PAR for a New IEEE Standard

Section 1

1.1 Assigned Project Number:

1.2 **Type of Document: *Guide***

1.3 Life Cycle: *Full Use*

Section 2

2.1 Project Title:

Guide for the Application of Alternating Current (AC) High-voltage (Rated above 72.5 kV) Short-circuit-current-restricting Circuit Breakers

Section 3

3.1 Working Group:

3.2 Sponsoring Society and Committee:

3.3 Joint Sponsor:

Section 4

4.1 Sponsor Balloting Information: entity

4.2 Expected Date of Submission of Draft to the IEEE-SA for Initial Sponsor Ballot

Month: April **Year:** 2023

4.3 Projected Completion Date for Submittal to RevCom

Month: October **Year:** 2023

Section 5

5.1 Approximate number of people expected to be actively involved in the development of this project: 5

5.2 Scope of the proposed standard:

This guide specifies the condition of use, rated values, design and structure, type tests, factory tests, selection guidelines, installation and operation rules for AC high-voltage short-circuit-current-restricting circuit breakers.

This guide is applicable to the AC high-voltage short-circuit-current-restricting circuit breakers which are designed for indoor or outdoor use in AC power systems with voltage level above 72.5 kV.

5.3 Is the completion of this standard contingent upon the completion of another standard? No

5.4 Will this document contain a Purpose clause? Yes

If yes, enter the purpose of the proposed standard:

The expansion on power grids gradually lifts the level of short-circuit current for which some nodes has already exceeded the breaking capacity of the routine circuit breakers. Thus, the AC high-voltage short-circuit-current-restricting circuit breaker is introduced to disconnect the power grids after a power system failure occurs before the conventional ones could intervene. The quick disconnection reduces the short-circuit current at the failure point therefore the conventional circuit breaker is able to handle the limited short-circuit current afterwards. It is proved that the level of short-circuit current can be reduced by more than 40% by using this special circuit breaker. In this way, the utilization of AC high-voltage short-circuit-current-restricting circuit breaker provides a practical solution to the issue of excessive short-circuit current.

As the demand of performance altered, the existing technical standards which focus on regular high-voltage circuit breakers are not applicable for the AC high-voltage short-circuit-current-restricting circuit breaker. Therefore the necessity on developing a new standard to provide basis and criteria for the design, test and engineering application for such circuit breakers is emerging.

5.5 Need for the project:

Generally speaking, there are four technical schemes on encountering short-circuit current excessiveness: outage of power lines, separated operation of substation busbar, installation of current-limiting reactors and, as this project expects to focus on, the utilization of AC high-voltage short-circuit-current-restricting circuit breakers. The AC high-voltage short-circuit-current-restricting circuit breaker is proved one of the most promising solutions corresponding to the short-circuit current issue and have already been applied to some engineering projects which illustrates a great application prospects and market demand.

Consequently, with the booming use of AC high-voltage short-circuit-current-restricting circuit breakers, the lack of relevant standards will cause a variety of problems such as conflicting product requirements, poor interchangeability, and unclear application methods in the promotion process, which could seriously hinder the application. Therefore a new guidance is to be developed urgently, in which the structural design, technical parameters, test requirements and selection guidance are to be standardized. Hence an application basis for equipment

manufacturers, power grid enterprises and technology R&D institutes is provided. Meanwhile, the further improvement for power grid's ability to withstand short-circuit current be guided.

5.6 Stakeholders for the standard:

Power grid enterprises, equipment manufacturers, equipment operation and maintenance companies, technology R&D institutes who are interested in short-circuit-current-restricting equipment and technology will benefit from this guide.

Section 6

6.1 Intellectual Property:

A. Is the Sponsor aware of any copyright permissions needed for this project? ***No***

B. Is the Sponsor aware of possible registration activity related to this project? ***No***

Section 7

7.1 Are there other standards or projects with a similar scope? ***Yes***

For conventional high-voltage circuit breakers and some special-purpose high-voltage circuit breakers, such as generator circuit breakers, there are relatively mature standards and specifications worldwide. However, the standardization of AC high-voltage short-circuit-current-restricting circuit breakers is still in a blank stage, whether in terms of the technical indicators, or the application requirements of the equipment. Currently, the relevant standards and projects are as follows:

(1) IEEE C37.04-2018 - IEEE Standard for Ratings and Requirements for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V

Sponsor Organization: IEEE

Project/Standard Number:C37.04

Project/Standard Date:2018

Project/Standard Title: IEEE Standard for Ratings and Requirements for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V

This standard applies to AC high-voltage circuit breakers with rated nominal voltage above 1000 V. A rating structure, preferred ratings, construction and functional component requirements are given in the standard. However, the relevant content of AC high-voltage short-circuit-current-restricting circuit breakers has not been included.

(2) IEEE C37.09-2018 IEEE Standard Test Procedures for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V

Sponsor Organization: IEEE

Project/Standard Number:C37.09

Project/Standard Date:2018

Project/Standard Title: IEEE Standard Test Procedures for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V

This standard applies to conventional AC high-voltage circuit breakers with rated maximum voltage above 1000 V. It defines various tests that are made on AC high-voltage circuit breakers. It specifies the tests and describes the accepted methods used to verify assigned ratings. It also describes the test procedures associated with production and field installation. The special tests for AC high-voltage short-circuit-current-restricting circuit breakers are not included in the standard.

(3) IEEE C37.122-2010 - IEEE Standard for High Voltage Gas-Insulated Substations Rated Above 52 kV

Sponsor Organization: IEEE

Project/Standard Number:C37.122

Project/Standard Date:2010

Project/Standard Title: IEEE Standard for High Voltage Gas-Insulated Substations Rated Above 52 kV

This standard establishes ratings and requirements for planning, design, testing, installation, and operation of gas-insulated substations for alternating-current applications above 52 kV. Typical installations are assemblies of specialized devices such as circuit breakers, switches, bushings, buses, instrument transformers, cable terminations, instrumentation and controls, and the gas-insulating system. This standard does not apply to special-purposed equipment such as AC high-voltage short-circuit-current-restricting circuit breakers.

(4) IEC 62271-1-2017 High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear

Sponsor Organization: IEC

Project/Standard Number:62271-1

Project/Standard Date:2017

Project/Standard Title: High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear

This standard is the general guideline of the IEC 62271 series standards. It applies to AC switchgear and controlgear designed for indoor and/or outdoor installation and for operation at service frequencies up to and including 60 Hz and having rated voltages above 1 000 V.However, the IEC 62271 series standards only specify the requirements for some conventional circuit breakers, and do not involve AC high-voltage short-circuit-current-restricting circuit breakers.

(5) IEC 62271-100 High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers

Sponsor Organization: IEC

Project/Standard Number:62271-100

Project/Standard Date:2017

Project/Standard Title: High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers.

This standard is a special guideline of the IEC 62271 series standards. It is applicable to AC circuit-breakers designed for indoor or outdoor installation and for operation at frequencies of 50 Hz and 60 Hz on systems having voltages above 1 000 V. It is only applicable to three-pole circuit-breakers for use in three-phase systems and single-pole circuit-breakers for use in single-phase systems. This standard does not cover AC high-voltage short-circuit-current-restricting circuit breakers.

(6) IEEE/IEC 62271-37-013-2015 IEEE/IEC International Standard for High-voltage switchgear and controlgear -- Part 37-013: Alternating-current generator circuit-breakers

Sponsor Organization: IEEE/IEC

Project/Standard Number:62271-37-013

Project/Standard Date:2015

Project/Standard Title: IEEE/IEC International Standard for High-voltage switchgear and controlgear -- Part 37-013: Alternating-current generator circuit-breakers.

This standard is for a special-purpose circuit breaker. It specifies the technical requirements for high voltage AC circuit breakers used in generator terminals. This standard is also applicable to

the operating mechanisms of generator circuit-breakers and to their auxiliary equipment, but is not applicable to AC high-voltage short-circuit-current-restricting circuit breakers.

(7) IEEE C37.012-2014 - IEEE Guide for the Application of Capacitance Current Switching for AC High-Voltage Circuit Breakers Above 1000 V

Sponsor Organization: IEEE

Project/Standard Number: C37.012

Project/Standard Date:2014

Project/Standard Title: IEEE Guide for the Application of Capacitance Current Switching for AC High-Voltage Circuit Breakers Above 1000 V.

This standard is for a special-purpose circuit breaker. The application guide addresses the general theory of capacitance current switching; and the notions of restrike, re-ignition, non-sustained disruptive discharge. Voltage factors used for single-phase testing as substitute for three-phase testing are explained. Application of circuit breakers for different network conditions and different capacitive loads is treated. This standard does not cover AC high-voltage short-circuit-current-restricting circuit breakers.

7.2 Joint Development - Is it the intent to develop this document jointly with another organization? ***No***

7.3 International Standards Activities

A. Adoptions - Is there potential for this standard to be adopted by another organization?: ***No***

B. Harmonization - Are you aware of another organization that may be interested in portions of this document in their standardization development efforts?:

No

7.4 Does the sponsor foresee a longer term need for testing and/or certification services to assure conformity to the standard? ***Yes***

Additionally, is it anticipated that testing methodologies will be specified in the standard to assure consistency in evaluating conformance to the criteria specified in the standard? ***Yes***

Section 8

8.1 Additional Explanatory Notes:

8.2 IEEE Code of Ethics

I acknowledge that I have read and I understand the IEEE Code of Ethics

I agree to conduct myself in a manner that adheres to the IEEE Code of Ethics when engaged in official IEEE business.