

ISO/TR 20123:2023-09 (E)

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

Contents		Page
	Foreword	v
	Introduction	vi
1	Scope	1
2	Normative references	1
3	Terms, definitions and abbreviated terms	1
	3.1 Terms and definitions.....	1
	3.2 Abbreviated terms.....	4
4	Overview of the nuclear industry	6
	4.1 Nuclear fuel cycle.....	6
	4.2 Nuclear power plant (NPP) safety leadership and management.....	6
	4.3 Differences between nuclear industry and other industries.....	8
5	Review of national reports	9
	5.1 General.....	9
	5.2 New build.....	10
	5.3 Operations and maintenance (O&M).....	10
	5.4 Decommissioning.....	11
	5.5 Summary of national reports.....	11
	5.6 High level requirements and some generic use cases.....	12
	5.7 Business case based on the adoption of industrial data standards.....	12
6	Framework for enterprise interoperability	13
	6.1 General.....	13
	6.2 Generic barriers to interoperability.....	14
	6.2.1 General.....	14
	6.2.2 Organizational.....	14
	6.2.3 Methodology and technology.....	15
	6.2.4 Semantics.....	15
	6.3 Nuclear industry specific barriers to interoperability.....	15
	6.4 Cybersecurity.....	16
	6.4.1 General.....	16
	6.4.2 Main cybersecurity challenges.....	16
	6.4.3 Main applicable security regulations, norms and standards.....	17
	6.5 Maturity roadmap.....	17
7	Fundamental pillars of a nuclear digital ecosystem (NDE)	17
	7.1 General.....	17
	7.2 Configuration management (CM).....	18
	7.3 Requirements management.....	19
	7.4 Breakdown structure management.....	20
	7.5 Reference data management.....	23
8	Model-based systems engineering (MBSE) and standardized industrial models	24
	8.1 Systems engineering and model-based systems engineering (MBSE).....	24
	8.2 Standardized industrial models.....	25
	8.2.1 General.....	25
	8.2.2 ISO 15926 series.....	26
	8.2.3 ISO 10303 series.....	28
	8.2.4 BIM standards for the build environment.....	30

9	Advanced methodologies and technologies for model-based systems engineering (MBSE)	31
9.1	General.....	31
9.2	Property modelling	31
9.3	Process modelling.....	33
9.4	Semantic modelling of reference data	34
9.5	Knowledge representation	34
9.6	Data quality.....	34
9.7	3-D geometry and topology.....	35
9.8	Digital twin (DT).....	35
9.9	Long term archiving (LOTAR).....	37
9.10	Alternative methods, standards and tools to be explored.....	38
10	Proposed strategy and high-level road map	38
10.1	General.....	38
10.2	Proposed strategy.....	39
10.3	Strategic structured roadmap for future standards development.....	40
10.3.1	General.....	40
10.3.2	Strong, simple, shared framework.....	41
10.3.3	Methodology of application	42
10.3.4	Technical guidelines.....	42
10.3.5	Future work items.....	42
10.4	Orientation for managers and practitioners of the nuclear industry.....	43
10.4.1	General.....	43
10.4.2	Systems engineering.....	43
10.4.3	Methods and knowledge representation.....	44
10.4.4	Impact of digital technology on standards for the nuclear ecosystem.....	44
	Annex A (informative) Nuclear power in China	45
	Annex B (Informative) Nuclear power in France	52
	Annex C (informative) Nuclear power in Japan	57
	Annex D (informative) Nuclear power in the Netherlands	61
	Annex E (informative) Nuclear power in the Republic of Korea	69
	Annex F (informative) Nuclear power in the United Kingdom	71
	Annex G (informative) Nuclear power in the United States of America (USA)	74
	Bibliography	82