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Automation systems and integration — Industrial data — Nuclear digital ecosystem specifications

Systèmes d'automatisation et intégration — Données industrielles — Spécifications de l'écosystème numérique nucléaire

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC *184*, *Automation systems and integration*, Subcommittee SC 04 *Industrial data*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The purpose of this document is to bring all current knowledge together about standardization of information on nuclear installations in the nuclear industry.

This document provides orientations for how the concept of an industrial digital ecosystem can be realised for the nuclear industry, its installations and practices. These orientations are based on surveys of the state of the art for the adoption of digital methods and technology for the nuclear sectors by the participating members of ISO/TC 184/SC 4 and a review of the current state of the standards for the digital representation of engineering data that are the responsibility of ISO/TC 184/SC 4 and international standards from other TCs/SCs from ISO, IEC, CEN and some de-facto international industry standards.

The objective is to provide the nuclear industry with a common framework to address the intertwined aspects to manage digital information based on standards and related to nuclear facilities and materials.

The nuclear facilities are composed of all the physical structures, systems, and components: mining, fuel manufacturing, nuclear material transport, nuclear power plants (NPPs), reprocessing plants, waste management and disposal facilities.

This document aims to support operational processes in a nuclear ecosystem using digital tools to produce, manage and share information.

It is based on the experience and skills of experts with generic competencies in standards for industrial data, developed during the past years in the edition of standards for product modelling, plant modelling and construction modelling associated with some specific experience of some members in nuclear facilities lifecycle, the corresponding information and records management in the lifecycle.

This document will be updated when new technological advances become available, as many initiatives in the field of the "Industry of the future" are underway, the most relevant of which is the development of the digital twin (DT). The corresponding outcomes can be integrated in a viable roadmap with steps to effectively guide practitioners of the nuclear ecosystem in implementing methodologies and technologies to make effective the benefit of the proposed standards.

This document does not provide answers to all of the issues but does raise questions and identifies barriers for successful implementation which will be addressed to create a digital ecosystem in the nuclear industry. It does provide a simple conceptual framework and a roadmap to guide the actors of the nuclear ecosystem.

To consolidate this perspective, this document has taken into account nuclear technology and the constraints on the nuclear industry. Developing a standardization framework for the nuclear industry could also be useful in order to face long standing issues met in conventional industries regarding information management.

Radioactivity structures all of the activities in the nuclear industry and strongly impacts the needs and the way of modelling facilities and of organising information to support the business processes.

Innovation and standardization will enable a nuclear digital ecosystem (NDE), which could be downsized for conventional industries with specific lighter requirements.

This methodology offers the best guarantee to meet the specific needs of a nuclear ecosystem and to reuse generic models, relationships, and standards already available or prepare their adaptation or extension for the future.

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Automation systems and integration — Industrial data — Nuclear digital ecosystem specifications

1 Scope

This document provides:

— a review and summary of the adoption of digital methods and technology in the national nuclear sectors;

— a summary of the state of the art of some of the standards supporting the digital representation and interoperability of industrial data;

— orientation on the use of these standards for model-based systems engineering (MBSE) in order to achieve a nuclear digital ecosystem (NDE);

— a high-level roadmap of the stages by which this ecosystem can be achieved, taking into account the maturity of the actors of the ecosystem, their relationships and the added value of using advanced standards.

NOTE The complete reports from the participating entities are presented in Annexes A to G.

This document includes the following:

— the systems composing the nuclear facilities and their input, output, and other products resulting from interactions in the nuclear system or with its environment;

— the material accounting and the corresponding requirements;

— waste management: all types of nuclear waste produced during processes and activities, and their properties are considered for a seamless management of information in the whole value chain of the nuclear ecosystem.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
asset
item, thing or entity that has potential or actual value to an organization

[SOURCE: ISO/TS 18101:2019]

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