

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	