中核控制系统工程有限公司
CHINA NUCLEAR CONTROL SYSTEM ENGINEERING CO., LTD.

CNCS

HAF601 Licensing Process of NicSys®8000N

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CNCS

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智慧科技 • 精控未来

About CNCS

DCS Series

Nuclear specific I&C systems

中核控制

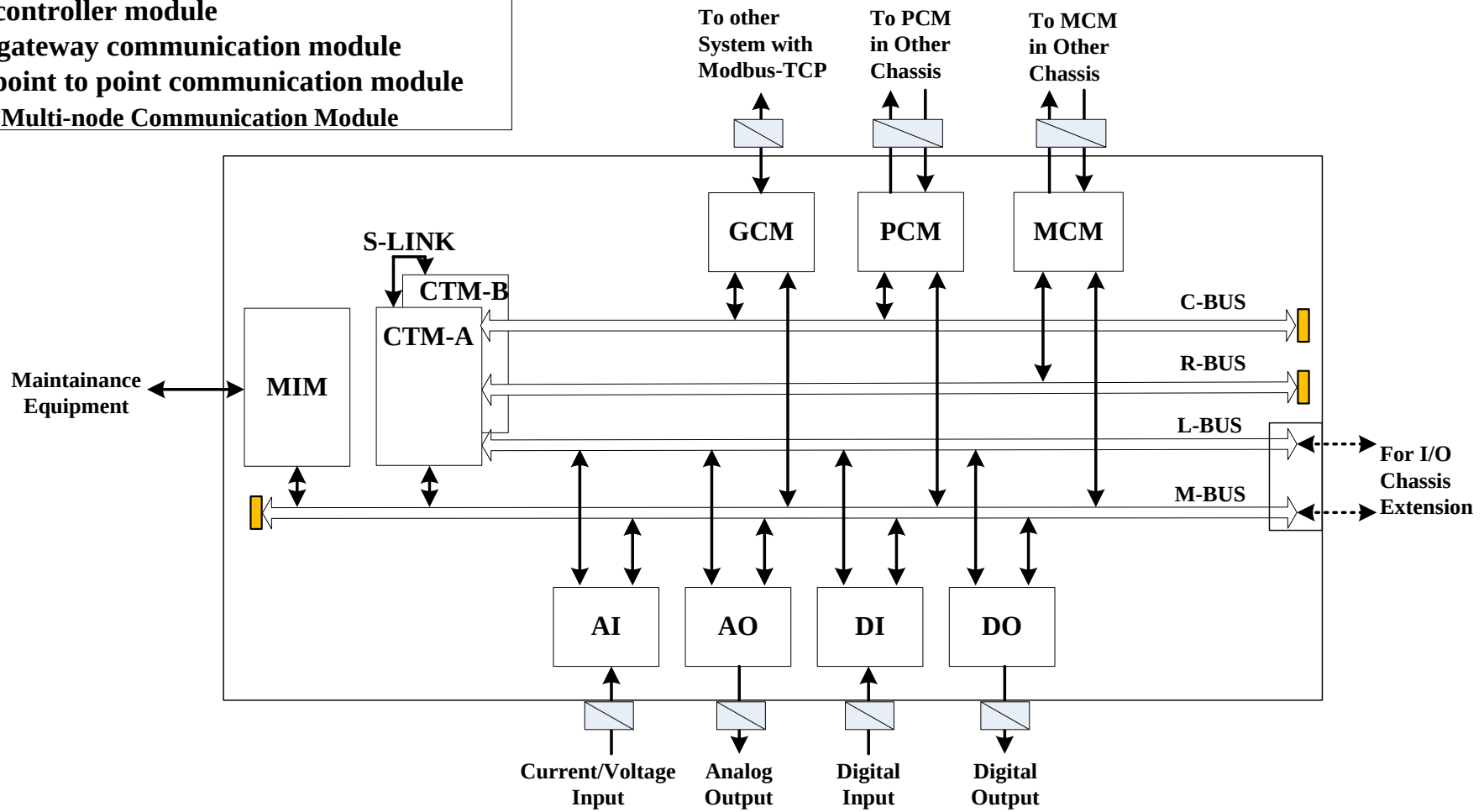
CNCS

Nuclear Detectors

Nuclear Instruments

About NicSys®8000N Platform

MIM: maintenance module
CTM: controller module
GCM: gateway communication module
PCM: point to point communication module
MCM: Multi-node Communication Module



Background

Licensing from China's National Nuclear Safety Administration (NNSA) is required by HAF601 for nuclear safety-related equipment vender whom design and manufacture in china.

Agenda

1 HAF601 License Introduction

2 HAF601 Licensing Process of NicSys®8000N

3 Compare HAF601 and NRC License

HAF601 License Introduction

HAF601 License Introduction

HAF601

Code on supervision and management of design, manufacturing, installation and non-destructive testing of civil nuclear safety equipment.

HAF602

Code on supervision and management of non-destructive testing personnel qualification of civil nuclear safety equipment.

HAF603

Code on supervision and management of welder and welding operator qualification of civil nuclear safety equipment.

HAF604

Code on supervision and management of the imported civil nuclear safety equipment.

License for Design and Manufacture

License for Design

License for Manufacturing

Conditions

- Business license
- Legal person

- More than 5 years nuclear related project experience

- Professionals
- Qualifications

- Workplace
- Facilities
- Tools & equipment

- Management system
- QA system in conformity with HAF003

- Type of equipment
- Classification
- Phase
- Manufacturing technique
- Material
- System Structure

Civil Nuclear Safety Equipment Type

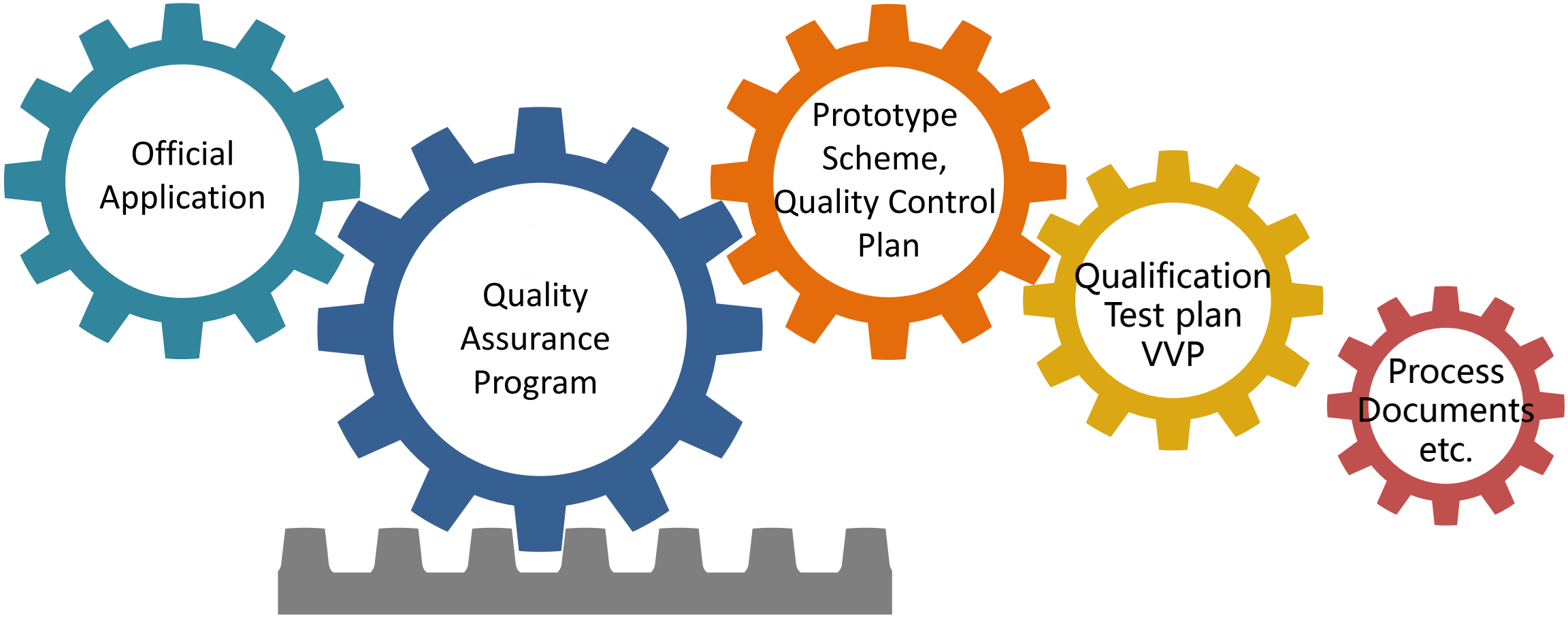
Machinery Equipment

1 Steel Containment ；
2 Containment Steel Liner ；
3 Pressure Vessel 、
4 Tanks
5 Heat Exchangers 、
6 Pipe and Pipe Fittings 、
7 Pumps 、
8 Core Structure 、
9 Control Rod Driver Mechanism 、
10 Fan 、
11 Compressor 、
12 Valve 、
13 Bearing Parts 、
14 Valve/bellows Expansion Joint 、
15 Gate 、
16 Mechanical Penetrations 、
17 Flange 、
18 Castings and Forgings

Electrical Equipment

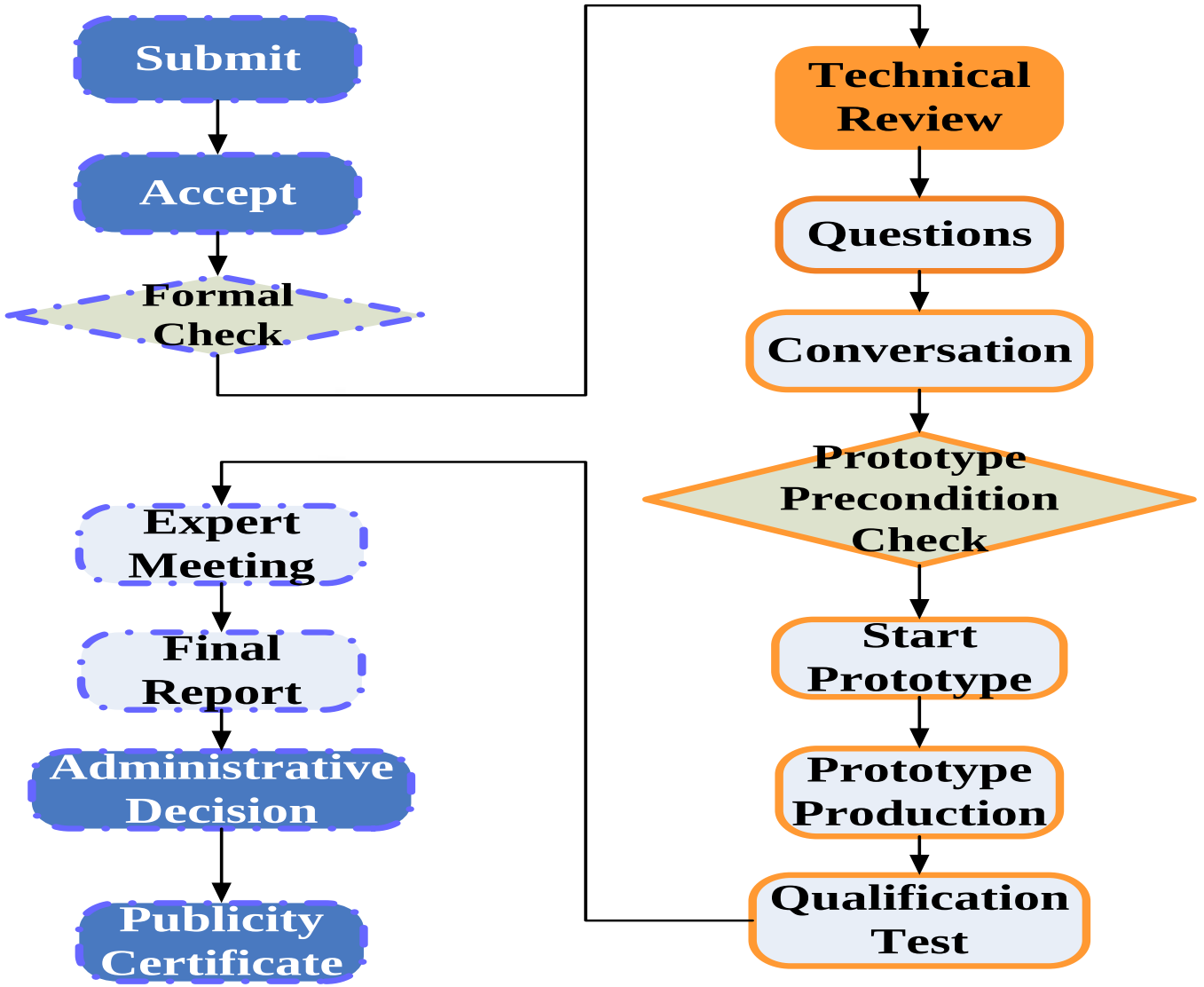
1 Sensor ；
2 Cables ；
3 ELectrrical penetration assemblies ；
4 **Instrument & control system cabinet** ；
5 Power equipment ；
6 Valve Driver Device ；
7 Motor ；
8 Transformer ；
9 Sets of Switch Equipment and Control Equipment

Application Documents



HAF601 Licensing Process

NNSA

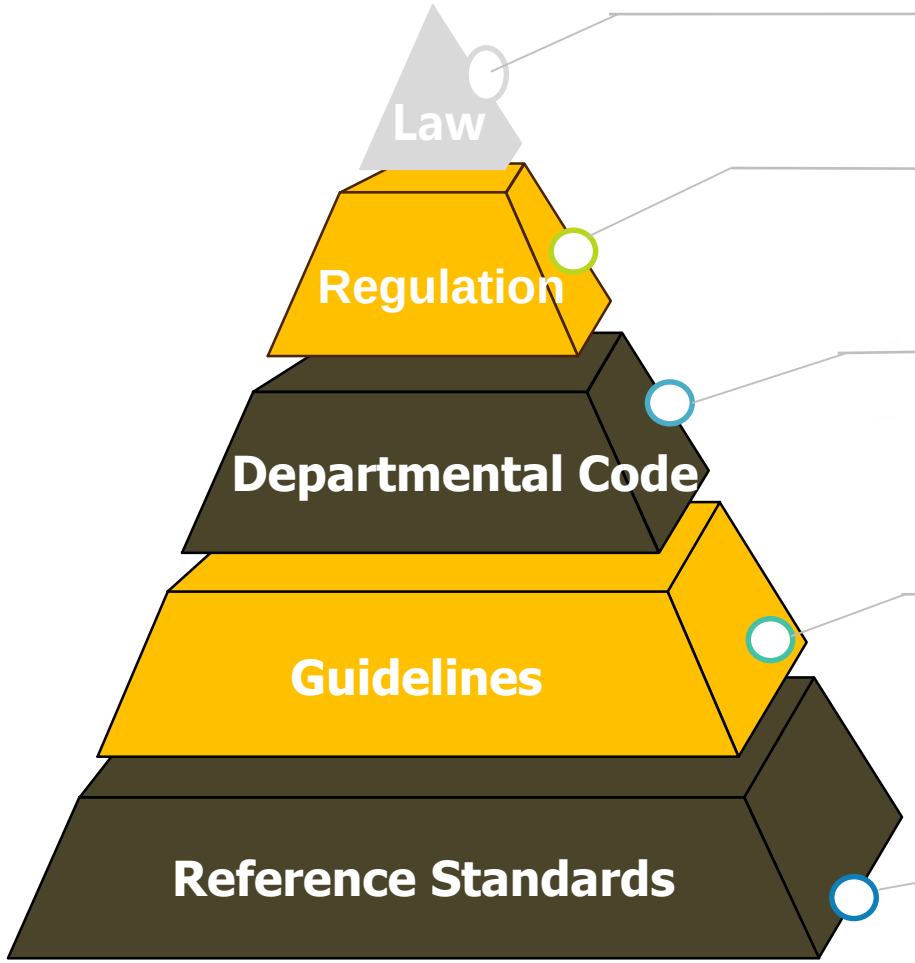


Technology Support Organization

NicSys®8000N's HAF601 Licensing Process

References

NicSys® 8000N



- Radioactive Pollution Prevention Law

- Regulations on the supervision and administration of civil nuclear safety equipment

- HAF601
- HAF003

- Catalog of civil nuclear safety equipment
- HAD003/001~010
- Approval Procedures
- Qualification Requirements
- …

- GB/GJB/EJ/NB… (Refer to IAEA/IEC/IEEE)

NicSys®8000N's HAF601 License Conditions

Legal Person	CNCS meet the legal conditions of enterprise
Work Achievements	• More than five years.
Quality Assurance	• HAF003
Facilities Equipment	• Manufacturing Site • Integration Site • Production Equipment • Design Verification/Analysis Software • Measure Instruments

NicSys®8000N's HAF601 License Conditions

Technical Capacity

- Refer to IAEA/IEC/IEEE Standard
- FPGA Development Technology and Solution
- TUV Certified V&V

Prototype

- Appropriate Scale
- Materials, Structure and Design Parameter

Professional

- Developer
- QA
- Manufacturer
- V&V

The Type and Scope

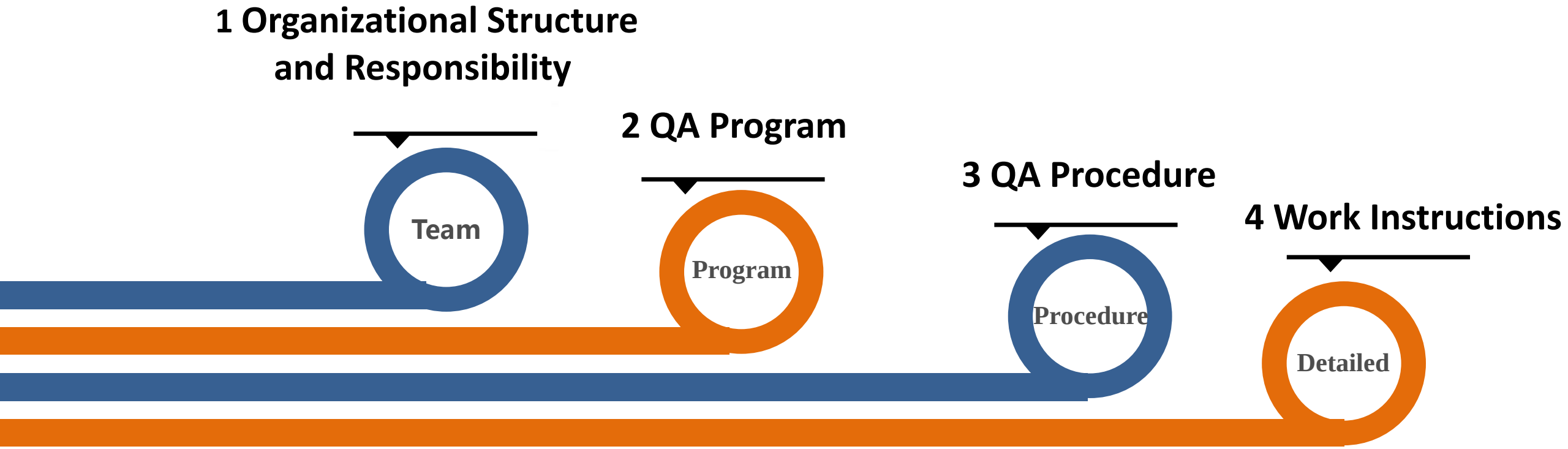
NicSys® 8000N

Scope of the activity in NicSys®8000N's HAF601 design/manufacture license

Eqpt. Class	Eqpt. Type	Nuclear Safety Level	Design/ Manufacture Capability	Typical Eqpt. Name	Scope of Design/Manufacture Activities	Workplace
Cabinets	• Cabinets • Racks	1E	• Anti-seismic: I • Environment: Outside of Containment	Nuclear Safety DCS Cabinets	• Requirement • Design • Implementation • Integration • Prototype • EQ • Test	• Development site • Integration site • Manufacturing site

Nuclear QA System _HAF003

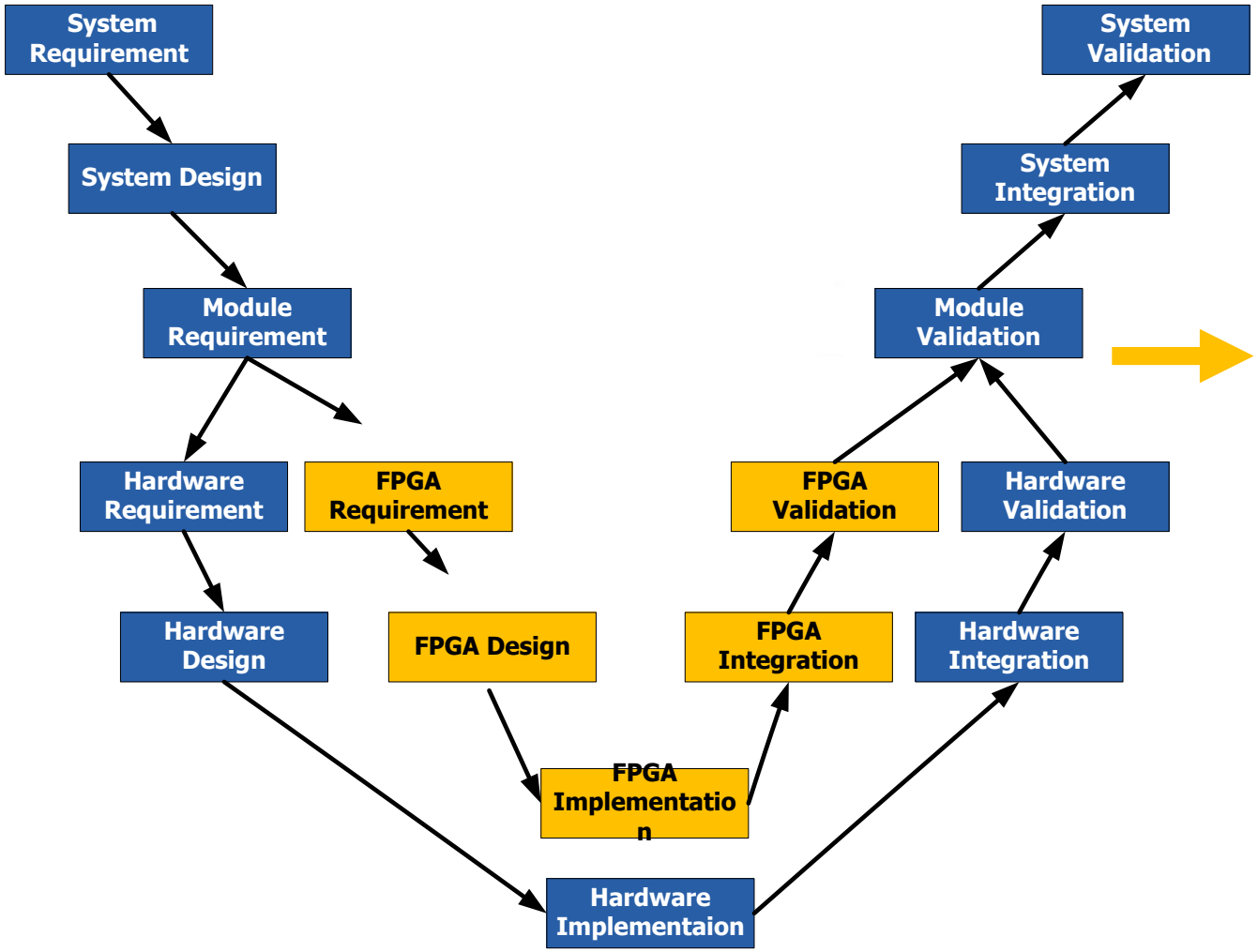
NicSys® 8000N



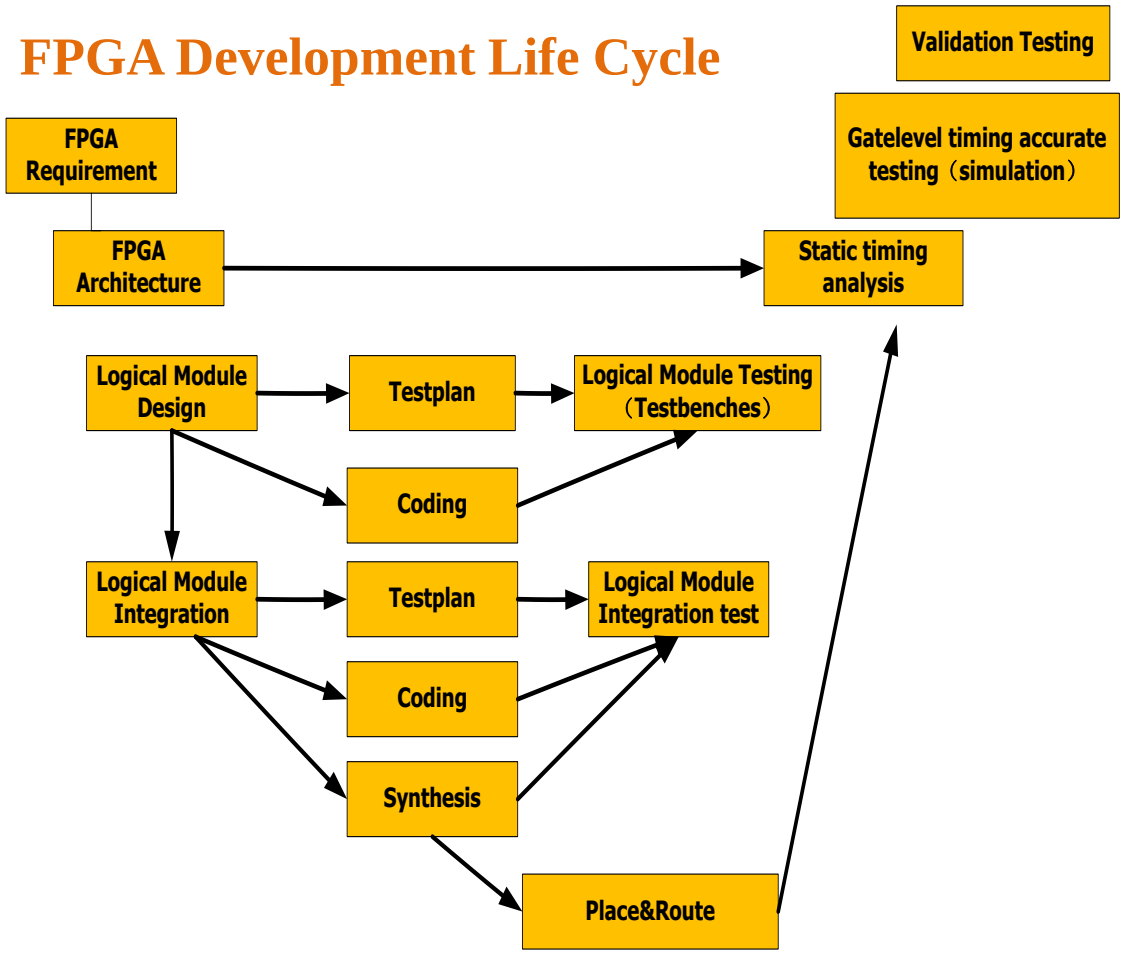
NicSys®8000N Platform Development Life Cycle Model

According to IEC61513, IEEE7-4.3.2, IEC62566 and IEEE1074

NicSys®8000N Development Life Cycle



FPGA Development Life Cycle

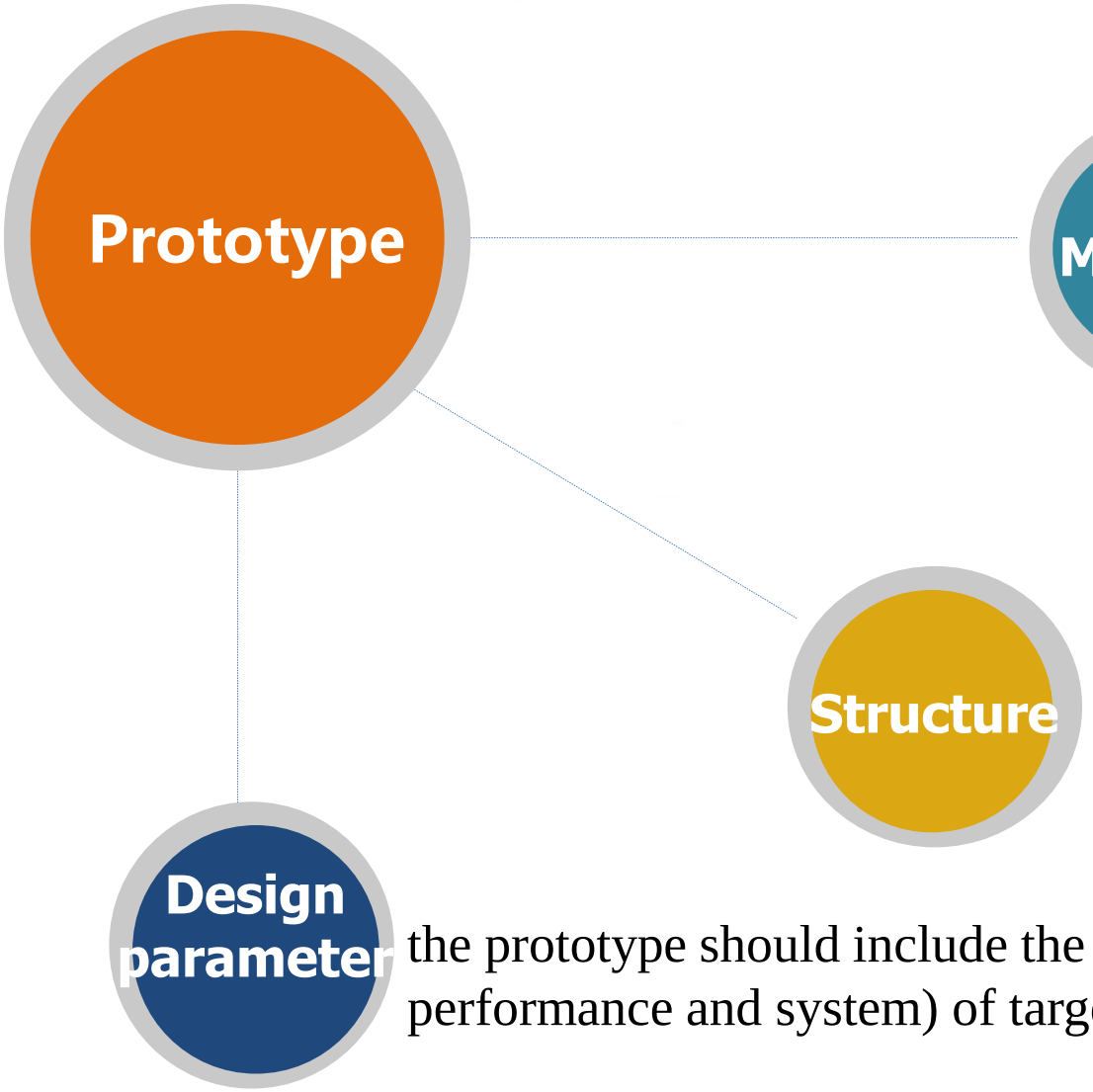


CNCS V&V

Lifecycle	System requirement	System architectural Design	Detailed Design		Implementation	Integration			Validation
			Module Requirement	Module Design		Module Integration	Module Validation	System Integration	
IEEE 1012	Concep V&V, Requirement V&V	Design V&V			Implementation V&V	Test V&V			
V&V Tasks	(1) System requirement evaluation (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) System integration V&V test plan generation (6) System validation V&V test plan generation (7) Hazard analysis (8) Security analysis (9) Risk analysis	(1) System design evaluation (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) System integration V&V test design generation (6) System validation V&V test design generation (7) Hazard analysis (8) Security analysis (9) Risk analysis	(1) Module requirement evaluation (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Module integration V&V test plan generation (6) Module validation V&V test plan generation (7) Hazard analysis (8) Security analysis (9) Risk analysis	(1) Module design evaluation (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Module integration V&V test design generation (6) Module validation V&V test design generation (7) Hazard analysis (8) Security analysis (9) Risk analysis	(1) source code documentation evaluation (2) Criticality analysis (3) Module integration V&V test case generation (4) Module validation V&V test case generation (5) Hazard analysis (6) Security analysis (7) Risk analysis	(1) Module integration V&V test execution (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Hazard analysis (6) Security analysis (7) Risk analysis	(1) Module validation V&V test execution (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Hazard analysis (6) Security analysis (7) Risk analysis	(1) System integration V&V test execution (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Hazard analysis (6) Security analysis (7) Risk analysis	(1) System validation V&V test execution (2) Interface analysis (3) Traceability analysis (4) Criticality analysis (5) Hazard analysis (6) Security analysis (7) Risk analysis

Prototype

NicSys® 8000N



Equipment Qualification NicSys® 8000N

Benchmark Test

Equipment Compliance Inspection, Benchmark Functional Performance Test Prudency/Operability test

EMC Test

Electromagnetic Interference Test of Conductive (CE, CS) and Radiation (RE, RS)

Environmental test

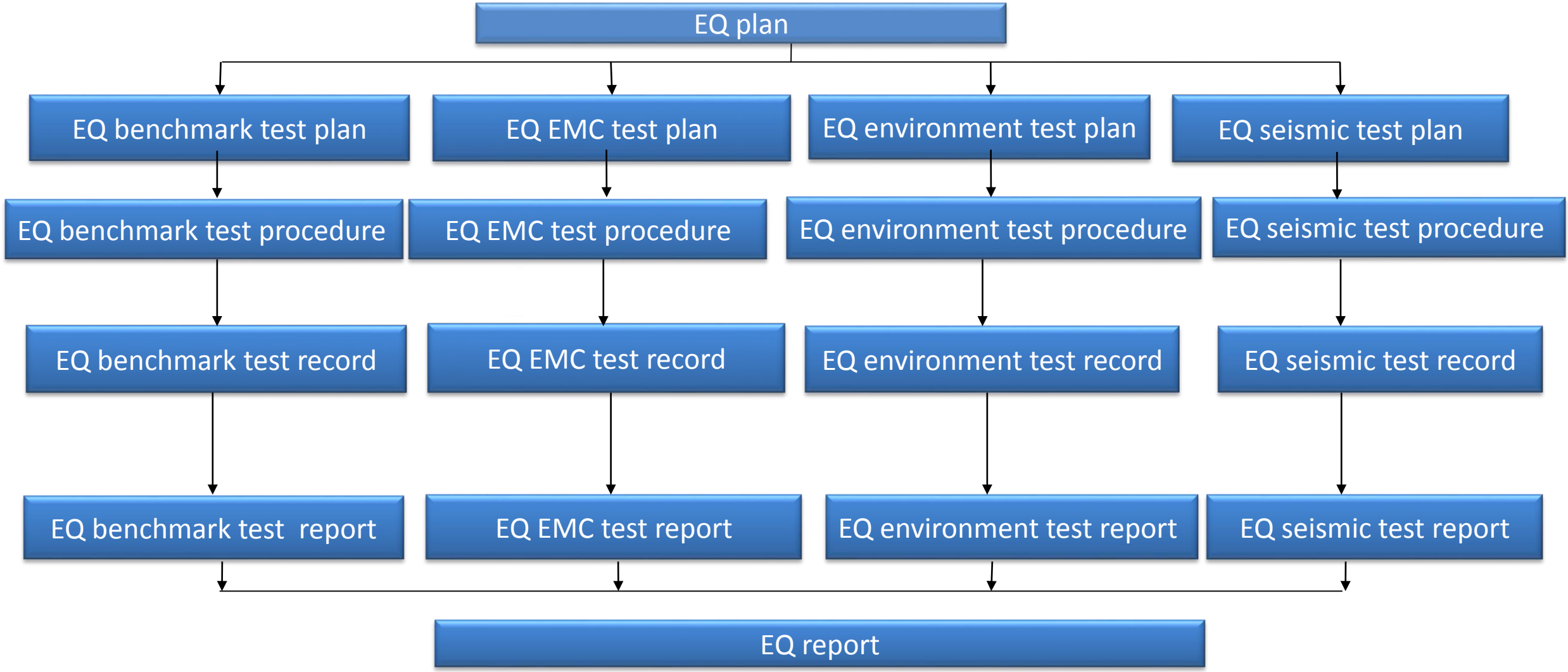
Temperature, Humid, Long-running and Mechanical Vibration Test (including thermal aging, mechanical aging and aging test, etc.)

Seismic test

Tests under conditions of the accident and after the accident.

Equipment Qualification

NicSys® 8000N



Compare HAF601 and NRC License

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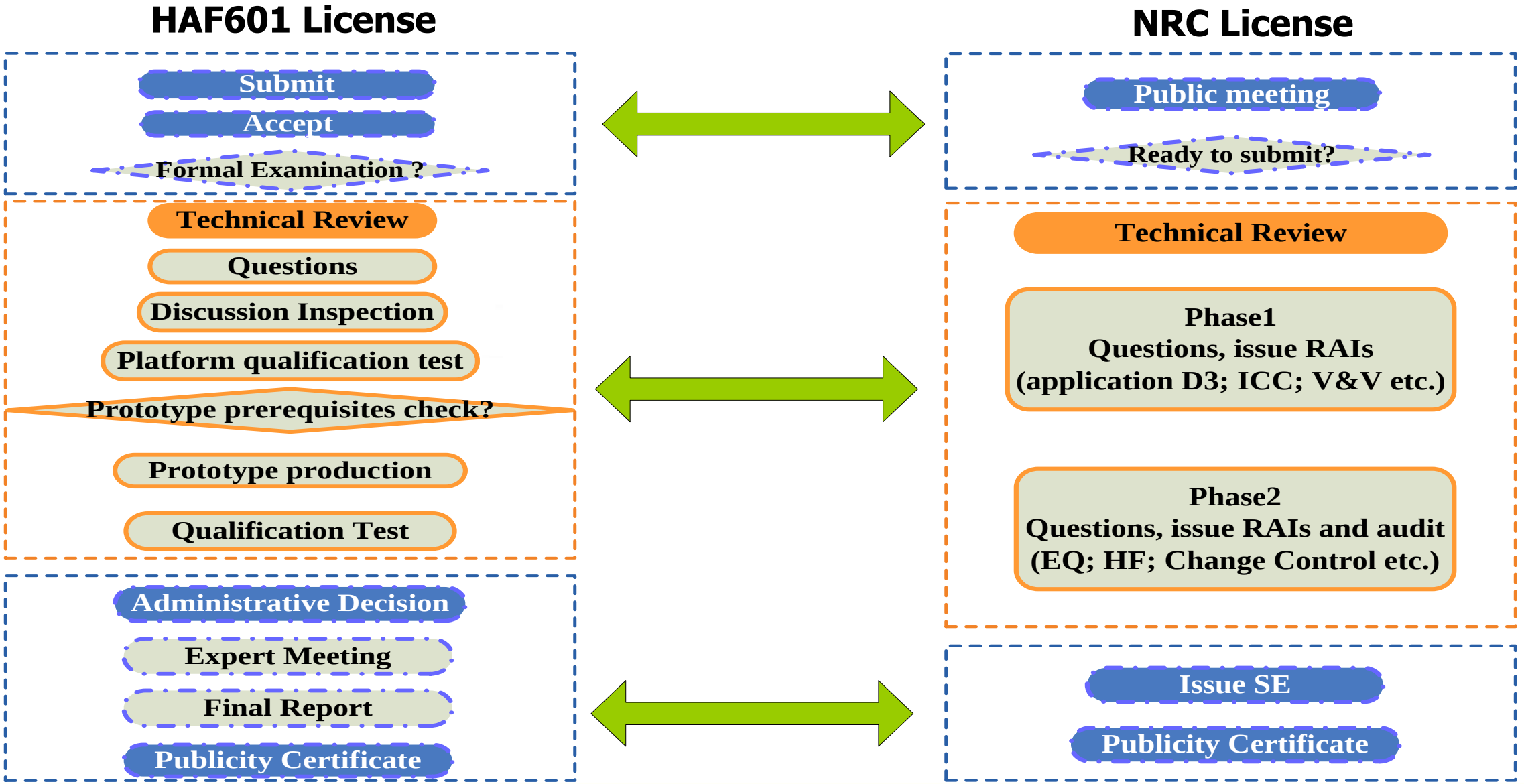

Differences

Comparison	HAF601 License	NRC License
Standards	GB/GJB/EJ/NB… (Refer to IAEA/IEC/IEEE)	Independent and Complete Standard System
Supervision Method	Design license Manufacturing license	None
Quality Assurance	HAF 003： 12 Elements	10 CFR 50 appendix B: 18 Elements
CGID	None(Vender responsibility)	EPRI/TR 106439 EPRI NP 5652
…	…	…

Thank You For Your Attention!

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