A. Introduction

Common cause failures within the digital protection system might result in unacceptable consequences for certain combinations of common cause failures and postulated initiating events. When this situation is encountered, a diverse actuation system is often provided to act as a backup for the main digital reactor protection system.

There is general agreement that a diverse actuation system can effectively mitigate the consequences of specific postulated initiating events in conjunction with a postulated common cause failure of a digital reactor protection system. There are, however, various approaches to the safety classification of instrumentation and control (I&C) systems and to the use of analogue or digital components with different attributes in the design of a diverse actuation system so as to reduce the possibility of
common cause failure, including common mode failure of the reactor protection system. The design criteria for a diverse actuation system vary among countries and a consensus on adequate level of diversity has not been established yet.

The International Atomic Energy Agency (IAEA) is preparing a new IAEA Technical Document (TECDOC) provisionally entitled Developing Design Criteria for a Diverse Actuation System for Nuclear Power Plants, which intends to provide, based on Member States’ current practices, common criteria for the design and implementation of a diverse actuation system as a backup system for a nuclear power plant’s (NPP’s) digital reactor protection system.

B. Objectives

B.1. Purpose

The purpose of the meeting is to provide an opportunity for the exchange of information, knowledge and experience, and to raise awareness of issues and good practices among key interested parties, including utility engineers, operators, researchers, managers, and personnel responsible for all aspects of design and implementation of I&C safety systems. This meeting will also benefit regulators who are involved in establishing requirements for I&C systems that are important to safety.

Specifically, the meeting will focus on the concept of diversity in I&C system architecture and, based on Member States’ current practices, on various approaches to the safety classification of I&C systems and to the use of analogue or digital components with different attributes in the design of a diverse actuation system so as to reduce the possibility of common cause failure, including common mode failure of the reactor protection system.

The participants will be given the opportunity to review the draft TECDOC and to provide their observations and comments, which will be used to further improve this publication.

B.2. Background

The IAEA published, in 2016, a new Safety Guide entitled Design of Instrumentation and Control Systems for Nuclear Power Plants (IAEA Safety Standards Series No. SSG-39). This guide provides guidance on the overall I&C architecture in support of applying the concept of defence in depth to the design of the plant systems, and on establishing defence in depth for the I&C system itself as protection against common cause failure. It outlines the analysis of defence in depth and diversity as one of the means of investigating the vulnerability of safety systems to common cause failure.

The above-mentioned new TECDOC will complement the IAEA Safety Guide SSG-39, in particular by giving detailed provisions on the diverse actuation aspects that are mentioned in Annex III (specifically in paragraphs III–11 and III–12) of SSG-39. Specifically, it identifies and discusses common criteria for the design of diverse actuation systems at NPPs with the aim of developing a consensus on the adequate level of diversity in the reactor protection systems. The critical areas are related to:

− Assessment of the level of diversity in digital I&C system architecture;

− Safety classification;

− Design criteria;
– Technological options for the diverse actuation system; and
– Use of manual actions for diverse actuation.

B.3. Interfaces


The draft text of the new TECDOC and a standard Form for Comments will be provided to the participants several months in advance of the meeting. Comments that are not submitted using the form provided will not be considered. The IAEA requests that written comments on the draft be provided not later than 30 June 2017. Proposals for addressing the issues raised in these comments will be prepared where possible and discussed during the meeting.

C. Provisional Programme

The topics to be covered during the meeting will consist of specific information on experiences, benefits, risks, difficulties and challenges related to the design and implementation of a diverse actuation system as a backup system for the digital reactor protection system at NPPs. Topics that could be discussed at this meeting include:

– The level of diversity in digital I&C system architecture;
– Different approaches to safety classification;
– Design criteria;
– Current practices in the design and implementation of diverse actuation systems;
– Available technological options for the diverse actuation system; and
– Current practices in the use of manual actions for diverse actuation.

An important aim of the meeting is to ensure that any inconsistencies between the draft TECDOC and the practices of Member States or with standards developed by other international organizations are identified and addressed.

The discussions at this meeting will also focus on addressing the comments submitted by the subject matter experts.
D. Participation

Participation is solicited from staff members of regulatory bodies, NPP operators, utility organizations, design and engineering organizations, as well as of international organizations engaged in all aspects of design and implementation of I&C safety systems. To ensure maximum effectiveness in the exchange of information, participants should be persons actively involved in the subject of the meeting.

Participants should complete the Participation Form (Form A) as soon as possible and send it to the competent national authority (e.g. Ministry of Foreign Affairs or National Atomic Energy Authority) for official transmission to the IAEA Secretariat (see Section K) to arrive not later than 12 May 2017. The designation of a participant will be accepted only if forwarded by the Government of an IAEA Member State or by an organization invited to participate.

The meeting is, in principle, open to all officially designated persons. The IAEA, however, reserves the right to restrict participation due to limitations imposed by the available facilities. It is, therefore, recommended that interested persons take the necessary steps for the official designation as early as possible.

E. Visas

Designated participants who require a visa to enter Austria should submit the necessary application to the respective diplomatic or consular representatives of Austria as soon as possible.

F. Expenditure

The IAEA is generally not in a position to bear the travel and other costs of participants in the meeting. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Such assistance can be offered upon specific request to normally one participant per country, provided that, in the IAEA’s view, the participant on whose behalf assistance is requested will make an important contribution to the meeting. The application for financial support should be made at the time of designating the participant and should reach the IAEA Secretariat not later than 12 May 2017.

G. Presentations

Participants are invited to provide presentations in order to share Member States’ experiences related to the topics described in Section C. Presentations should be submitted to the Scientific Secretary at least one week before the start of the meeting. They should be prepared according to the guidelines included in Attachment B.
H. Working Language

The working language of the meeting will be English. No simultaneous interpretation will be provided.

I. Proceedings

The preparation of a proceedings volume is not envisaged for this meeting. Instead, the results of the meeting will be reflected in an updated technical report as soon as possible after the meeting. The PowerPoint presentations will be compiled and distributed to participants during the meeting.

J. Local Arrangements

The meeting will be held at the IAEA’s Headquarters in Vienna, Austria, from 11 to 14 July 2017. The meeting will start in Room C4 in the C Building of the Vienna International Centre (VIC) on Tuesday, 11 July 2017, at 9.30 a.m. and end at 1 p.m. on Friday, 14 July 2017. Participants are kindly requested to arrive at Checkpoint 1/Gate 1 of the VIC at least half an hour before the meeting starts to allow adequate time for the admission formalities to be carried out. Participants should bring some form of personal identification, such as a national passport.

The meeting agenda, together with information on local arrangements, will be sent to designated participants once the completed Participation Forms have been received.

K. Secretariat

The Scientific Secretary of the meeting is Mr Alexander Duchac of the Division of Nuclear Installation Safety, Department of Nuclear Safety and Security.

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Administrative assistance:

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Division of Nuclear Installation Safety
Department of Nuclear Safety and Security
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 22832
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Email: M.Garcia@iaea.org
## Participation Form

**Technical Meeting on the Development of the IAEA Technical Document on Developing Design Criteria for a Diverse Actuation System for Nuclear Power Plants**

**IAEA Headquarters, Vienna, Austria**

**11–14 July 2017**

To be completed by the participant and sent to the competent official authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA, or National Atomic Energy Authority) of his/her country for subsequent transmission to the International Atomic Energy Agency (IAEA), Vienna International Centre, PO Box 100, 1400 Vienna, Austria, either electronically by email to: Official.Mail@iaea.org or by fax to: +43 1 26007 (no hard copies needed).

Participants who are members of an invited organization can submit this form to their organization for subsequent transmission to the IAEA.

**Deadline for receipt by IAEA through official channels: 12 May 2017**

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ATTACHMENT B: INSTRUCTIONS FOR THE PREPARATION OF PRESENTATIONS

Length

Presentations, preferably in Microsoft PowerPoint format, should not exceed 30 slides.

Copyright

Authors are responsible for ensuring that nothing in their presentations infringes any existing copyright. If previously copyrighted material is included, authors must provide evidence that the copyright holder has given permission for its use.

Manuscript

The original manuscript, where applicable, should be provided as electronic files in a Microsoft Office or PDF format.
ATTACHMENT C: LIST OF PUBLICATIONS THAT MAY BE USEFUL IN PREPARING FOR THE MEETING


