2.2, 2.3, and M2 all require the Regional Reliability Organization (RRO), as well as the Reliability Coordinator, approve protective relay settings. This determination should be made at the Regional Reliability Organization.

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Yes

No

Comments See Comment # 7. RCCWG does not feel that this standard accurately addresses the Industry action due to the concerns stated. That said, to the extent that extreme emergency conditions can be identified in advance of their occurrence and simulated, this standard has addressed the stated concerns.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The RCCWG feels the standard should include all requirements. The reference document should remain a document that can be revised without requiring the standards process be followed.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference. There are, however, philosophical differences in the application of relays, even among neighbors. One example is that some entities do not utilize zone 3 relays, and others find zone 3 relaying to be a vital backup component to system protection.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

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5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.  
RCCWG feels that implementation should be delayed until # 7 comments are accommodated.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

R2, 2.1, 2.2, 2.3, and M2 all require the Regional Reliability Organization (RRO), as well as the Reliability Coordinator, approve protective relay settings. This determination should be made at the Regional Reliability Organization.

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Robert Rauschenbach</b>	
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

A more straight forward standard should be developed where the NERC formula is used for Relay Load Limit Calculations for 230 kV and above. The Relay Load Limit would then need to be used by Operations and Planning as a line limit not to be exceeded under the NERC Table 1 conditions. The conservative 0.85 per unit voltage and 1.5 current values used in the NERC formula would provide margin against relay trips under multiple contingencies / extreme emergencies.

This method would be more performance based and less prescriptive. It avoids the exceptions and their various interpretations, and allows utilities to set relays as needed to best provide a reliable system. Requiring the Relay Load Limit to exceed the maximum thermal rating does not make sense if the thermal capacity is not being used, but merely available for ultimate designs. The requirement to exceed maximum thermal rating is what ultimately leads to the need for exceptions and their interpretation.

A utility attempting to meet this standard may be providing less backup coverage when it is not necessary. This lack of backup could ultimately lead to reduced reliability or a blackout scenario due to an un-cleared fault on the system.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection:

With the way the present standard is written, the reference document is necessary.

3. Are you aware of any regional differences that would be required as a result of this standard?

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Yes

No

If yes, please identify the regional difference.

The definition of 100-200kV critical facilities is not defined and will lead to differences between regional interpretations. The requirements should be dropped for 100-200kV.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why. Utilities should be given at least two years to meet new requirements. One year to budget and plan, another for implementation.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Introduction section:**

**4.1.2 Critical facilities between 100 kV and 200 kV need further definition. Each of the regions will interpret this differently. Perhaps facilities between 100 kV and 200 kV should not be included as critical until a clear definition is provided.**

**Requirements section:**

**R1.3.1 and R1.3.2 The use of 0.85 per unit voltage for relay load limit is redundant. The maximum power transfer is calculated at 1.0 per unit. The 115% factor in R1.3 already provides margin.**

**R1.5 This doesn't make sense. How can the line carry a maximum load of 1.7 multiplied by the end of line 3-phase fault? This requirement should be removed.**

**R1.6** It is not clear how the 230% factor is derived. Is this 2.0 times the generation rating time a 1.15 multiplier? For parallel lines, how many contingencies should be considered? With 4 lines in parallel, would 3 lines be assumed out-of-service? This does not appear realistic. Further definition is needed. Justification for requirements beyond those shown in NERC's Table-1 should be provided.

**R1.8** The term 'any system configuration' is ambiguous and confusing. It is not clear how many contingencies should be considered. As is R1.6, further definition is needed, and justification for requirements beyond those shown in NERC's Table-1 should be provided.

**R1.9** It seems R1.7 is covered under R1.9.

**R1.12** The necessity to cover remote lines under breaker failure conditions is not addressed. Remote breaker failure coverage is required on breaker-and-a-half, ring-bus, and in-line breaker applications. The 1.25 coverage of these breaker failure conditions should be included as an exception.

**R1.12.3** There is already margin in the relay load limit calculation. There is no need for an additional restriction on the facility rating. This is operationally burdensome and confusing to carry two load limit numbers.

**R2** R2.1, R2.2, and R2.3 appear redundant. R2 already states approval is required from Regional Reliability Organization and Reliability Coordinator. The relay load limits should be included in all facility ratings.



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Individual Commenter Information		
(Complete this page for comments from one organization or individual.)		
Name:	Dave Folk (on behalf of Dave Powell, Bob McFeaters, and Jim Huber)	
Organization:	FirstEnergy Corp.	
Telephone:	330-336-9063	
E-mail:	folkd@firstenergycorp.com	
NERC Region		Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection: Including the reference material with all of its technical exceptions into the standard would be confusing since the exceptions are similar to the standard's requirements but worded differently. However, attaching the non-mandatory reference material would serve as a historical record of development of the standard and may enhance the understanding of the standard. If future developments call for changes to the standards criteria, making the reference voluntary will allow it to remain as a background document. In addition, a citing for this reference material is needed in the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why. Both 5.1 and 5.2 should be on the same cycle. Recommend the effective date be 1/1/09 to allow time to address "lessons learned" after the 7/1/08 Beyond Zone 3 completion date. However, if staggered effective dates are used for these two requirements, they should be 6 months later than those stated to allow for incorporating "lessons learned".

6. Do you agree with the proposed violation risk factors?

Yes

No

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**R1 Include the words "load carrying" in front of capability.**

**R1.1 Please confirm that the 150% margin that is added on top of the 0.85 p.u. voltage and 30 degree power factor angle is not too large. Would a margin of 125-130% be sufficient? This would have a tendency to provide an increased level of protection for the transmission system.**

**The voltage used to evaluate loadability at generating switchyard buses should not be lower than the value at which the plant auxiliary systems can be operated.**

**R1.11 This requirement is not clearly stated. Why is it referring to R1.10? R1.10 is for fault protection relays and R1.11 is for overload relays and they say virtually the same thing. The wording in R1.11 does not reflect the intent of the reference document. The reference document section similar to R1.11 allows for lower settings with supporting documentation. Therefore reference to R1.11 should be included in M2.**

**R1.12 Include the words "load carrying" in front of capability.**

**M2 What is meant by the terms circuit rating and facility rating? Do they need special definitions.**

**General :**

**Should this standard include definitions for several special terms used in this standard?**

**Consider a bi-annual review and self-certification or data submittal rather than an annual review.**

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Name:		<b>Ed Davis</b>
Organization:		<b>Entergy Services, Inc</b>
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E-mail:		<b>edavis@entergy.com</b>
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Explain why.

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Explanation for selection: Due to the technical complexities of the standard, the reference document is useful for providing guidance to achieve compliance. Although the document addresses the specific requirements and could possibly be used to determine compliance, it may not be all encompassing. It should not be used as a basis for determining any non-compliance and therefore should not be part of the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

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If no, please identify which effective date should be modified and identify why.

We believe that entities should be allowed a 2 year period after FERC approval of the standard to become compliant with these kinds of standards that may require significant capital investment. First, entities should not be considered non-compliant with any requirements of any standard that is not FERC approved. Second, once the standard is approved by FERC the entity should have one year to analyze his system for compliance and to budget funds to replace needed equipment. The second year would be needed to install the equipment and ensure the proper operation of the equipment.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

Level 3 and level 4 non-compliance criteria should be swapped since level 3 is a more severe "violation" than level 4.

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

This form must be used to submit comments on the proposed Relay Loadability standard. Comments must be submitted by **September 29, 2006**. You must submit the completed form by e-mail to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words "Relay Loadability Comments" in the subject line. If you have questions please contact Richard Schneider at [richard.schneider@nerc.net](mailto:richard.schneider@nerc.net) or 609-452-8060.

<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>NERC System Protection and Control Task Force</b>	
Organization:	<b>NERC</b>	
Telephone:		
E-mail:	<b>spctf@nerc.com</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
<input type="checkbox"/> MAIN	<input type="checkbox"/>	5 — Electric Generators
<input type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	<input type="checkbox"/>	
<input checked="" type="checkbox"/> NA — Not Applicable	<input type="checkbox"/>	

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name: **NERC System Protection and Control Task Force**

Lead Contact: **Jon Sykes**

Contact Organization: **Salt River Project**

Contact Segment:

Contact Telephone: **602-236-6442**

Contact E-mail: **jasykes@srpnet.com**

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>
<b>Charles Rogers</b>	<b>Consumers Energy</b>	<b>RFC</b>	
<b>Henry Miller</b>	<b>American Electric Power</b>	<b>RFC</b>	
<b>Philip Winston</b>	<b>Georgia Power Co</b>	<b>SERC</b>	
<b>Philip Tatro</b>	<b>National Grid USA</b>	<b>NPPC</b>	
<b>Tom Weidman</b>	<b>Consultant</b>	<b>N/A</b>	
<b>John Ciufu</b>	<b>Hydro One</b>	<b>NPCC</b>	
<b>Deven Bhan</b>	<b>WAPA</b>	<b>MRO</b>	
<b>William Miller</b>	<b>Exelon</b>	<b>RFC</b>	
<b>Dave Angell</b>	<b>Idaho Power</b>	<b>WECC</b>	
<b>Baj Agrawal</b>	<b>Arizona Public Service</b>	<b>WECC</b>	
<b>Mike McDonald</b>	<b>Ameren</b>	<b>SERC</b>	
<b>Joe Burdis</b>	<b>PJM</b>	<b>RFC</b>	
<b>John D Roberts</b>	<b>TVA</b>	<b>SERC</b>	
<b>Robert Cummings</b>	<b>NERC</b>	<b>N/A</b>	

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments PRC-023 (Draft), in Appendix A, briefly mentions Switch-onto-Fault relaying and Out-of-Step Blocking and Tripping relaying, but very little else is said about these subjects, either in the Standard or in the Reference Paper. The above-referenced previous actions addressed these subjects in detail; SOTF is the subject of an informational paper by the SPCTF. We recommend that these subjects be addressed in more detail, particularly in the Reference Document.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: It will be very difficult, if not impossible, to accurately apply the Standard without the Reference Document, but the Reference Document should be available to easily correct if necessary. However, the Standard should, either within a footnote or as a direct reference within the Standard itself, call the user's attention to the existence of the Reference Document and the Reference should be posted with the Standard on the NERC Standards website.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why. The implementation plan should allow for previously-approved "Temporary Exceptions" to the criteria within the Standard, or delayed mitigation, to be accepted as a mitigation plan under Compliance Monitoring with no findings of non-compliance as long as the mitigation plan is followed. These previously-approved "Temporary Exceptions" will have been approved within the "NERC 8a" and/or "Beyond Zone 3" review process by the NERC System Protection and Control Task Force with the concurrence of the NERC Planning Committee.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. As reflected in the draft Standard, the VRF for R1 must apply to only R1 in its entirety, and not to each individual sub-clause of R1, in order to accurately reflect the phrase within R1, "any one of the following criteria..."

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Regarding Levels of Non-Compliance, we would suggest that the criteria for Level 3 and the criteria for Level 4 should be exchanged. A violation resulting in a Reportable Disturbance seems to be more serious than "no evidence exists to support that relays comply with one of the criteria ...". The existing Level 3 should also be "causal or contributory" instead of just "causal". It would also seem that a non-compliance with the relay loadability criteria (either evidentiary or on the physical relay) , whether causal to a Reportable Disturbance or not, should be identified within the Levels of Non-Compliance. Perhaps, this should be reflected by "Evidence indicates that relay settings do not comply with R1.1 through R1.13." as a Level 4 non-compliance.**

**Regarding R1 - The phrase "The relay performance shall be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees" should more clearly state that it applies only to RELAYS sensitive to voltage and/or power factor angle. For example, we suggest "Relay load-carrying capacity (in amperes) shall be evaluated at 0.85 per unit voltage and at a power factor angle of 30 degrees for relays sensitive to voltage and/or power factor angle, and shall be evaluated directly for overcurrent relays."**

**Regarding R1.10 - "Transformer protection relays and relays on transformer terminated lines shall be set so that they do not operate at or below the greater of:"**

**Editorial Comments - In R2 and M2, "Requirement 13" should be "R1.13". Also, in R2.2, R2.3, and M2, please use a consistent reference to various requirements; either "Requirement ..." or R..."**

Although we understand the reasoning behind tying Level 4 non-compliance to a reportable disturbance, it seems to be inappropriate to do so in this Standard. No requirement is established within the Standard that specifies that a non-compliance shall not contribute to a reportable disturbance. Standards set forth Requirements and Measures by which compliance with the requirements will be assessed. The Levels of Non-Compliance must be tied back to the Measures; they should not introduce additional de facto requirements beyond those already set forth in the Requirements section, e.g. not causing a reportable disturbance. While I agree that causing a reportable disturbance is a significant concern, I feel it is inappropriate to incorporate penalties for doing so in every (or even one) Standard for which non-compliance may lead to a reportable disturbance. Failure to comply with the Standard should have one penalty associated with it based on the Level of Non-Compliance defined in the Standard. If penalties are to be assessed for causing a reportable disturbance, this should be done outside of the Compliance section of each and every Standard for which non-compliance could lead to a reportable disturbance. Establishing such penalties outside the Standards would ensure uniform treatment for all such events.



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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
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<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

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**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?  
Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The maintenance of the reference manual is preferred. As we go forward the SPCTF or similar can make changes/revisions without going through the NERC Process each time.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Guidance on applying the standard to "switch on to fault" SOTF should be provided in the reference document.**

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Individual Commenter Information		
(Complete this page for comments from one organization or individual.)		
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NERC Region		Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
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<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		



**Background Information:**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

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## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

---

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Requirement R1: The phrase "The relay performance should be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees" should clearly state that the requirement applies only to RELAYS that are sensitive to voltage and/or power factor angle.**

**Requirement R1.1 remove the word "seasonal" that precedes "Facility Rating of a circuit."**

**Requirement R2 and Measure M2 make reference to requirement R.13 It should read R1.3 instead.**

**References to requirements in the documents use the full word (e.g. Requirement 1.12 in R2.20 or the abbreviation Rx.y (e.g. R1.6 in R2). We recommend consistency in the use of these references.**

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<b>Individual Commenter Information</b>		
(Complete this page for comments from one organization or individual.)		
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
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**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

**Background Information:**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The maintenance of the reference manual is preferred. As we go forward the SPCTF or similar can make changes/revisions without going through the NERC Process each time. Should it be determined that aspects of the reference manual need to be mandatory and not a guideline they need to be incorporated into the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

---

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. Agree with the violation risk factor for R.1 but not sure about the "Lower" ranking for R.2. The RRO or RC approval process only strengthens the standard apart from the fact that it provides a platform for communication between the RC and the transmission / generator owners who would primarily be responsible for the settings. Also, the RC or RRO would have a bigger picture of the various regions and it would be relatively easier for them to analyze the impacts of the various settings on a regional level as compared to a more localized level.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Level 3 incorporates the clause: "... and the relay settings were causal to a Reportable Disturbance". We feel that improper or incorrect device settings or maintenance could lead eventually to that particular device being the cause of a disturbance or a reportable event. However, this should not be the basis for the violation. Linking a compliance level to a causal effect should not be part of a standard as this would render this particular standard inconsistent with the other standards.**

**We believe that the level orders are reversed for Level 3 and Level 4. Level 3 actually refers to "non-compliance" through the statement: "Relay settings do not comply..." whereas Level 4 is referring to "supporting evidence or documentation" through the statement: "Evidence does not exist...". From the language, it clearly seems to indicate that Level 3 is more stringent than Level 4.**

**We feel that L 2.2.1 is incorrectly stated. In its present form, it states that "Evidence that relay settings comply with one of the criteria in R.1.1 through R1.13 exists but is incomplete or incorrect". This statement should be revised as "Evidence that relay settings comply with the criteria in R1.1 through R1.13 exists but is incomplete or incorrect for one or more of the requirements".**

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<b>Individual Commenter Information</b>	
(Complete this page for comments from one organization or individual.)	
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E-mail:	<b>jdrjcassociates@cs.com</b>
NERC Region	Registered Ballot Body Segment
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<input type="checkbox"/> MRO	<input type="checkbox"/> 6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/> 7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/> 8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/> 9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	
<input type="checkbox"/> NA — Not Applicable	



**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name:  
Lead Contact:  
Contact Organization:  
Contact Segment:  
Contact Telephone:  
Contact E-mail:

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

**Background Information:**

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The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: Anything in the reference that should be mandatory should be included in the standards requirements not in an attachment.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

---

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

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<b>Individual Commenter Information</b>		
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
<input checked="" type="checkbox"/> MAAC	<input checked="" type="checkbox"/>	4 — Transmission-dependent Utilities
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<input type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input checked="" type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
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<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		

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<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

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NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.



## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

Regarding Levels of Non-Compliance, we would suggest that the criteria for Level 3 and the criteria for Level 4 should be exchanged. A violation resulting in a Reportable Disturbance seems to be more serious than "no evidence exists to support that relays comply with one of the criteria ...". The existing Level 3 should also be "causal or contributory" instead of just "causal". It would also seem that a non-compliance with the relay loadability criteria (either evidentiary or on the physical relay) , whether causal to a Reportable Disturbance or not, should be identified within the Levels of Non-Compliance. Perhaps, this should be reflected by "Evidence indicates that relay settings do not comply with R1.1 through R1.13." as a Level 4 non-compliance.

Requirements section:

Reference the last sentence of R1. "The relay performance shall be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees." We suggest that this sentence should more clearly state that it applies only to relays that are sensitive to voltage or power factor angle.

R1.3.1 and R1.3.2 The calculation of maximum power transfer at 1.0 per unit is inconsistent with the use of 0.85 per unit voltage for relay load limit.

R1.5 More explanation should be included in this requirement. The present wording is somewhat ambiguous as to the intent, and more detail should be included to avoid confusion.

R1.6 The standard and the reference document need to limit the application of this criteria on multiple lines out of a generation center to a 3 line situation. While it is agreed that the 3 line situation where 2 lines become outaged is foreseeable (i.e. one line is out for maintenance and a fault occurs on the second line), applying this scenario to more multiples becomes more and more unlikely.

R1.9 It seems R1.7 is covered under R1.9. Please explain why both are needed.

R2 R2.1 and R2.2 appear redundant. R2 already states approval is required from Regional Reliability Organization and Reliability Coordinator. The relay load limits should be included in all facility ratings.

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<b>Individual Commenter Information</b>	
<b>(Complete this page for comments from one organization or individual.)</b>	
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NERC Region	Registered Ballot Body Segment
<input checked="" type="checkbox"/> ERCOT	<input checked="" type="checkbox"/> 1 — Transmission Owners
<input checked="" type="checkbox"/> ECAR	<input type="checkbox"/> 2 — RTOs, ISOs, Regional Reliability Councils
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<input type="checkbox"/> WECC	
<input type="checkbox"/> NA — Not Applicable	

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Lead Contact:  
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Contact Segment:  
Contact Telephone:  
Contact E-mail:

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The Reference material provides example calculations of how to accomplish the requirements included in the Loadability Standard. The Reference guide may need updated from time to time to stay current as an aid without the standard needing to be updated. The reference material does not add any requirements, it only explains how to meet the requirements contained in the Loadability Standard. Therefore, Reference Document should remain a separate document, but should be clearly referenced within the Loadability Standard so that it can be found and used to meet the Loadability Standard requirements.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

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## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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Yes

No

If no, please identify which effective date should be modified and identify why. The implementation plan, however, should allow for previously approved "Temporary Exceptions" to the criteria, within the Standard, as an approved mitigation plan with regard to Compliance Monitoring. The Compliance Monitoring should not result in a finding of non-compliance as long as the "Temporary Exception" mitigation plan is being followed.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. Please note that only a VRF should be assigned to R1 since each of the sub clauses of R1 is a method for accomplishing the R1 requirement.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

Level three and four seem to be reversed. Level three is dealing with a relay that actually caused an event due to not meeting the Loadability Standard requirements, while level four deals with the documentation of a relay's compliance with the Loadability Standard. Also, if the two levels are reversed, should it matter how a relay is discovered to be in non-compliance with the Loadability Standard? The new level four should read: Relay settings that do not comply with the loadability criteria in R1.

The last sentence of R1 is stated for distance relay evaluation. A method to evaluate other relays should be worked into this sentence.

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
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Yes

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Comments

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Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

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Yes

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7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

Reference R1.10 and R1.11 Is should be clear that where the relay protection referred to does not exist, that R1.10 and R1.11 are not requiring their installation, only describing their performance should they exist.

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<b>Individual Commenter Information</b>	
<b>(Complete this page for comments from one organization or individual.)</b>	
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NERC Region	Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input type="checkbox"/> 1 — Transmission Owners
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Yes

No

Comments The referenced activities seem to be all included in the requirements, but nothing additional seems to be included. However, the supporting information in the documents for the previous activities seems crucial to being able to meet the requirements

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: It seems to be very difficult, if not impossible, to accurately apply the Standard without the Reference Document, but the Reference Document should be available such that it can be easily corrected if necessary. In order to support the tie between the Standard and the Reference Document, it seems that the Reference Document should be referenced within the standard, either via a statement within R1 such as "For additional guidance on these requirements, please see "PRC-023 Reference - Determination and Application of Practical Relaying Loadability Ratings", or via a similar footnoted reference on R1.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No



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If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why. The implementation plan should allow for previously-approved "Temporary Exceptions" to the criteria within the Standard, or delayed mitigation, to be accepted as a mitigation plan under Compliance Monitoring with no findings of non-compliance as long as the established and approved mitigation plan is followed.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**It seems that the Level 3 and Level 4 non-compliance are reversed in their severity and priority. Also, there are errors in R2 and M2; "Requirement 13" should be "R1.13", and please use a consistent approach to referencing other requirements - "Requirement" or "R".**

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

This form must be used to submit comments on the proposed Relay Loadability standard. Comments must be submitted by **September 29, 2006**. You must submit the completed form by e-mail to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words "Relay Loadability Comments" in the subject line. If you have questions please contact Richard Schneider at [richard.schneider@nerc.net](mailto:richard.schneider@nerc.net) or 609-452-8060.

Individual Commenter Information		
(Complete this page for comments from one organization or individual.)		
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NERC Region		Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input checked="" type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
<input type="checkbox"/> MAIN	<input checked="" type="checkbox"/>	5 — Electric Generators
<input type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input checked="" type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

PEC believes the reference document separate but referenced in the standard making it available to easily correct if necessary.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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No

If no, please identify which effective date should be modified and identify why. PEC believes that the Implementation Plan for PRC-023 should be changed. Those needing to comply will need at least two years to meet new requirements once they are finalized. One year to budget and plan, another for implementation. Therefore effective date should be two (2) years from NERC BOT approval.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. The Risk Factor for R1 should be Low. The standard may be new but the engineering of zone relay settings is not. Also it is unlikely that missing a setting will result in cascading outages.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Regarding Levels of Non-Compliance, we would suggest that the criteria for Level 3 and the criteria for Level 4 should be exchanged. A violation resulting in a Reportable Disturbance seems to be more serious than "no evidence exists to support that relays comply with one of the criteria ...". The existing Level 3 should also be "causal or contributory" instead of just "causal". It would also seem that a non-compliance with the relay loadability criteria (either evidentiary or on the physical relay) , whether causal to a Reportable Disturbance or not, should be identified within the Levels of Non-Compliance. Perhaps, this should be reflected by "Evidence indicates that relay settings do not comply with R1.1 through R1.13." as a Level 4 non-compliance.**

**Requirements section:**

**Reference the last sentence of R1. "The relay performance shall be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees." We suggest that this sentence should more clearly state that it applies only to relays that are sensitive to voltage or power factor angle.**

**R1.3.1 and R1.3.2 The calculation of maximum power transfer at 1.0 per unit is inconsistent with the use of 0.85 per unit voltage for relay load limit.**

**R1.5 More explanation should be included in this requirement. The present wording is somewhat ambiguous as to the intent, and more detail should be included to avoid confusion.**

**R1.6 The standard and the reference document need to limit the application of this criteria on multiple lines out of a generation center to a 3 line situation. While it is agreed that the 3 line situation where 2 lines become outaged is foreseeable (i.e. one line is out for maintenance and a fault occurs on the second line), applying this scenario to more multiples becomes more and more unlikely.**

**R1.9 It seems R1.7 is covered under R1.9. Please explain why both are needed.**

**R2 R2.1 and R2.2 appear redundant. R2 already states approval is required from Regional Reliability Organization and Reliability Coordinator. The relay load limits should be included in all facility ratings.**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
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<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	<input type="checkbox"/>	
<input type="checkbox"/> NA — Not Applicable	<input type="checkbox"/>	

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments This standard generally addresses the industry action listed above but Manitoba Hydro has some significant reservations about how the standard is written as well as concerns about potential risks to reliability if this standard is implemented. (1) This standard should be more directly based on expected result or performance - that collapse should be slowed or delayed to the extent of the thermal capability of facilities. Suggest the purpose statement read - Protective relay settings shall not limit transmission loadability so that uncontrolled collapse is slowed or delayed to the extent of the thermal capability of facilities. The proposed standard should make direct reference to the additional time this standard is targeting to give the operators to respond to an emergency situation. In the current draft there is a rather indirect reference to 15 minutes. (2) The Manitoba Hydro is concerned that this standard is removing some inherent thermal overload protection from the bulk electric system. In its response to comments the SAR drafting team stated - The emergency loadability of equipment should be reflected in the equipment ratings, and the fault protective relay should not be responsible for relieving emergency loading concerns. Controlling of emergency load should be left to system operators. - The fact is that fault protection also provides (admittedly crude) overload protection and Manitoba Hydro believes there is increased inherent risk to the bulk electric system in the sentiment of the Sar drafting team's second statement. In NERC Recommendation 8a it is stated - It is not practical to expect operators will always be able to analyze a massive, complex system failure and to take the appropriate corrective actions in a matter of a few minutes. - and yet this is what this standard is expecting. Something like 400 transmission circuits tripped during August 14 blackout with no significant thermal overload damage. If the requirements of this standard had been met prior to August 14, 2003, would equipment damage have further delayed restoration? A risk analysis should be conducted before implementing this standard. (3) Manitoba Hydro believes this draft of the standard is too prescriptive. The equipment owner should be deciding the appropriate level of risk with regard to thermal overload and loss of life. The SDT should not decide the level of risk for the transmission owners. The standard is a good guide but too prescriptive. (4) The SAR designates that this standard shall also be applicable to the Regional Reliability Organization. In its response to comments the SAR drafting team stated - It is anticipated that the RRO will be responsible for compliance to NERC for developing a methodology for identifying its operationally significant circuits and for identification of those operationally significant circuits. The SAR was modified to include these clarifications. - However, there are no requirements on the RRO in this standard. Specifically, where in the standards is the RRO required to identify lines/transformers critical to the reliability of the

electric system? If it is even appropriate for the RRO to come up with the methodology, the needed requirements on the RRO should include a requirement to develop the methodology in coordination with the RC, PA and the TO. (5) In 4.1.2 and 4.1.4, the words "as designated by the Regional Reliability Organization as critical to the reliability of the electric system" are not consistent with those used in the SAR (operationally significant circuits, etc.). (6) if during the largest blackout in US history, the existing system, group of standards, and relay set points separated the system in time to prevent significant equipment damage so that the system could be restored virtually without incident; then implications of changing relay setting philosophy should be studied carefully. For example, what is the time overload characteristic of wavetraps compared to line conductors? How will system operators know when equipment damage is imminent in order to take that equipment out of service on time?

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?

Explain why.

- Reference should be made a mandatory part of the standard
- Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: In its response to comments the Sar drafting team stated that - the resulting standard to be developed will develop loadability requirements, not methods to satisfy the requirements -. Manitoba Hydro agrees with this approach of the SAR drafting team. The reference document should not be made part of the standard because the how should be left up to the owner of the protection system. Also, a reference document will not be able to keep up to date with changing relay technology. Manitoba Hydro recognizes the value of the reference document as a guide and the hard work that went into preparing it.

3. Are you aware of any regional differences that would be required as a result of this standard?

- Yes
- No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

- Yes
- No

If yes, please identify the conflict, being as specific as possible. However, there could be regulatory issues regarding, for example, vertical clearance issues, for the proposed overloading of lines.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

(1) The effective dates for lines operated at 100kV to 200 kV and transformers, as designated by the regional reliability organization as critical to the reliability of the electric system in the region should be one year after the regional reliability organization has made this designation. It would seem reasonable that owners should not be expected to even start review of the 100kV OS circuits until the Region has defined the specific circuits. A date that the RRO's are required to make this designation should be recommended by the SDT and added to the implementation plan. (2) Regarding implementation plan, one would have expected an implementation time frame of the stated durations strictly for identifying initial areas of non-compliance, and defining a plan to become compliant, with subsequent dates provided for becoming fully compliant. Eleven months after establishment of the standard is not a reasonable time frame for implementing all setting changes, and certainly not for design changes if required. It would appear that NERC are depending on all participants to have proceeded with reviews and actions as indicated in the initial zone 3 exercise. Perhaps regions/owners had every right to not proceed until the proposed standard is in force. Perhaps many of the efforts have proceeded, but should the proposed standard require that they all did?

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. Manitoba Hydro feels that the more appropriate violation risk factor is medium because implementing this standard will not prevent the initiation of a blackout event.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**(1) Manitoba Hydro has a concern with the 15% additional margin applied to the facility rating. This can be considered a negative margin wrt protecting against thermal overload. The SAR indicates that protection should not unnecessarily limit the loadability of the system, it does not state that protection should be sacrificed or removed. This approach is outside the intention of the SAR. Again it should be up to the equipment owner to assess the appropriate overloading philosophy. (2) Does this standard expose the TO etc. to legal risk if there is damage to the public (violating virtual clearances for example) (3) If we are relying on the operator to prevent overloads, are the associated metering, communication, and human machine interface systems (not to mention the human involvement) designed and maintained with equivalent reliability to the protection system? Also, the SCADA system may be down therefore the operator may not be able to assume the role of preventing equipment damage. (4) There should be a classification that allows the transmission owners with stability limited lines to perform studies which allow relay settings to identify the conditions the relay will actual see under extreme conditions. The .85 pu voltage, and power factor angle of 30 degrees. criteria may not be appropriate for all cases.(5) If you have too prescriptive a standard you may discourage people coming up with adaptive**

solutions. (6) This standard removes the option of using zone three relays to provide more reliable system operation

(a) For internal lines – it may not be possible to set an out of step relay to block tripping on a true out of step condition. (Moving blinders in may make it impossible to detect fast moving swings)(b) On interties: It may not be possible to set relays to detect fastest swing to be able to trip the tie – as a consequence, undesired tripping of other lines may occur. (7) This standard seems to be precluding the concept of TO's etc. applying to use other settings than prescribed by this standard as was the case with zone 3 issue. A TO should be allowed to use relay settings other than based on the the prescribed criteria if it can be demonstrated there is no benefit to applying the prescribed criteria in a given situation but there is, in fact, a negative impact on the TO's system. (8) R2.1 and R2.2 could be combined by adding 1.12 to the list in R2.1 and removing R2.2 (9) In M1 and M2 it should be further clarified what is meant by "evidence". (11) In R2, why would it be necessary to get approval of the RRO and RC? If each criteria choice is valid, why is this necessary? This is unnecessary bureaucracy. (10) Is the interpretation of R1 that the TO etc. could more than one criteria within their system? (11) In Appendix A what is meant by: 1.2.3 Protection systems intended for protection during stable power swings? (12) On page 6, R1.1.2, I in the formula for Zrelay30, should 1.5 be 1.1?

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
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Organization:	<b>California ISO</b>	
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E-mail:	<b>bkingsford@caiso.com</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

---

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**R2, R2.1, R2.2, R2.3, and M2 list the Reliability Coordinators as an entity that is required to approve transmission relays set according to the criteria in R1.6, R1.7, R1.8, R1.9, R1.12, or R.13. We disagree with the standard listing Reliability Coordinators as an entity that will approve relay settings when set according to the criteria above. We are concerned that Reliability Coordinators may not be staffed with relay engineers and obtaining approval from the Reliability Coordinators would be perceived as validation of a setting when that approval would really only be an acknowledgement of the setting criteria.**

**Reliability Coordinator should be deleted from the requirements and measures listed above.**

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<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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**Group Comments (Complete this page if comments are from a group.)**

Group Name: **NERC Regional Reliability Standards Working Group (RRSWG)**  
 Lead Contact: **David Taylor**  
 Contact Organization: **North American Electric Reliability Council**  
 Contact Segment: **N/A**  
 Contact Telephone: **(609) 452-8060**  
 Contact E-mail: **david.taylor@nerc.net**

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>
<b>H. Steven Myers</b>	<b>Electric Rel Council of Texas</b>	<b>ERCOT</b>	<b>2</b>
<b>John E. Odom, Jr</b>	<b>Florida Reliability Coor Council</b>	<b>FRCC</b>	<b>2</b>
<b>Larry E. Brusseau</b>	<b>Midwest Reliability Organization</b>	<b>MRO</b>	<b>2</b>
<b>Guy V. Zito</b>	<b>Northeast Power Coor Council</b>	<b>NPCC</b>	<b>2</b>
<b>Robert W. Millard</b>	<b>ReliabilityFirst Corporation</b>	<b>RFC</b>	<b>2</b>
<b>Patrick Huntley</b>	<b>SERC Reliability Corporation</b>	<b>SERC</b>	<b>2</b>
<b>Mak Nagle</b>	<b>Southwest Power Pool</b>	<b>SPP</b>	<b>2</b>
<b>Kenneth J. Wilson</b>	<b>Western Electricity Coor Council</b>	<b>WECC</b>	<b>2</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the "NERC Recommendation 8a Review" and the "Protection System Review Program – Beyond Zone 3". Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible. R2 of this draft standard requires the TO, GO, or DP to obtain approval from the RRO and RC prior to using the criteria established in R1.6, R1.7, R1.8, R1.9, R1.12, or R.13 for each circuit terminal using the listed criteria. By establishing an obligation on the TO, GO, or DP to follow RRO and RC approved criteria, this makes PRC-023-1 a "fill-in-the-blank" standard. Section 215 of the U.S. Federal Power Act does not allow enforcement of a reliability standard upon a bulk power system owner, operator or user, including the setting of financial penalties and sanctions, to the extent a portion of the requirements exists outside the standard. However, Section 215 of the U.S. Federal Power Act does allow for a Regional Entity to establish a regional reliability standard through a NERC

approved procedure to make the requirements listed in R2 enforceable. Section 215 does not grant a similar right to the RC. Accordingly, the Regional Reliability Standards Working Group (RRSWG) recommends that references to the RC in R2 and M2 of this standard be removed.

The RRSWG suggests that if the intent of the drafting team is to have a regional reliability standard developed to support the NERC standard by stating approval criteria and requirements unique to the region developing the supporting standard, that the standard be revised to show in section A.4 that it is applicable to the Regional Entity (RE), not RRO, and to clearly identify the RE requirements and measurements. If, instead, the intent of the drafting team is not to have a regional reliability standard developed, the RRSWG suggests that R2 and M2 be deleted or refined to remove the "fill-in-the-blank" characteristics. To do so, the drafting team might consider the following refinement to R2 that would remove the "fill-in-the-blank" characteristics. The refinement would be to have the TO, GO, or DP develop documentation that demonstrates its application of R1.6, R1.7, R1.8, R1.9, R1.12, or R.13 complies with the criteria in the PRC-023 Reference Document. This refinement may require an additional requirement of the entity to simply provide its relay application documentation to the RRO and the RC for its information and use. The applicable measurement would be for the RRO to verify compliance with the PRC-023 Reference Document criteria. This refinement would also require the PRC-023 Reference Document to be incorporated as an attachment to the standard or written into the NERC standard as additional requirements.

It is not the intent of the RRSWG to be overly prescriptive here. It is only our intent to provide options to the drafting team which it might not have already considered. The RRSWG assumes the drafting team will implement the appropriate revisions to the draft standard.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

This form must be used to submit comments on the proposed Relay Loadability standard. Comments must be submitted by **September 29, 2006**. You must submit the completed form by e-mail to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words "Relay Loadability Comments" in the subject line. If you have questions please contact Richard Schneider at [richard.schneider@nerc.net](mailto:richard.schneider@nerc.net) or 609-452-8060.

<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region		Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
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<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		



**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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**Group Comments (Complete this page if comments are from a group.)**

Group Name: **Bonneville Power Administration Transmission**

Lead Contact: **Lorissa Jones**

Contact Organization: **Bonneville Power Administration**

Contact Segment:

Contact Telephone: **360-418-8978**

Contact E-mail: **ljones@bpa.gov**

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>
<b>Dean Bender</b>	<b>Bonneville Power Administration</b>	<b>WECC</b>	<b>1</b>
<b>Rita Coppernoll</b>	<b>BPA</b>	<b>WECC</b>	<b>1</b>
<b>Jon Daume</b>	<b>BPA</b>	<b>WECC</b>	<b>1</b>

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: I don't see how you could be in compliance with one and not the other. The reference supplies necessary details and should be an attachment to the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference. It is more difficult to make relays on long transmission lines comply with the standard. The WECC will be impacted more because of the number of long transmission lines in that region.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why. The proposed effective date of January 1, 2008 for transmission lines operated above 200kV, etc. is appropriate, but the July 1, 2008 deadline for transmission lines operated at 100kV to 200kV and transformers with low voltage terminals connected at 100kV to 200kV as designated by the regional reliability organization is not adequate because all of the regional reliability organizations have not yet designated which lines and transformers will fall under this requirement. The proposed effective date for these lines and transformers should be at least two years after the regional reliability organization has designated the lines and transformers that are required to meet this reliability standard.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. I think that the risk factor should be high.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

## Comments on NERC Line Loadability Standard PRC-023 Reference

Most WECC members are well aware of the problem of setting zone 2 or zone 3 distance relays on long transmission lines with enough reach to adequately protect the line without violating NERC recommendation 8A. The problem arises because the thermal current limit of a line is independent of the lines length and does not change for a given conductor size no matter how long it is. The impedance of the line, however, increases with the lines length. As the line length and impedance increases, the reach of the distance relays that protect the line must also increase to provide adequate protection, until at some point the relay setting would operate for the maximum thermal current. This creates the dilemma of how to protect such a long line without limiting its load carrying ability.

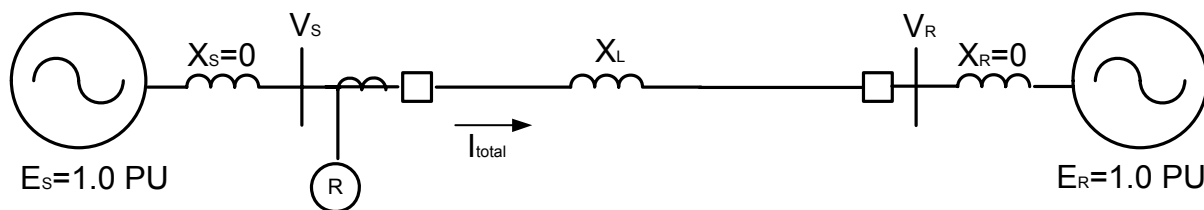
On the other hand, as the line length and impedance increases, the ability to transfer power across the line diminishes until a point is reached where the maximum possible power transfer is less than the rated thermal power transfer limit. Using this diminished power transfer capability instead of the thermal limit as the basis of setting the reach of the distance relays should allow for a longer relay reach that will hopefully provide adequate protection for the line.

Requirements R1.3.1 and R1.3.2 of NERC Standard PRC-023-1, and as detailed in the *PRC-023 Reference*, attempt to allow the use of the maximum power transfer capability of a line to justify the use of relay settings that will operate at loads less than the line's thermal rating. While this approach has merit, I have the following concerns:

- 1) R1.3.1, correctly applied, will not justify a mho characteristic relay reach at the line impedance angle greater than 100% of the line impedance, and therefore, is not useful.
- 2) R1.3.2 offers little improvement over R1.3.1 and is not likely to justify the necessary reaches of zone 2 or 3 relays on very long lines.
- 3) The impedance seen by a relay is a constant percentage of the line impedance for any given power angle. This can be used to determine the maximum acceptable relay reach for any power angle. This may be useful to justify practical limits for relay reach.

Following is my explanation of the above concerns.

### 1) R1.3.1 Does Not Justify Relay Reaches Greater Than 100% of the Line Impedance



R1.3.1 attempts to determine a relay reach based on the maximum theoretical power flow across a line that occurs when the power angle,  $\delta$ , is  $90^\circ$ .

From R1.3.1 of the *PRC-023 Reference*, page 4:

$$I_{\text{total}} = (V_{LL}\sqrt{2})/(X_L\sqrt{3})$$

The impedance seen by the relay is:

$Z_R = V_{LG}/I_{total}$  where  $V_{LG}$  is the line-to-ground voltage and  $V_{LG} = V_{LL}/\sqrt{3}$  under balanced load

$$Z_R = (V_{LL}/\sqrt{3}) / [(V_{LL}\sqrt{2})/(X_L\sqrt{3})]$$

$$Z_R = X_L/\sqrt{2}$$

So the impedance seen by the relay,  $Z_R$ , is independent of the bus voltage during a maximum power transfer condition. If the voltage sags, the maximum possible power transfer across the line will also drop, and the impedance seen by the relay will remain constant.

Under the conditions assumed in R1.3.1,  $|V_S| = |V_R|$  and the angle between  $V_S$  and  $V_R$  (power angle,  $\delta$ ) is  $90^\circ$ , the current through the line,  $I_{total}$  will lag the voltage at the sending end by  $45^\circ$ , and the impedance seen by the relay,  $Z_R$ , will be at  $45^\circ$ . Converting this to the maximum allowable reach for a mho characteristic relay at the line angle of  $90^\circ$  gives:

$$Z_{90} = Z_R / \cos(90^\circ - 45^\circ) = (X_L/\sqrt{2}) / \cos 45^\circ = X_L$$

The result shows that for a mho characteristic distance relay, the maximum power transfer approach will never justify setting the reach of a mho characteristic beyond 100% of the line impedance. Stated another way, at the maximum theoretical power transfer, a mho-characteristic distance relay with a reach equal to 100% of the line impedance at a maximum torque angle of  $90^\circ$  will pick up on load.

The results derived in R1.3.1 are slightly different because two safety factors are introduced. The first a voltage factor of 0.85 isn't necessary because, as shown above, the impedance seen by the relay is unaffected by the voltage when the maximum power transfer approach is used. The second safety factor increases the current by 1.15 which results in a reduced allowable relay reach of  $1/1.15$  or 87%.

Even with the safety factors, the impedance allowed by R1.3.1 is still larger than the value derived above ( $Z_{90} = X_L$ ) because R1.3.1 incorrectly recommends that the impedance derived from the maximum power transfer equation be applied at a power factor angle of  $30^\circ$  instead of  $45^\circ$ . From R1.3.1:

$$Z_{relay30} = (0.85V_{LL}) / (1.15 \cdot I_{total}\sqrt{3}) = (0.85/1.15)(V_{LL} \cdot X_L\sqrt{3}) / (V_{LL}\sqrt{2}\sqrt{3})$$

$$Z_{relay30} = (0.85/1.15)(X_L / \sqrt{2}) = 0.739X_L/\sqrt{2}$$

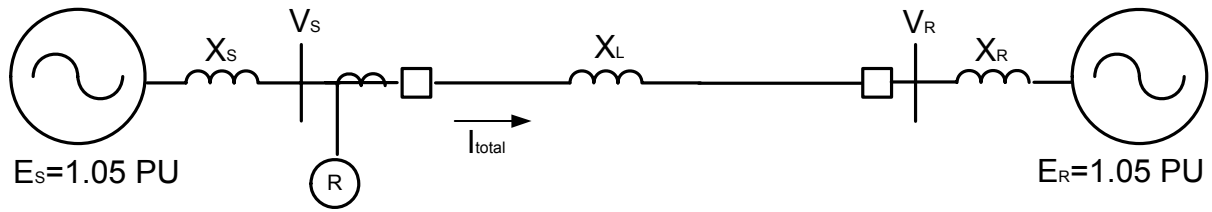
The maximum allowable reach for a mho characteristic relay at the line angle of  $90^\circ$  is:

$$Z_{90} = Z_{relay30} / \cos(90^\circ - 30^\circ) = (0.739X_L/\sqrt{2}) / \cos 60^\circ$$

$$Z_{90} = 1.045 \cdot X_L$$

So, the use of a  $30^\circ$  power factor angle as recommended in R1.3.1 offsets the safety margins that were applied and allows a slightly longer distance relay reach of 104.5% of the line impedance. This is not enough reach for a zone 2 relay to provide adequate protection for the line. The maximum power transfer approach, as used in R1.3.1, is useless in justifying adequate zone 2 settings for long lines!

## 2) R1.3.2 Offers Little Help Over R1.3.1



R1.3.2 uses the source impedances of the system to obtain a reduced maximum theoretical power flow at the power angle,  $\delta$ , of  $90^\circ$ , and therefore a longer allowable relay reach than obtained by R1.3.1

From R1.3.2 of the *PRC-023 Reference*, page 6:

$$I_{\text{total}} = (1.05V_{LL}\sqrt{2}) / [(X_S + X_R + X_L)\sqrt{3}]$$

$$Z_{\text{relay}30} = (0.85V_{LL}) / (1.15 \cdot I_{\text{total}}\sqrt{3}) = (1/1.05)(0.85/1.15)(X_S + X_R + X_L)/\sqrt{2} = 0.498(X_S + X_R + X_L)$$

This is the same impedance seen by the relay as derived in R1.3.1 with  $X_L$  replaced by  $(X_S + X_R + X_L)$  and the result divided by 1.05 because of the 1.05 P.U. source voltage used.

The maximum allowable reach for a mho characteristic relay at the line angle of  $90^\circ$  is:

$$Z_{90} = Z_{\text{relay}30} / \cos(90^\circ - 30^\circ) = 0.498(X_S + X_R + X_L) / \cos 60^\circ$$

$$Z_{90} = 0.996(X_S + X_R + X_L)$$

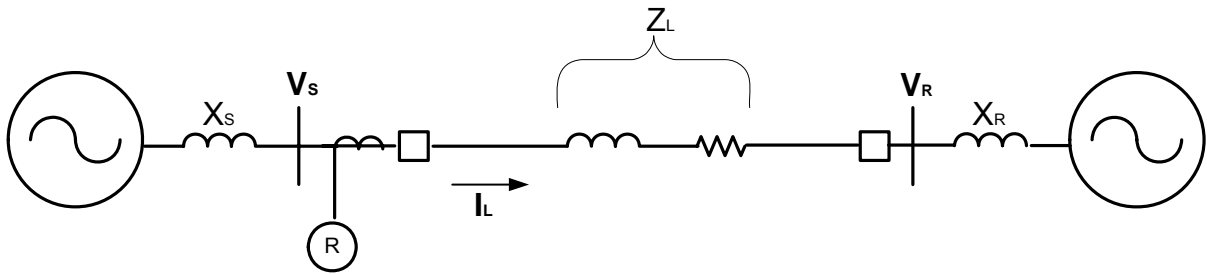
This shows that the maximum allowable reach of a mho characteristic relay at the line angle is approximately equal to  $(X_S + X_R + X_L)$ . This method will only allow a mho characteristic relay to overreach the line impedance by the same percentage that  $X_S + X_R$  is to the line impedance  $X_L$ .

$$Z_{90} = 0.996 \cdot X_L [1 + (X_R + X_S)/X_L]$$

In order to justify setting a zone 2 relay at the standard 125% of the line impedance with this method,  $X_S + X_R$  must equal 25% of  $X_L$ . For many long lines the source impedance at the terminals will not equal 25% of the line impedance and this method will not justify a mho characteristic reach that provides adequate line protection.

As in R1.3.1, R1.3.2 applies the relay reach at a power factor angle of  $30^\circ$  instead of the correct angle of  $45^\circ$ . Using  $45^\circ$  results in even less allowable relay reach.

### 3) Another Approach



From the above diagram where  $V_s$  is the phase-to-ground voltage at the sending end, and  $V_R$  is the phase-to-ground voltage at the receiving end:

$$V_s = V_s \angle \theta_s \quad \text{and} \quad V_R = V_R \angle \theta_R$$

$$I_L = (V_s \angle \theta_s - V_R \angle \theta_R) / Z_L \angle \theta_L$$

The impedance seen by the relay,  $Z_R$ , is:

$$Z_R = V_s / I_L = V_s \angle \theta_s / [(V_s \angle \theta_s - V_R \angle \theta_R) / Z_L \angle \theta_L]$$

$$Z_R = Z_L \angle \theta_L \cdot V_s \angle \theta_s / (V_s \angle \theta_s - V_R \angle \theta_R)$$

If the receiving end voltage is used as the reference,  $\theta_R = 0^\circ$  and the power angle  $\delta = \theta_s - \theta_R = \theta_s$ . If the magnitude of the sending- and receiving-end voltages are equal,  $V_R = V_s$ , and we get:

$$Z_R = Z_L \angle \theta_L \cdot V_s \angle \theta_s / (V_s \angle \theta_s - V_s \angle 0^\circ)$$

$$Z_R = Z_L \cdot V_s \angle (\theta_s + \theta_L) / V_s (1 \angle \theta_s - 1)$$

$$Z_R = Z_L \cdot 1 \angle (\theta_s + \theta_L) / (1 \angle \theta_s - 1)$$

This shows that the impedance seen by the relay,  $Z_R$ , is dependent only on the difference in angles between the sending and receiving end voltages and the magnitude and angle of the line impedance. The following table shows some values of  $Z_R$  for different values of  $\theta_s$  when the line impedance angle,  $\theta_L$ , is  $90^\circ$ . The far right column shows the corresponding relay reach at  $90^\circ$  for a mho characteristic distance relay ( $Z_{R90} = Z_R / \cos[90^\circ - \theta_{ZR}]$ ).

$\theta_s$	$Z_R$	Relay reach at line angle of $90^\circ$
$90^\circ$	$(0.707 \angle 45^\circ) \cdot Z_L$	$1.0 \cdot Z_L$
$85^\circ$	$(0.740 \angle 42.5^\circ) \cdot Z_L$	$1.095 \cdot Z_L$
$80^\circ$	$(0.778 \angle 40^\circ) \cdot Z_L$	$1.210 \cdot Z_L$
$75^\circ$	$(0.821 \angle 37.5^\circ) \cdot Z_L$	$1.349 \cdot Z_L$
$70^\circ$	$(0.872 \angle 35^\circ) \cdot Z_L$	$1.520 \cdot Z_L$
$65^\circ$	$(0.931 \angle 32.5^\circ) \cdot Z_L$	$1.732 \cdot Z_L$
$60^\circ$	$(1.00 \angle 30^\circ) \cdot Z_L$	$2.00 \cdot Z_L$

The table shows that in order to get a useful zone 2 reach of 125% or more of the line impedance, the power angle must be less than about  $78^\circ$ .



If the line impedance angle,  $\Theta_L$ , is different than  $90^\circ$ , the allowable relay reach at the line angle will still be the same as that shown for a line angle of  $90^\circ$  in the table above. For example, the allowable relay reach for a line impedance angle of  $80^\circ$  on a system operating at a power angle of  $75^\circ$  gives:

$$Z_R = Z_L \cdot 1 \angle (\Theta_S + \Theta_L) / (1 \angle \Theta_S - 1)$$

$$Z_R = Z_L \cdot 1 \angle (75^\circ + 80^\circ) / (1 \angle 75^\circ - 1)$$

$$Z_R = Z_L \cdot (0.821 \angle 27.5^\circ)$$

The allowable relay reach at the line angle of  $80^\circ$  is:

$$Z_{R80} = Z_L \cdot 0.821 / \cos(80^\circ - 27.5^\circ)$$

$$Z_{R80} = 1.349 \cdot Z_L$$

This is the same reach as the one in the table above for a power angle of  $75^\circ$ . This example can be applied to any line and power angle, and the above table can be generalized to:

Power Angle $\delta$	Mho Characteristic Relay Reach at Line Angle
$90^\circ$	$1.0 \cdot Z_L$
$85^\circ$	$1.095 \cdot Z_L$
$80^\circ$	$1.210 \cdot Z_L$
$75^\circ$	$1.349 \cdot Z_L$
$70^\circ$	$1.520 \cdot Z_L$
$65^\circ$	$1.732 \cdot Z_L$
$60^\circ$	$2.00 \cdot Z_L$

If we wanted to set a mho characteristic relay to reach 130% of the line impedance at the line angle ( $Z_{LA}$ ) and allowed for a 15% overreach error, we'd have

$$Z_{LA} = (1.15)(1.30) Z_L = 1.495 \cdot Z_L$$

From the above table, the relay would not pick up on load until the power angle across the line exceeded  $70^\circ$ .

## Summary

Trying to justify zone 2 and zone 3 relay reaches on long lines using the maximum power transfer capability of the line as described in R1.3.1 doesn't work. The method described in R1.3.2 will be very limited in its usefulness. A more useful approach would be to select a practical power angle less than  $90^\circ$  that is not exceeded during stable power system operation and base the maximum relay reach on that. Can a power angle of less than  $90^\circ$  be accepted as a practical limit that is unlikely to be exceeded in real-life operation? If so, a maximum relay reach, as a percentage of line impedance at the line angle, should be allowed for mho characteristic relays without further restrictions or justification. For example, if a  $70^\circ$  power angle is acceptable as a limit that is unlikely to be exceeded in stable operation, a relay reach at the line angle of 130% of the line impedance could be allowed without further restriction or justification. This could greatly reduce the number of relay settings requiring an exception to the standard.

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		<b>Herb Schrayshuen</b>
Organization:		<b>National Grid</b>
Telephone:		<b>(315) 428-3159</b>
E-mail:		<b>herbert.schrayshuen@us.ngrid.com</b>
NERC Region		Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
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**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>

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NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?  
Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The entire Reference Document should not be incorporated in the Standard, however, the Standard Drafting Team should review the draft Standard to ensure that adequate information is contained in each Requirement to ensure consistent interpretation and application. In some cases important information necessary to apply the stated Requirement is contained in text or a diagram within the Reference Standard. Some examples that we find requiring further clarification include:

R1.3: Additional information is required regarding line resistance and the power angle between the sending and receiving line terminals.

R1.3.2: The reference to 1.05 p.u. voltage should identify this as the Thevenin equivalent source voltage behind the actual system source impedance at each end of the line, rather than at the end of the line.

R1.12: The maximum distance relay setting should clarify that the reach at the maximum torque angle (MTA) shall be set to provide no greater than 125% overreach at the impedance angle of the protected transmission line. The present language could be interpreted as requiring a setting of no more 125% of the line impedance magnitude applied at the MTA, which may not provide adequate protection coverage at the line impedance angle.

The Reference Document contains a significant volume of information to assist the industry in applying the Standard. Additional information as noted above should be included in the Standard, and the remaining information in the Reference document should be posted with the Standard on the NERC website as a separate reference source.

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

---

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

### **Section B -- Requirements**

**R1: The Standard should clarify that the protection system owner is free to select any of the criteria in R1.1 through R1.13 and need not apply the same one on all protection systems.**

**R11: The Standard should allow for overcurrent settings set below 150% of the maximum transformer nameplate rating or 115% of the highest operator established emergency transformer rating if the relays are supervised by a distance element that meets the relay loadability requirements.**

**R2: The reference to "R.13" should be "R1.13". The same error is repeated under Section C - Measures at M2 and under Section D - Compliance at 2.1.1.**

**R2.1 and R2.2: Given the identical wording in these two requirements it is not clear to the reader why these two requirements could not be combined. Additional text should be added to clarify that R2.1 pertains to criteria used to verify that the loading cannot be reasonably expected to exceed relay loadability, whereas R2.2 pertains to a criterion that establishes an equipment rating less than its actual capability based on the relay setting.**

**Section D -- Compliance**

**We do not agree with assigning different Levels of Non-Compliance depending on the method by which the non-compliance is identified. The draft Standard sets forth the Requirements and the Measures by which compliance with the requirements will be assessed. The Levels of Non-Compliance must be tied back to the Measures; they should not introduce additional de facto requirements beyond those already set forth in the Requirements section, e.g. not causing a reportable disturbance. While we agree that causing a reportable disturbance is a significant concern, we feel it is inappropriate to incorporate penalties for doing so in every (or even one) Standard for which non-compliance may lead to a reportable disturbance. Failure to comply with a Requirement in the Standard should have one penalty associated with it based on the Level of Non-Compliance defined in the Standard. If penalties are to be assessed for causing a reportable disturbance, this should be done outside of the Standards. Establishing such penalties outside the Standards would ensure uniform treatment for all such events.**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Tim Bartel</b>	
Organization:	<b>Minnkota Power Cooperative, Inc.</b>	
Telephone:	<b>701-795-4314</b>	
E-mail:	<b>tbartel@minnkota.com</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input checked="" type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
<input type="checkbox"/> MAIN	<input checked="" type="checkbox"/>	5 — Electric Generators
<input type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	<input type="checkbox"/>	
<input type="checkbox"/> NA — Not Applicable	<input type="checkbox"/>	





**Background Information:**

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**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection:

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Yes

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If yes, please identify the regional difference.

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Yes

No

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Yes

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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No

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6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

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Using this one-size-fits-all approach for out-of-step blocking / tripping relays would prevent proper application in some situations. Orderly system separation following major events may require higher impedance out-of-step blinder settings than would be allowed by the standard.

Perhaps this is allowed for by the reference to "stable power swings" in section 1.2.3 of Attachment A, but it is not clear if this is the case.

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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<input type="checkbox"/> NA — Not Applicable		

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name: **Midwest Reliability Organization**  
 Lead Contact: **Robert Coish**  
 Contact Organization: **Midwest Reliability Organization**  
 Contact Segment: **2**  
 Contact Telephone: **(204) 487-5479**  
 Contact E-mail: **rgcoish@hydro.mb.ca**

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>
<b>Al Boesch</b>	<b>NPPD</b>	<b>MRO</b>	<b>2</b>
<b>Terry Bilke</b>	<b>MISO</b>	<b>MRO</b>	<b>2</b>
<b>Ken Goldsmith</b>	<b>ALT</b>	<b>MRO</b>	<b>2</b>
<b>Carol Gerou</b>	<b>MP</b>	<b>MRO</b>	<b>2</b>
<b>Todd Gosnell</b>	<b>OPPD</b>	<b>MRO</b>	<b>2</b>
<b>Wayne Guttormson</b>	<b>SPC</b>	<b>MRO</b>	<b>2</b>
<b>Jim Maenner</b>	<b>WPS</b>	<b>MRO</b>	<b>2</b>
<b>Tom Mielnik</b>	<b>MEC</b>	<b>MRO</b>	<b>2</b>
<b>Darrick Moe Chair</b>	<b>WAPA</b>	<b>MRO</b>	<b>2</b>
<b>Pam Oreschnick</b>	<b>XEL</b>	<b>MRO</b>	<b>2</b>
<b>Dick Pursley</b>	<b>GRE</b>	<b>MRO</b>	<b>2</b>
<b>Dave Rudolph</b>	<b>BEPC</b>	<b>MRO</b>	<b>2</b>
<b>Eric Ruskamp</b>	<b>LES</b>	<b>MRO</b>	<b>2</b>
<b>Joe Knight, Secretary</b>	<b>MRO</b>	<b>MRO</b>	<b>2</b>
		<b>MRO</b>	<b>2</b>

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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Yes

No

Comments The MRO generally believes this standard addresses the industry action listed above but has some significant reservations about how the standard is written as well as concerns about potential risks to reliability if this standard is implemented. (1) This standard should be more directly based on the concept that collapse should be slowed or delayed to the extent of the thermal capability of facilities. Suggest the purpose statement read - Protective relay settings shall not limit transmission loadability uncontrlled collapse is slowed or delayed to the extent of the thermal capability of facilities. The proposed standard should make direct reference to the additional time this standard is targeting to give the operators to respond to an emergency situation. In the current draft there is a rather indirect reference to 15 minutes. (2) The MRO is concerned that this standard is removing some inherent thermal overload protection from the bulk electric system. In its response to comments the SAR drafting team stated - The emergency loadability of equipment should be reflected in the equipment ratings, and the fault protective relay should not be responsible for relieving emergency loading concerns. Controlling of emergency load should be left to system operators. - The fact is that fault protection also provides (admittedly crude) overload protection and MRO believes there is increased inhent risk to the bulk electric system in the sentiment of the Sar drafting team's second statement. In NERC Recommendation 8a it is stated - It is not practical to expect operators will always be able to analyze a massive, complex system failure and to take the appropriate corrective actions in a matter of a few minutes. - and yet this is what this standard is expecting. Something like 400 transmission circuits tripped during August 14 blackout with no significant thermal overload damage. If the requirements of this standard had been met prior to August 14, 2003, would equipment damage have further delayed restoration? The MRO believes that a risk analysis should be conducted before implementing this standard. (3) The MRO believes this draft of the standard is too prescriptive. The equipment owner should be deciding the appropriate level of risk with rgard to thermal overload and loss of life. The SDT should not decide the level of risk for the transmission owners. The standard is a good guide but too prescriptive. (4) The SAR designates that this standard shall also be applicable to the Regional Reliability Organization. In its response to comments the SAR drafting team stated - It is anticipated that the RRO will be responsible for compliance to NERC for developing a methodology for identifying its operationally significant circuits and for identification of those operationally significant circuits. The SAR was modified to include these clarifications. - However, there are no requirements on the RRO in this standard. Specifically, where in the standards is the RRO required to identify lines/transformers critical to the reliability of the electric system? If it is even appropriate for the RRO to come up with the methodology, the



needed requirements on the RRO should include a requirement to develop the methodology in coordination with the RC, PA and the TO. (5) In 4.1.2 and 4.1.4, the words "as designated by the Regional Reliability Organization as critical to the reliability of the electric system" are not consistent with those used in the SAR (operationally significant circuits, etc.). (6) if during the largest blackout in US history, the existing system, group of standards, and relay set points separated the system in time to prevent significant equipment damage so that the system could be restored virtually without incident; then implications of changing relay setting philosophy should be studied carefully. For example, what is the time overload characteristic of wavetraps compared to line conductors? How will system operators know when equipment damage is imminent in order to take that equipment out of service on time?

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?

Explain why.

- Reference should be made a mandatory part of the standard
- Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

- (1) In its response to comments the Sar drafting team stated that

- the resulting standard to be developed will develop loadability requirements, not methods to satisfy the requirements -. The MRO agrees with this approach of the SAR drafting team. The reference document should not be made part of the standard because the how should be left up to the owner of the protection system. Also, a reference document will not be able to keep up to date with changing relay technology. The MRO recognizes the value of the reference document as a guide and the hard work that went into preparing it. (2) The reference document (Determination and Application of Practical Relaying Loadability Ratings, Version 1.0, August 14, 2006) states generator protection relays are excluded from requirements of this PRC-023-1 standard (Page 1, section 2.3, reference document). The attachment A (section 1.2.4) to standard PRC-023-1 states generator protection relays that are susceptible to load are excluded from requirements of this PRC-023-1 standard. Should the attachment A of the standard be consistent with the reference document for the standard? (3) The reference document (Determination and Application of Practical Relaying Loadability Ratings, Version 1.0, August 14, 2006) states on page 9 states 200% of aggregated generation nameplate capability when the standard lists 230% of aggregated generated nameplate capability. (section R1.6) Why is the standard 230% when its reference document uses 200%? (4) The reference document (Determination and Application of Practical Relaying Loadability Ratings, Version 1.0, August 14, 2006) states on page 14 "If an overcurrent relay is supervised by either a top oil or simulated winding hot spot element less than 100°C and 140 C respectively, justification for the reduced temperature must be provided." Where as in the standard (section R.11, last part), the standard states "Install supervision for the relays using either a top oil or simulated winding hot spot temperature element. The setting should be no less than 100 C for the top oil or 140°C for the winding hot stop temperature."

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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Shouldn't the reference document be consistent with the standard? (Where anything less than 100°C and 140 C would have justification associated with it.)

3. Are you aware of any regional differences that would be required as a result of this standard?

- Yes  
 No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

- Yes  
 No

If yes, please identify the conflict, being as specific as possible. However, there could be regulatory issues regarding, for example, vertical clearance issues, for the proposed overloading of lines.

5. Do you agree with the proposed effective dates?

- Yes  
 No

If no, please identify which effective date should be modified and identify why.

(1)The effective dates for lines operated at 100kV to 200 kV and transformers, as designated by the regional reliability organization as critical to the reliability of the electric system in the region should be one year after the regional reliability organization has made this designation. It would seem reasonable that owners should not be expected to even start review of the 100kV OS circuits until the Region has defined the specific circuits. A date that the RRO's are required to make this designation should be recommended by the SDT and added to the implementation plan. (2) Regarding implementation plan, one would have expected an implementation time frame of the stated durations strictly for identifying initial areas of non-compliance, and defining a plan to become compliant, with subsequent dates provided for becoming fully compliant. Eleven months after establishment of the standard is not a reasonable time frame for implementing all setting changes, and certainly not for design changes if required. It would appear that NERC are depending on all participants to have proceeded with reviews and actions as indicated in the initial zone 3 exercise. Perhaps regions/owners had every right to not proceed until the proposed standard is in force. Perhaps many of the efforts have proceeded, but should the proposed standard require that they all did?

6. Do you agree with the proposed violation risk factors?

- Yes  
 No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. TThe MRO feels that the more appropriate violation risk factor is medium because implementing this standard will not prevent the initiation of a blackout event.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**(1) The MRO has a concern with the 15% additional margin applied to the facility rating. This can be considered a negative margin wrt protecting against thermal overload. The SAR indicates that protection should not unnecessarily limit the loadability of the system, it does not state that protection should be sacrificed or removed. This approach is outside the intention of the SAR. Again it should be up to the equipment owner to assess the appropriate overloading philosophy.**

**(2) Does this standard expose the TO etc. to legal risk if there is damage to the public (violating virtual clearances for example)**

**(3) If we are relying on the operator to prevent overloads, are the associated metering, communication, and human machine interface systems (not to mention the human involvement) designed and maintained with equivalent reliability to the protection system? Also, the SCADA system may be down therefore the operator may not be able to assume the role of preventing equipment damage.**

**(4) There should be a classification that allows the transmission owners with stability limited lines to perform studies which allow relay settings to identify the conditions the relay will actual see under extreme conditions. The .85 pu voltage, and power factor angle of 30 degrees. criteria may not be appropriate for all cases.**

**(5) If you have too prescriptive a standard you may discourage people coming up with adaptive solutions.**

**(6) This standard removes the option of using zone three relays to provide more reliable system operation**

**(a) For internal lines – it may not be possible to set an out of step relay to block tripping on a true out of step condition. (Moving blinders in may make it impossible to detect fast moving swings)**

**(b) On interties: It may not be possible to set relays to detect fastest swing to be able to trip the tie – as a consequence, undesired tripping of other lines may occur.**

**(7) This standard seems to be precluding the concept of TO's etc. applying to use other settings than prescribed by this standard as was the case with zone 3 issue. A TO should be allowed to use relay settings other than based on the the prescribed criteria if it can be demonstrated there is no benefit to applying the prescribed criteria in a given situation but there is, in fact, a negative impact on the TO's system.**

**(8) R2.1 and R2.2 could be combined by adding 1.12 to the list in R2.1 and removing R2.2**

**(9) In M1 and M2 it should be further clarified what is meant by "evidence".**

**(11) In R2, why would it be necessary to get approval of the RRO and RC? If each criteria choice is valid, why is this necessary? This is unnecessary bureaucracy.**

**(10) Is the interpretation of R1 that the TO etc. could more that one criteria within their system?**

**(11) In Appendix A what is meant by: 1.2.3 Protection systems intended for protection during stable power swings?**

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<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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Yes

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Comments

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Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection: The IRC supports the separation of standards (i.e. mandatory requirements and measures) from Guidelines and Technical Documents. Unless the material in the Technical Requirement is required, then the Reference Document should be kept separate from the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

---

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**The IRC favors standards that define performance requirements and measure compliance based on that performance. The IRC questions the incorporation of difference Levels of Compliance based on the cause of the given performance.**

**NERC already has a process that includes Violation Risk Factors and Violation Severity Levels to 'adjust' non-compliance penalties. To include another subjective adjustment factor would seem to be inappropriate.**

**The IRC suggests that the SDT consider reversing the level orders for Level 3 and Level 4. From the language in the standard, the current Level 3 is more stringent than Level 4.**

**The IRC does not agree that the Reliability Coordinators should be included as a responsible entity for relay setting approvals (per R2, R2.1, R2.2, R2.3, and M2). The IRC notes that not all RCs have appropriate expertise in making such determinations and therefore suggests that the verification of relay settings is more appropriate at the Transmission Operator level. Further the Functional Model White Paper does not include any relay setting or authorization responsibilities for the RC.**



**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Makarand Nagle</b>	
Organization:	<b>Southwest Power Pool</b>	
Telephone:	<b>501-614-3564</b>	
E-mail:	<b>mnagle@spp.org</b>	
NERC Region		<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input checked="" type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
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<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

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## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**NERC should provide, as a part of the standard, the loadability verification spreadsheet(s) and technical exceptions documentation it wants for documentation purposes. There may be many differing opinions on what documentation is acceptable. However, NERC should have created forms/spreadsheets/papers for completion that satisfy their documentation for loadability requirements.**

**Although SPP agrees with the need for a protection loadability standard, we believe this standard should apply to only 345kV and above systems. Most companies with 345kV and above have a larger impact on wide area/multi-state blackouts. Although the 100 to 200 kV systems may be critical to a localized region, loss of those voltages will probably not spread into a multi-state blackout, provided the 345kV and above systems remain in service. There are other regional requirements for loading and line ratings that probably suffice for the localized regions.**

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Name:		
Organization:		
Telephone:		
E-mail:		
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<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
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**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The reference document should be made "voluntary" in order to preserve and maintain the clarity of the requirements within the standard. The current compliance programs are not designed to interpret and measure reference documents and therefore would make compliance enforcement to another "type" of document inappropriate, difficult and confusing, especially with regard to the technical nature of the content.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

---

Yes

No

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

R1 should be a "medium" risk factor because of the inherent potential of mis-applied settings affecting BES system performance. However, an incorrect relay setting or a mis-applied relay setting, by itself, is unlikely to lead to the effects on the BES as described in the definition of a "high" risk factor. For the setting to affect the BES to the degree as described in the definition of "high" risk factor, multiple other core operational requirements would have had to have been violated. Therefore, for a mis-applied setting to affect the overall reliable response of a system to a particular disturbance, the effects on the system would be a result of multiple requirement violations, including the lack of appropriate monitoring and analysis along with inadequate operator intervention at posturing an affected system,.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Section 2.3 and 2.4 should be swapped with regards to Levels of Non-Compliance. A mis-applied setting that was causal to a Reportable Disturbance appears to be the worst-case infraction and therefore should be the "Level 4" Non-compliance.**

**Has the drafting team considered the concept of "temporary exceptions" to the setting criteria ? One of the concerns expressed in our Region is that during certain system modifications, (ie. new lines, configuration changes, ampacity upgrades, etc) it may be necessary to deviate from the prescribed criteria on a temporary basis, so that the necessary relaying modifications may be made to accommodate the system changes? This type of "temporary exception" would allow construction implementation without racking up a violation, and still maintaining adequate equipment protection.**

**Lastly, has the drafting team considered adding a "grace" period for resolving self-identified non-compliances to the setting requirements of this standard? As an example a "non-compliant" setting that is self-identified would be reportable but would not result in a non-compliance violation if the settings were corrected within a certain time period.**

**We appreciate the team's rigorous efforts at creating this complex standard and also appreciate the opportunity to provide the above comments.**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Anita Lee</b>	
Organization:	<b>Alberta Electric System Operator</b>	
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E-mail:	<b>anita.lee@aeso.ca</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
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**Background Information:**

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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

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Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection: The AESO supports the separation of standards (i.e. mandatory requirements and measures) from Guidelines and Technical Documents. Unless the material in the Technical Requirement is required, then the Reference Document should be kept separate from the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

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If no, please identify which effective date should be modified and identify why. The effective date for the circuits described in 4.1.2 and 4.1.4 (transmission lines and transformers with low voltage terminal at 100 kV to 200 kV) should be a certain time period after the determination by the Regional Reliability Organization of such circuits, rather than the proposed fixed effective date of July 1, 2008. This will address the concern that some RROs may be late in making those determinations. It is also not clear as to where is the requirement for the RROs to make such determination and how often a review should be made

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
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<input type="checkbox"/> MAIN	<input type="checkbox"/>	5 — Electric Generators
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<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
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<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		





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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an 'Attachment' to the standard and made mandatory **or** provided as a 'Voluntary Reference' outside the standard to support implementing the standard?  
Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: Southern Company Transmission agrees with the explanation for this selection made by the SERC Protection and Control Subcommittee and the NERC System Protection and Control Task Force. Their explanations state, "It will be very difficult, if not impossible, to accurately apply the Standard without the Reference Document, but the Reference Document should be available to easily correct if necessary. However, the Standard should, either within a footnote or as a direct reference within the standard itself, call the user's attention to the existence of the Reference Document and the Reference should be posted with the Standard on the NERC Standards website."

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

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5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Southern Company Transmission supports the following portion of the comments made by the NERC System Protection and Control Task Force:**

**"Regarding Levels of Non-Compliance, we would suggest that the criteria for Level 3 and the criteria for Level 4 should be exchanged. A violation resulting in a Reportable Disturbance seems to be more serious than 'no evidence exists to support that relays comply with one of the criteria . . . .' The existing Level 3 should also be 'causal or contributory' instead of just 'causal'. It would also seem that a non-compliance with the relay loadability criteria (either evidentiary or on the physical relay), whether causal to a Reportable Disturbance or not, should be identified within the Levels of Non-Compliance. Perhaps, this should be reflected by 'Evidence indicates that relay settings do not comply with R1.1 through R1.13' as a Level 4 non-compliance.**

**Regarding R1 - The phrase 'The relay performance shall be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees' should more clearly state that it applies only to RELAYS sensitive to voltage and/or power factor angle.**

**Editorial Comments - In R2 and M2, 'Requirement 13' should be 'R1.13'. Also, in R2.2, R2.3, and M2, please use a consistent reference to various requirements; either 'Requirement . . . ' or 'R . . . .'"**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:		<b>Michael Calimano</b>
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NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?  
Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: The maintenance of the reference manual is preferred. As we go forward the SPCTF or similar can make changes/revisions without going through the NERC Process each time.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No



## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**The NYISO also supports the IRC comment that the Reliability Coordinators should not be included as a responsible entity for relay setting approvals (per R2, R2.1, R2.2, R2.3, and M2).**

**Also, guidance on applying the standard to "switch on to fault" SOTF should be provided in the reference document.**

**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>John Bussman</b>	
Organization:	<b>AECI</b>	
Telephone:	<b>417-885-9216</b>	
E-mail:	<b>jbussman@aeci.org</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/>	2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/>	3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/>	4 — Transmission-dependent Utilities
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<input type="checkbox"/> MRO	<input type="checkbox"/>	6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input checked="" type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments Basically they do, however AECI does not believe that .85 pu for calculations is necessary. Our standards used 1.0 pu.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: Everyone needs to set their relays with consistency throughout the region. This will ensure that the way the settings are calculated will be the same for all regions. Any change to the reference will require a change to the standard.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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If no, please identify which effective date should be modified and identify why. The Transmission owners need enough time to prepare the calculation, determine setting and plan setting changes within their region. One year after board approval should be enough time.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**See SERC comments for the Level of non compliance section comments.**

**In R1. We are not sure of the basis for the .85pu voltage and 30 degrees phase angle.**

**R1.3.1 Agree with the SERC comment of the inconsistency of .85 vs 1.0 pu.**

**Agree with SERC comments regarding R1.6 R1.9 and R2**

**R1.5 We are concerned on how the transmission line being fed from a "weak source" can be protected if the line relays are set to not operate at or below 170% of the maximum end-of-line three-phase fault magnitude. It would seem that if a fault condition did exist at the end of the line, the relay would not clear this fault and would just serve it as load. More clarification is required regarding this setting**

**How does this standard apply to tapped lines that are greater than 200KV when the relays are set to trip the tapped line however not the main feeder line.**

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<b>Individual Commenter Information</b>		
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Organization:		
Telephone:		
E-mail:		
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input type="checkbox"/>	1 — Transmission Owners
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<input type="checkbox"/> NPCC	<input type="checkbox"/>	7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/>	8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/>	9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC		
<input type="checkbox"/> NA — Not Applicable		





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**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments PHI supports the complete set of comments of the NERC System Protection and Control Task Force (SPCTF) for this standard. We will not repeat them in our comments.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection:

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**See SPCTF comments**

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<b>Individual Commenter Information</b>		
<b>(Complete this page for comments from one organization or individual.)</b>		
Name:	<b>Roger Champagne</b>	
Organization:	<b>Hydro-Québec TransÉnergie</b>	
Telephone:	<b>514 289-2211 X 2766</b>	
E-mail:	<b>champagne.roger.2@hydro.qc.ca</b>	
NERC Region	<input type="checkbox"/>	<b>Registered Ballot Body Segment</b>
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/>	1 — Transmission Owners
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<input type="checkbox"/> WECC	<input type="checkbox"/>	
<input type="checkbox"/> NA — Not Applicable	<input type="checkbox"/>	



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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?  
Explain why.

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3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

---

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Hydro-Québec TransÉnergie (HQTÉ) is concerned about the Applicability of the standard (section A 4.1). It appears the standard applies to elements based solely on their voltage level.**

**It should be clarified that the standard applies only to BPS equipments. As a member of NPCC, HQTÉ have been using a performance based criteria to determine such equipments rather than using the voltage level.**

**HQTÉ has also an issue about some specific application of the standard.**

**In particular, for a portion of our 315 kV system, the standard as written cannot be complied with for technical reasons due to the system characteristics. We had to apply for technical exception.**

**Also, in relation to the hot spot winding protection for all 735 kV transformers, HQTÉ practice for overloading those transformers imposes additional safety margins than what is proposed in IEEE C57.91 -1995. Again, HQTÉ will have to apply for technical exception.**

**These technical exceptions will not affect the reliability of the system.**

**The standard should be less specific to allow for such technical conditions. If technical exceptions are permitted, this should be indicated in the standard.**

**HQTÉ suggest the addition of two more elements in item 1.2 of Attachment A:**

**1) Relay elements associated with DC lines**

**2) Relay elements associated with transformers at converter station.**



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**Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

**Group Comments (Complete this page if comments are from a group.)**

Group Name: **SCE&G ERO Working Group**  
 Lead Contact: **Sally Ballentine Wofford**  
 Contact Organization: **South Carolina Electric & Gas Company**  
 Contact Segment: **Transmission**  
 Contact Telephone: **803-217-9343**  
 Contact E-mail: **sbwofford@scana.com**

<b>Additional Member Name</b>	<b>Additional Member Organization</b>	<b>Region*</b>	<b>Segment*</b>
Lee Xanthakos	South Carolina Electric & Gas Co	SERC	1
Hubert C. Young	South Carolina Electric & Gas Co	SERC	3
Richard Jones	South Carolina Electric & Gas Co	SERC	5
Henry Delk	South Carolina Electric & Gas Co	SERC	
Jonh T. Blalock	South Carolina Electric & Gas Co	SERC	
Dan Goldston	South Carolina Electric & Gas Co	SERC	
Todd Johnson	South Carolina Electric & Gas Co	SERC	
Jay Hammond	South Carolina Electric & Gas Co	SERC	
Phil Kleckley	South Carolina Electric & Gas Co	SERC	
Pat Longshore	South Carolina Electric & Gas Co	SERC	
Simon Shealy	South Carolina Electric & Gas Co	SERC	
Bob Smith	South Carolina Electric & Gas Co	SERC	
Andy Bowden	South Carolina Electric & Gas Co	SERC	
Arnie Cribb	South Carolina Electric & Gas Co	SERC	
Marion Frick	South Carolina Electric & Gas Co	SERC	
Ernie Gibbons	South Carolina Electric & Gas Co	SERC	
Jerry Lindler	South Carolina Electric & Gas Co	SERC	
Wayne Stuart	South Carolina Electric & Gas Co	SERC	
Brad Stokes	South Carolina Electric & Gas Co	SERC	
Shawn McCarthy	South Carolina Electric & Gas Co	SERC	
Ernie Mehaffey	South Carolina Electric & Gas Co	SERC	
Rick Lytle	South Carolina Electric & Gas Co	SERC	

\* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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**Please Enter All Comments in Simple Text Format.**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

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Explanation for selection: Without the reference document, it will be very difficult to accurately apply the standard. At the minimum, the Standard should clearly provide reference to Reference Document. The following question should be asked: Will auditors judge compliance with the Standard by applying the Reference Document? If so, maybe the Reference Document should be included in the standard. The only reason this commentor did not check the other box (reference part of the standard) is to avoid encumbering clarification/correction of the reference document when needed.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

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5. Do you agree with the proposed effective dates?

## Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability

---

Yes

No

If no, please identify which effective date should be modified and identify why. Utilities should be given more time, at least 2 years after BOT approval, to meet these requirements. One year to budget and plan and another year to implement

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

### **Requirements Section:**

**R1 Opening paragraph: "The relay performance shall be evaluated at 0.85 per unit voltage and a power factor angle of 30 degrees. Suggest that this sentence be clarified to state that it applies only to relays sensitive to voltage and/or power factor angle.**

**R1.2.1 and R1.3.2 Reference Document - The calculation of maximum power transfer at 1.0 per unit seems to be inconsistent with the use of 0.85 pu voltage for the relay load limit.**

**R1.5 Reference Document - More explanation is needed to avoid confusion.**

**R2 In the text of R2, R.13 should be R1.13. R2.1 and R2.2 appear to be easily combined.**

### **Non-Compliance Levels**

**Suggest that non-compliance levels 3 & 4 be exchanged. It seems that non-compliance resulting in a reportable disturbance is more serious than ....evidence does not support....**

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Yes

No

Comments

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard?

Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: PJM supports the separation of standards (i.e. mandatory requirements and measures) from Guidelines and Technical Documents.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why. A risk factor of High for a requirement that is related to a methodology seems excessive. Not using the suggested criteria will not de facto cause instability or cascading et al.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**Level 2 needs to be reworded . Level 2 implies "that evidence of COMPLIANCE exists" then states that the evidence is incomplete. Either it is compliant or it is incomplete.**

**The Level 3 and Level 4 non compliance seems to be reversed. Level 3 seems to be related to a more adverse result than does Level 4.**

**Reliability Coordinators are responsible for relay setting approvals (per R2, R2.1, R2.2, R2.3, and M2). The verification of relay settings is more appropriate at the Transmission Operator level.**

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NERC Region	Registered Ballot Body Segment
<input type="checkbox"/> ERCOT	<input checked="" type="checkbox"/> 1 — Transmission Owners
<input type="checkbox"/> ECAR	<input type="checkbox"/> 2 — RTOs, ISOs, Regional Reliability Councils
<input type="checkbox"/> FRCC	<input type="checkbox"/> 3 — Load-serving Entities
<input type="checkbox"/> MAAC	<input type="checkbox"/> 4 — Transmission-dependent Utilities
<input type="checkbox"/> MAIN	<input type="checkbox"/> 5 — Electric Generators
<input checked="" type="checkbox"/> MRO	<input type="checkbox"/> 6 — Electricity Brokers, Aggregators, and Marketers
<input type="checkbox"/> NPCC	<input type="checkbox"/> 7 — Large Electricity End Users
<input type="checkbox"/> SERC	<input type="checkbox"/> 8 — Small Electricity End Users
<input type="checkbox"/> SPP	<input type="checkbox"/> 9 — Federal, State, Provincial Regulatory, or other Government Entities
<input type="checkbox"/> WECC	
<input type="checkbox"/> NA — Not Applicable	



**Background Information:**

Protective relays have often contributed to system disturbances including the Northeast Blackout of 1965, and the Blackout of August 14, 2003. The 2003 blackout analyses showed that relay loadability played a pivotal role in accelerating and spreading the early part of the cascade in Ohio and Michigan. Although the U.S.-Canada Power System Outage Task Force focused on the role played by “zone 3” relays, it was later found that other phase-distance and over-current relays also contributed to the cascade.

The purpose of the proposed Standard is to ensure that protection systems and settings will neither limit transmission loadability, nor contribute to cascading outages.

NERC’s System Protection and Control Task Force produced a reference document to assist entities in understanding the standard. You are encouraged to read the reference document with the standard before responding to the comments on the Transmission Relay Loadability standard. If you have comments on the SPCTF’s Transmission Relay Loadability reference document, please e-mail those comments in a separate Word document to [sarcomm@nerc.com](mailto:sarcomm@nerc.com) with the words “Relay Loadability Comments” in the subject line.

**Please Enter All Comments in Simple Text Format.**

1. Do you feel that the requirements stated in this standard accurately address the industry action generally referred to as the “NERC Recommendation 8a Review” and the “Protection System Review Program – Beyond Zone 3”. Recommendation 8a called for all transmission owners to evaluate the zone 3 relay settings on all transmission lines operating at 230 kV and above for the purpose of verifying that each zone 3 relay is not set to trip on load under extreme emergency conditions. These activities included a review of all transmission protection systems relative to provided criteria and correction of those systems that did not conform to the criteria. The criteria established for those review activities are the genesis of this standard.

Yes

No

Comments R1.6 through R1.13 will need have a closer look to see if they match NERC 8A. Plus, at the moment the MRO does not not want to define the critical lines.

2. Do you believe the Transmission Relay Loadability Standard Reference Document should be incorporated as an ‘Attachment’ to the standard and made mandatory **or** provided as a ‘Voluntary Reference’ outside the standard to support implementing the standard? Explain why.

Reference should be made a mandatory part of the standard

Reference should be made available as a voluntary reference without mandatory compliance

Explanation for selection: Reference documents are too specific.

3. Are you aware of any regional differences that would be required as a result of this standard?

Yes

No

If yes, please identify the regional difference. Special protection schemes, system stability criteria, varying operating procedures.

4. Are you aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement or agreement?

Yes

No

If yes, please identify the conflict, being as specific as possible.

5. Do you agree with the proposed effective dates?

Yes

No

## **Comment Form for 1<sup>st</sup> Draft of Standard PRC-023-1 — Transmission Relay Loadability**

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If no, please identify which effective date should be modified and identify why.

6. Do you agree with the proposed violation risk factors?

Yes

No

If no, please identify which requirement's risk factors you disagree with and identify what you think the risk factor should be and why.

7. If you have other comments or specific suggestions for improvements to this standard that you have not already made, please provide them here:

**7a. The purpose (A3) should change from, "Protective relay settings shall not limit transmission loadability." to, "In most cases Protective relay settings should not limit transmission line loadability." There are a-typical applications where relays need to limit the loadability of a line.**

**7b. We need a better method to apply for an exception.**

**7c. In R.1.11 and the second method to set relays. The temperatures for the top oil and winding hot spot should be expressed as % of transformer insulation.**

**7d. R2.1 & R2.2 should be combined.**

**7e. In CM2, the relays should be set according to the criteria in R1.6, R1.7, R1.8, R1.9, R1.12, or R1.13.**

**7f. In the attachment A, the main sentence should have the "trip" reference removed to read, "This standard addresses any protective functions which could operate with or without time delay, on load current, including but not limited to:" This change in the verb would agree with protective function 1.1.3 out-of-step blocking.**

**7g. In D2.1.1, "..., or R.13 ..." should change to "..., or R1.13 ...".**