IEEE STANDARDS ASSOCIATION

IEEE Recommended Practice for the Investigation of Events at Nuclear Facilities

IEEE Power and Energy Society

Sponsored by the
Nuclear Power Engineering Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

IEEE Std 1707™-2015

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Documents
Document Sharing Hub
Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE 1707-2015

IEEE Recommended Practice for the Investigation of Events at Nuclear Facilities

Sponsor

Nuclear Power Engineering Committee
of the
IEEE Power and Energy Society

Approved 28 October 2015

IEEE-SA Standards Board

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Abstract: Common terminology and recommended practices for initiating and conducting event investigations, analyzing data, producing results, and identifying corrective actions associated with facility personnel, processes, equipment, and systems at nuclear facilities are provided in this document. The scope of event investigation activities addressed includes, but is not limited to, root cause analysis, which is an in depth investigation process used to identify primary causes of an event based on the systematic and consistent use of analysis tools. This recommended practice can be used for the investigation of all events and allows the use of a graduated approach to the depth of the investigation based upon the event significance.

Keywords: event investigation, IEEE 1707™, nuclear, root cause

---

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2015 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 30 December 2015. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-0-7381-9983-2 STD20418
Print: ISBN 978-0-7381-9984-2 STDPD20418

IEEE prohibits discrimination, harassment, and bullying.
For more information, visit http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading "Important Notice" or "Important Notices and Disclaimers Concerning IEEE Standards Documents."

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association ("IEEE-SA") Standards Board. IEEE ("the Institute") develops its standards through a consensus development process, approved by the American National Standards Institute ("ANSI"), which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied "AS IS" and "WITH ALL FAULTS."

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at http://ieeexplore.ieee.org/xpl/standards.jsp or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at http://standards.ieee.org.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: http://standards.ieee.org/findstds/errata/index.html. Users are encouraged to check this URL for errata periodically.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at http://standards.ieee.org/about/sasb/patcom/patents.html. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Participants

At the time this IEEE recommended practice was completed, the SC 5.5 Lessons Learned Working Group had the following membership:

Julius Persensky, *Chair*
Christopher Kerr, *Co-Chair*
Kay Wilde Palmer, *Vice Chair*

Carl Allesandro
Terry Bartley
Dorian Conger
William Corcoran
Robert Fisher
Richard Foote
Felicity Harrison
Alex House
Angie Kozak
Jack Martin
Graem Meteer
Mark Paradies
Robert Shular
Olivier St-Cyr
Pierre Tanguay
Tracy Theesfeld
Paul Wong

The following members of the individual balloting committee voted on this recommended practice. Balloters may have voted for approval, disapproval, or abstention.

William Ackerman
Satish Aggarwal
Robert Aiello
George Ballassi
William Bloethe
Daniel Brosnan
Robert Carruth
Tom Crawford
Paul Croll
John Disosway
Stephen Fleger
Keith Flowers
Robert Fuld
Randall Groves
Ajit Gwal
Daryl Harmon
Hamidreza Heidarisafa
Werner Hoelzl
Piotr Karocki
Christopher Kerr
Thomas Koshy
Omar Mazzoni
Michael Newman
Ted Riccio
John Stevens
Eugene Stoudenmire
John Vergis
Robert Waters
Kenneth White

When the IEEE-SA Standards Board approved this recommended practice on 28 October 2015, it had the following membership:

John D. Kulick, *Chair*
Jon Walter Rosdahl, *Vice Chair*
Richard H. Hulett, *Past Chair*
Konstantinos Karachalios, *Secretary*

Masayuki Ariyoshi
Ted Burse
Stephen Dukes
Jean-Philippe Faure
J. Travis Griffith
Gary Hoffman
Michael Janezic
Joseph L. Koepfinger*
David J. Law
Hung Ling
Andrew Myles
T. W. Olsen
Glenn Parsons
Ronald C. Petersen
Annette D. Reilly
Stephen J. Shellhammer
Adrian P. Stephens
Yatin Trivedi
Phillip Winston
Don Wright
Yu Yuan
Daidi Zhong

*Member Emeritus

Copyright © 2015 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Introduction

This introduction is not part of IEEE Std 1707™-2015, IEEE Recommended Practice for the Investigation of Events at Nuclear Facilities.

IEEE Subcommittee 5 on Human Factors, Control Facilities and Human Reliability (SC5), a unit of the IEEE Nuclear Power Engineering Committee (NPEC), has developed and maintained human factors engineering standards for nuclear facilities since the early 1980s. SC5 has structured its standards in a hierarchical fashion. The top-level SC5 guidance document is IEEE Std 1023™, IEEE Recommended Practice for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations and Other Nuclear Facilities. IEEE Std 1023 promotes the systematic integration of human performance considerations in the life cycle of commercial nuclear power stations and other nuclear facilities. IEEE Std 1023 is supported by additional standards written to address specific technical needs. IEEE Std 1707 is an additional standard that provides a recommended practice to establish the characteristics of an acceptable approach to event investigations. Such investigations can serve as part of the basis for operating experience reviews needed to support IEEE Std 1023. The need for a Corrective Action Program at nuclear facilities is discussed in regulations (e.g., 10 CFR Part 50, Appendix B, criterion XVI). The investigation process in IEEE Std 1707 provides one framework for implementing such programs. In addition, this process aligns with the event investigation section of the voluntary guidance of OSHA Safety and Health Program Management Guidelines (Federal Register 54:3904-3916), which supports 29 CFR 1910 requirements.

This recommended practice provides the nuclear industry a common approach for planning, conducting, and reporting event investigations. It includes definitions and elements for corrective action plans. Staff and management at nuclear facilities who complete event investigations and those evaluating event investigation reports can use the document to fulfill their respective roles. Event investigation reports serve a key role for sharing event information within the facility conducting the investigation, as well as among similar facilities and by the organizations charged with evaluating the event investigations. It is important that reports include sufficient information in a manner that allows for a common understanding of event causation. This recommended practice focuses not only on specific causes, but on the entire organizational infrastructure's role in events. The investigation reports also can be used to focus on needed improvements in personnel, processes, and system and equipment performance.

This recommended practice identifies seven elements of an acceptable event investigation including the following:

a) Establishing roles and responsibilities (see 4.1)

b) Planning (see 4.2)

c) Information gathering and analysis (see 4.3)

d) Cause determination (see 4.4)

e) Corrective action plan (see 4.5)

f) Investigation report (see 4.6)

g) Records (see 4.7)

This document is intended to be used by personnel at nuclear power plants, nuclear fuel processing plants, research and test reactors, and at nuclear materials production reactors to implement an acceptable event investigation process and by regulators whose job it is to assure that a robust event reporting system is being applied.

Copyright © 2015 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

Contents

1. Overview 1
1.1 Scope 1
1.2 Overview of event investigation process 1

2. Normative references 3

3. Definitions 3

4. Event investigation process 4
4.1 Establishing roles and responsibilities 4
4.2 Planning 6
4.3 Information gathering and analysis 9
4.4 Cause determination 14
4.5 Corrective action plan 17
4.6 Investigation report 19
4.7 Records 21

Annex A (informative) Bibliography 23

Annex B (informative) Common cause evaluations 25
B.1 General 25
B.2 Common cause analysis approach 25
B.3 Common cause analysis methodology 25

Copyright © 2015 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

IEEE Recommended Practice for the Investigation of Events at Nuclear Facilities

IMPORTANT NOTICE: IEEE Standards documents are not intended to ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notice" or "Important Notices and Disclaimers Concerning IEEE Documents." They can also be obtained on request from IEEE or viewed at http://standards.ieee.org/IPR/disclaimers.html.

1. Overview

1.1 Scope

This document provides common terminology and recommended practices for initiating and conducting event investigations, analyzing data, producing results, and identifying corrective actions associated with facility personnel, processes, equipment, and systems at nuclear facilities.

1.2 Overview of event investigation process

The event investigation process provides a systematic and complete framework for investigating events and their causes consistently. The threshold for a root cause investigation should be based on the level of risk, which is a function of the probability of recurrence (assuming no corrective actions) and consequence of the event (actual and potential). For example, a high consequence event with a high probability of recurrence is a high risk event requiring a root cause analysis.

Figure 1 provides a graphical view of the steps of an event investigation and refers to the applicable clauses of this document where the topic is discussed as follows:

— Planning (4.2): The important aspects of this step are early actions (remedial actions, preservation of evidence), investigation team formation, and charter development.

— Information gathering and analysis (4.3): Success in determining the cause(s) of an event requires obtaining factual information that supports analysis to conclusively explain what occurred and why it occurred. This includes extent of condition and operating experience reviews, as well as use of data analysis to support cause determination.

Copyright © 2015 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE 1707-2015

— Cause determination (4.4): The gathered information is then systematically analyzed through the use of facility approved methods as a means of determining the cause(s) of the event. The factually-based analysis provides a direct link between the event itself and the cause(s).

— Corrective action plan (4.5): Provides a specific set of the actions targeted to address the adverse conditions associated with the event as well as its causes, extent of condition, and extent of cause.

— Investigation report (4.6): Conveys the results of an investigation in a manner that enables management to make informed decisions. The first phase is for initial review and approval of the completed report, while the second phase is an assessment of corrective action effectiveness.

— Records (4.7): Investigation reports and associated information should be retained in accordance with company requirements and in some cases, reports may be required to be maintained as quality records based upon regulatory and industry requirements (e.g., NRC 10 CFR Part 50 Appendix B [B1][1]).

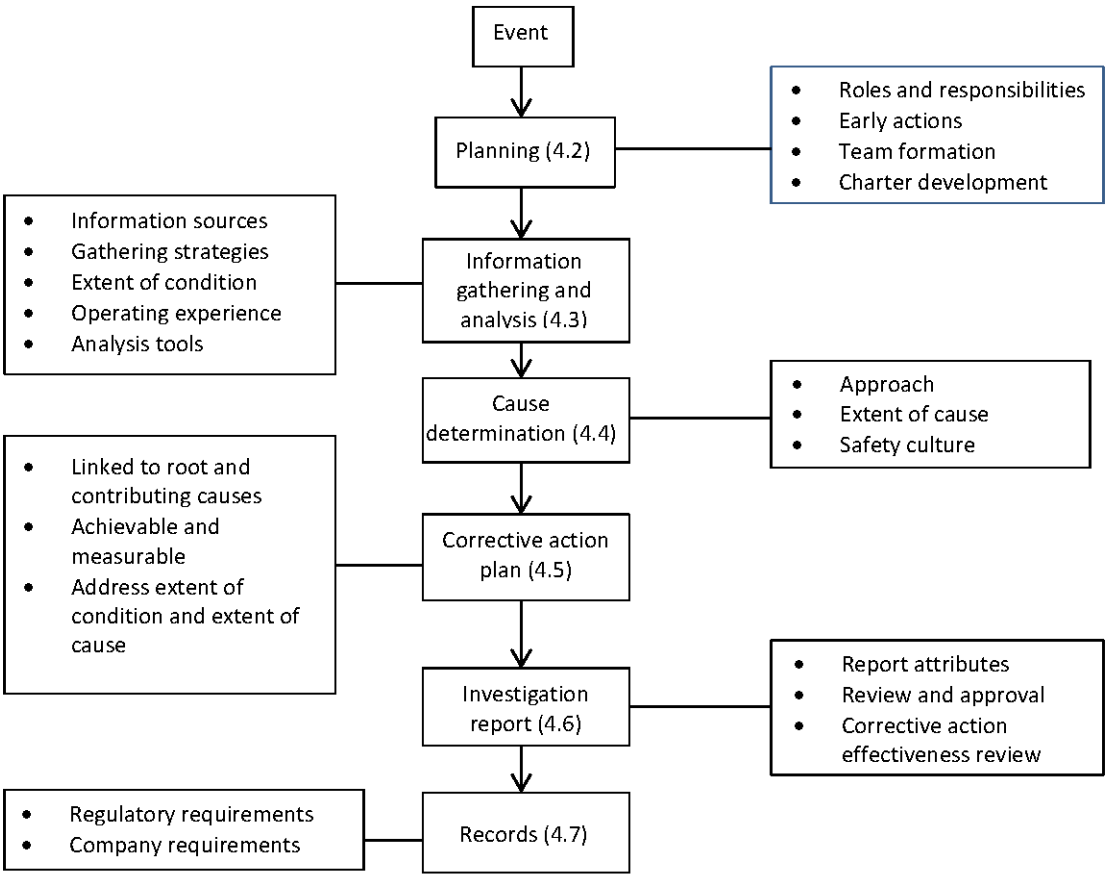

Figure 1—Event investigation process

Figure 1 shows the process for event investigation activities is based on a root cause analysis approach, which is an in-depth investigation process used to identify primary causes of an event based on the systematic and consistent use of analysis tools. This recommended practice can be used as a framework for the investigation of all events, but this document will only focus on events requiring a root cause analysis.

[1]The numbers in brackets correspond to those of the bibliography in Annex A.

Copyright © 2015 IEEE. All rights reserved.
Documents
Document Sharing Hub
Authorized licensed use limited to: Tsinghua University. Downloaded on February 24,2026 at 23:31:06 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE 1707-2015