



Technical Meeting on Architectural Approaches in the Design of Nuclear Power Plant Instrumentation and Control Systems

**Hosted by the
Government of France**

**through
Rolls-Royce Civil Nuclear SAS**

Grenoble, France

27–30 September 2016

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Information Sheet

A. Background

Most nuclear units built before the 1990's relied largely on analogue instrumentation and control (I&C) systems. Digital safety I&C systems were introduced gradually, either in the initial design or as upgrades. In most cases, the early digital I&C systems were constrained to conform to the conventional analogue I&C architecture in terms of form, fit, and function. Digital I&C architectures for more recent evolutionary and advanced nuclear power plants (NPPs) have introduced architectural changes to allow greater connectivity and integration among previously separate and distinct systems. For a variety of reasons, digital I&C systems play an increasing role in NPPs nowadays. All new designs depend in large part on digital systems and their software, and most I&C upgrades of existing units rely on software based technologies.

The new systems have many advantages compared to older analogue-based solutions. However, there has been an associated set of common challenges related to digital I&C systems that the industry continues to debate and struggle with today. These challenges appear in the form of uncertainty and inconsistency in developing and licensing digital I&C systems and equipment, as well as technical complications arising from the enhanced functionality, highly integrated (and inter-dependent) architectures, widespread communications, and flexible configurability enabled by digital technology. Eventually, the benefits of expanded capabilities may be compromised by the burden of significant complexity.

Recognizing the relevance of the above-mentioned issues and the rapid development of techniques, the members of the Technical Working Group on Nuclear Power Plant Instrumentation and Control (TWG-NPPIC) at their 2015 meeting recommended to the International Atomic Energy Agency (IAEA) that it should initiate relevant activities to address these problems. In response, the IAEA is developing a new IAEA Nuclear Energy Series report entitled *Architectural Approaches in the Design of Nuclear Power Plant Instrumentation and Control Systems* to provide guidance to Member States in this area.

The objective of this proposed new publication is to provide an overview of the current knowledge, up-to-date best practices, experiences, and benefits and challenges related to the use of digital technology in the life cycle of safety I&C systems at NPPs. The document is intended to be used by Member States to support the design, development, licensing, implementation, and operation of the systems in question.

Additionally, the IAEA has developed a new Safety Guide entitled *Design of Instrumentation and Control Systems for Nuclear Power Plants*, which is under publication at present. The preparation process for this new guide has taken account of developments in I&C systems since the publication of the predecessor guides *Instrumentation and Control Systems Important to Safety in Nuclear Power Plants* (IAEA Safety Standards Series No. NS-G-1.3, Vienna, 2002) and *Software for Computer Based Systems Important to Safety in Nuclear Power Plants* (IAEA Safety Standards Series No. NS-G-1.1, Vienna, 2000). The main changes are due to the continued development of digital applications and the evolution of the methods necessary for their safe, secure and practical use.

B. Objectives

The purpose of the meeting is to serve as an international forum for sharing best practices and strategies used in the engineering and design of digital I&C systems at NPPs, as well as for discussing the challenges and issues that need to be resolved in this area. An additional goal of the meeting is to disseminate information on the lessons learned through the work on the above-mentioned new IAEA Nuclear Energy Series report.

The meeting has the following primary objectives:

- To provide an international forum for presentations and discussions on the subject of the meeting;
- To strengthen Member States' capabilities for improved understanding of the role of architectural approaches to be considered in the design of digital I&C systems;

- To disseminate the experience that has been gained while developing the new IAEA Nuclear Energy Series report provisionally entitled *Architectural Approaches in the Design of Nuclear Power Plant Instrumentation and Control Systems*;
- To review the draft version of that report; and
- To support the IAEA in defining future activities in the field of I&C system design for NPPs.

C. Topics

Presentations are invited on all approaches that are related to engineering and design aspects of digital I&C systems at NPPs. The following list provides examples of presentation topics that would be appropriate for the meeting:

- Digital I&C system design philosophy
- Defence in depth in I&C functions
- Classification and functional allocation within the architecture
- Communications interconnectivity, architectural approaches for enhancing information access, integrity, availability, and protection
- Potential sources of common cause failure, design methods to resolve common cause failure vulnerabilities
- The application of diversity, independence and physical separation between different levels of the I&C system
- Sustainability (ease of modernization)
- Technology dependencies, e.g. computer vs. field programmable gate array-based systems
- Issues with system security, design of features that implement both computer security controls and safety strategies
- Control of the development environment and processes
- Human factors engineering issues, including human–system interface design
- Design considerations for new-builds and the modernization of existing plants
- Standards and guidance for architectural issues in the design of NPP I&C systems
- Regulatory requirements
- Lessons learned from experience (previous designs, operating experience, proven practices, etc.).

D. Working Material

The draft manuscript of the new IAEA Nuclear Energy Series report provisionally entitled *Architectural Approaches in the Design of Nuclear Power Plant Instrumentation and Control Systems* will be provided to the participants prior to the meeting. This draft will serve as the basis for dialogues at the meeting. Participants will be requested to review selected parts of the document and to provide their remarks and comments.

E. Participation

In view of the subject of the meeting, participation is limited to IAEA Member States that currently operate NPPs or are in the construction of their first nuclear power units. Participation is solicited from representatives of NPPs and regulatory bodies, utilities, technical support organizations, developers, vendors, research organizations and international organizations engaged in the field of I&C system designs for NPPs. To ensure maximum effectiveness in the exchange of information, participants should be persons actively involved in the subject matter of the meeting.

F. Application Procedure

Designations should be submitted using the attached Participation Form. Completed forms should be endorsed by the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA, or National Atomic Energy Authority) and returned through the established official channels. They must be received by the IAEA not later than **15 July 2016**. Designations received after that date or applications sent directly by individuals or by private institutions cannot be considered. Designating Governments will be informed in due course of the names of the selected candidates and at that time full details will be given on the procedures to be followed with regard to administrative and logistic matters.

The meeting is, in principle, open to all officially designated persons. The IAEA, however, reserves the right to limit participation due to limitations imposed by the available facilities. The maximum number of participants for this meeting that are not French nationals is 45. It is, therefore, recommended that interested persons take the necessary steps for the official designation as early as possible.

G. Visas

Designated participants who require a visa to enter France should submit the necessary application to the nearest diplomatic or consular representative of France as soon as possible.

H. Expenditure

The costs of the meeting are borne by the host organization; no registration fee is charged to participants. Travel and subsistence expenses of participants will have to be borne in general by their designating Governments/organizations. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Such assistance may 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.

The organizers of the meeting do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the meeting, and it is clearly understood that each Government, in designating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

I. Presentations

Presentations should be prepared as Microsoft PowerPoint (.ppt) or Portable Document Format (.pdf) files. Computer-based projection facilities will be provided. Authors are requested to provide the Scientific Secretary with electronic copies of their presentation files in advance of their scheduled presentation slot so that the files can be duly uploaded. Electronic versions of the presentations are also necessary to ensure timely issuance of the proceedings to be prepared and distributed in electronic form.

It is not mandatory for all participants to submit a presentation. However, the IAEA welcomes and encourages contributions in this format. Time for the presentations will be limited to 25 minutes followed by a five-minute discussion period. The number of presentations may have to be limited so as to leave sufficient time for discussions and review of the draft IAEA Nuclear Energy Series report provisionally entitled *Architectural Approaches in the Design of Nuclear Power Plant Instrumentation and Control Systems*.

J. Working Language

The working language of the meeting will be English; no interpretation will be provided.

K. Local Arrangements

The meeting will be held at the Europole/World Trade Centre, 38000 Grenoble, France and will start on Tuesday, 27 September 2016, at 9.30 a.m. and end on Friday, 30 September 2016, at 2.00 p.m.

The meeting agenda, together with information on local arrangements, will be sent to the designated participants.

The local representatives of Rolls-Royce Civil Nuclear SAS will be Mr Romain Desgeorge and Mr Arnaud Duthou.

Contact details:

Mr Romain Desgeorge

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Host organization administrative assistance:

Ms Syrine Plébin

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Email: syrine.plebin.cn@rolls-royce.com

L. Accommodation

The host organization, Rolls-Royce Civil Nuclear SAS, will be providing a link to help in making hotel room reservations at the Hipark Grenoble Hotel or the Hotel Europole. Participants are requested to book their rooms themselves. Information on the hotels can be found at:

http://www.hipark-residences.com/web/h/en/residence/grenoble/extended-hotels-c_5409.html

and

<http://www.hoteleuropole.com/Accueil.htm>

Additionally, participants may elect to make their own bookings at other hotels in the area of the meeting location.

M. IAEA Secretariat

The IAEA Scientific Secretary for the meeting is Mr Janos Eiler of the Department of Nuclear Energy. His contact details are:

Mr Janos Eiler

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Subsequent correspondence on scientific matters should be sent to the Scientific Secretary and correspondence on other matters related to the meeting to the Administrative Secretary.

Participation Form

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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).

Kindly send also a copy to Mr Janos Eiler, IAEA, by email: J.Eiler@iaea.org, and to Mr Romain Desgeorge and Mr Arnaud Duthou, Rolls-Royce Civil Nuclear SAS, by email to: romain.desgeorge.cn@rolls-royce.com and arnaud.duthou.cn@rolls-royce.com.

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: 15 July 2016

Family name:		Given name(s):		Mr/Ms
Institution:				
Full address:				
For urgent communications please indicate your:	Tel.: Fax: Email:			
Nationality:	Designating Government or organization:			
Mailing address (if different from address indicated above):				
Do you intend to give a presentation? Yes <input type="checkbox"/> No <input type="checkbox"/> Title:				