



РОСАТОМ

ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

# Role of I&C Conceptual Design in NPP Licensing

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Currently, modern NPP construction projects face new challenges related to satisfying requirements of constantly improving nuclear codes and standards as well as demanding EPC-contracts.

In order to overcome risks related to violation of deadlines and possibilities of significant I&C architecture redesign during approval of design documentation, it is suggested to split design documentation into two major parts, that is, conceptual design and basic design.

This stages are also mentioned in standards Russian GOST 34.601 and IEC 61513.

ГОСУДАРСТВЕННЫЙ СТАНДАРТ СОЮЗА ССР

Комплекс стандартов на автоматизированные системы

АВТОМАТИЗИРОВАННЫЕ СИСТЕМЫ. СТАДИИ СОЗДАНИЯ.

ГОСТ  
34.601-90

Information technology. Set of standards for automated systems. Stages of development.

Дата введения  
с 01.01.1992г.

Настоящий стандарт распространяется на автоматизированные системы (АС), используемые в различных видах деятельности (исследование, проектирование, управление и т.п.), включая их сочетания, создаваемые в организациях, объединениях и на предприятиях (далее - организациях).

Стандарт устанавливает стадии и этапы создания АС. В приложении 1 приведено содержание работ на каждом этапе.



IEC 61513

Edition 2.0 2011-08

INTERNATIONAL  
STANDARD

NORME  
INTERNATIONALE

Nuclear power plants – Instrumentation and control important to safety –  
General requirements for systems



International standardization bodies (mainly IEC and ISO) developing and issuing international standards for all electrical, electronic and related technologies, including nuclear one, regularly revise them and release new versions of standards.



International  
Organization for  
Standardization



**IAEA**  
International Atomic Energy Agency  
*Atoms For Peace*



**INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION**



**IEEE**

*Advancing Technology  
for Humanity*

# ISO/IEC 27000-series " Information security management systems"



This group of standards from ISO27000 was published in recent 5 years:

ISO/IEC 27000 — Information security management systems — Overview and vocabulary

ISO/IEC 27002 — Code of practice for information security management

ISO/IEC 27007 — Guidelines for information security management systems auditing (focused on the management system)

ISO/IEC TR 27008 — Guidance for auditors on ISMS controls (focused on the information security controls)

ISO/IEC 27010 — Information security management for inter-sector and inter-organizational communications

ISO/IEC 27013 — Guideline on the integrated implementation of ISO/IEC 27001 and ISO/IEC 20000-1

ISO/IEC 27033-1 — Network security - Part 1: Overview and concepts

ISO/IEC 27033-3 — Network security - Part 3: Reference networking scenarios - Threats, design techniques and control issues

ISO/IEC 27034-1 — Application security - Part 1: Guideline for application security

ISO/IEC 27037 — Guidelines for identification, collection, acquisition and preservation of digital evidence



The real new challenge is recently released cyber security standards for nuclear power plants.

*IEC 62645 “Nuclear power plants – Instrumentation and control systems – Requirements for security programs for computer-based systems” – 2014*

*IEC 62859 Ed.1: “Nuclear power plants - Instrumentation and control systems - Requirements for coordinating safety and cybersecurity”. -2016*

**As a result, there is no NPP project, which is designed according to these modern standards.**

The greatest risk for NNP (and I&C) licensing process is updated and revised nuclear codes (the requirements of regulatory bodies). Both Russian VVER projects in Europe, Paks-II and Hanhikivi-1 NPPs, have risks related to renewal of nuclear codes.

- Finland's regulatory body updated 11 of 46 YVL Guides since 2013.
- Hungary's regulatory body is going to release new Nuclear Safety Code.
- Russia's regulation body updated NP-001-15 «General Safety Provisions for Nuclear Power Plants» and new NP-082-07 «Nuclear safety rules for reactor installations of nuclear power plants» is expecting.

All VVER projects without construction licenses are suffering from these “improvements”.

## Group A: Safety management of a nuclear facility

Guide	Title	Issued
YVL A.1	Regulatory oversight of safety in the use of nuclear energy <a href="#">↗</a>	22 Nov 2013
YVL A.2	Site for a nuclear facility <a href="#">↗</a>	15 Nov 2013
YVL A.3	Management system for a nuclear facility <a href="#">↗</a>	2 Jun 2014
YVL A.4	Organisation and personnel of a nuclear facility <a href="#">↗</a>	2 Jun 2014
YVL A.5	Construction and commissioning of a nuclear facility <a href="#">↗</a>	2 Jun 2014
YVL A.6	Conduct of operations at a nuclear power plant <a href="#">↗</a>	5 Jun 2014
YVL A.7	Probabilistic risk assessment and risk management of a nuclear power plant <a href="#">↗</a>	15 Nov 2013
YVL A.8	Ageing management of a nuclear facility <a href="#">↗</a>	20 May 2014
YVL A.9	Regular reporting on the operation of a nuclear facility <a href="#">↗</a>	15 Aug 2014
YVL A.10	Operating experience feedback of a nuclear facility <a href="#">↗</a>	15 Nov 2013
YVL A.11	Security of a nuclear facility <a href="#">↗</a>	15 Nov 2013
YVL A.12	Information security management of a nuclear facility <a href="#">↗</a>	22 Nov 2013



UNOFFICIAL TRANSLATION FROM FINNISH.  
LEGALLY BINDING ONLY IN FINNISH AND SWEDISH.

REGULATION STUK Y/1/2016

## Radiation and Nuclear Safety Authority Regulation on the Safety of a Nuclear Power Plant

Adopted in Helsinki on **22 December 2015**

By virtue of Section 7 q of the Nuclear Energy Act (990/1987),  
as it is in Act 676/2015, the Radiation and Nuclear Safety Authority has issued the following:

### Chapter 1 Scope of application and definitions

#### Section 1 Scope

1. This regulation shall apply to nuclear power plants. The regulation also applies to other nuclear facilities equipped with a nuclear reactor and nuclear facilities intended for the storage of spent nuclear fuel that are not part of a nuclear power plant.

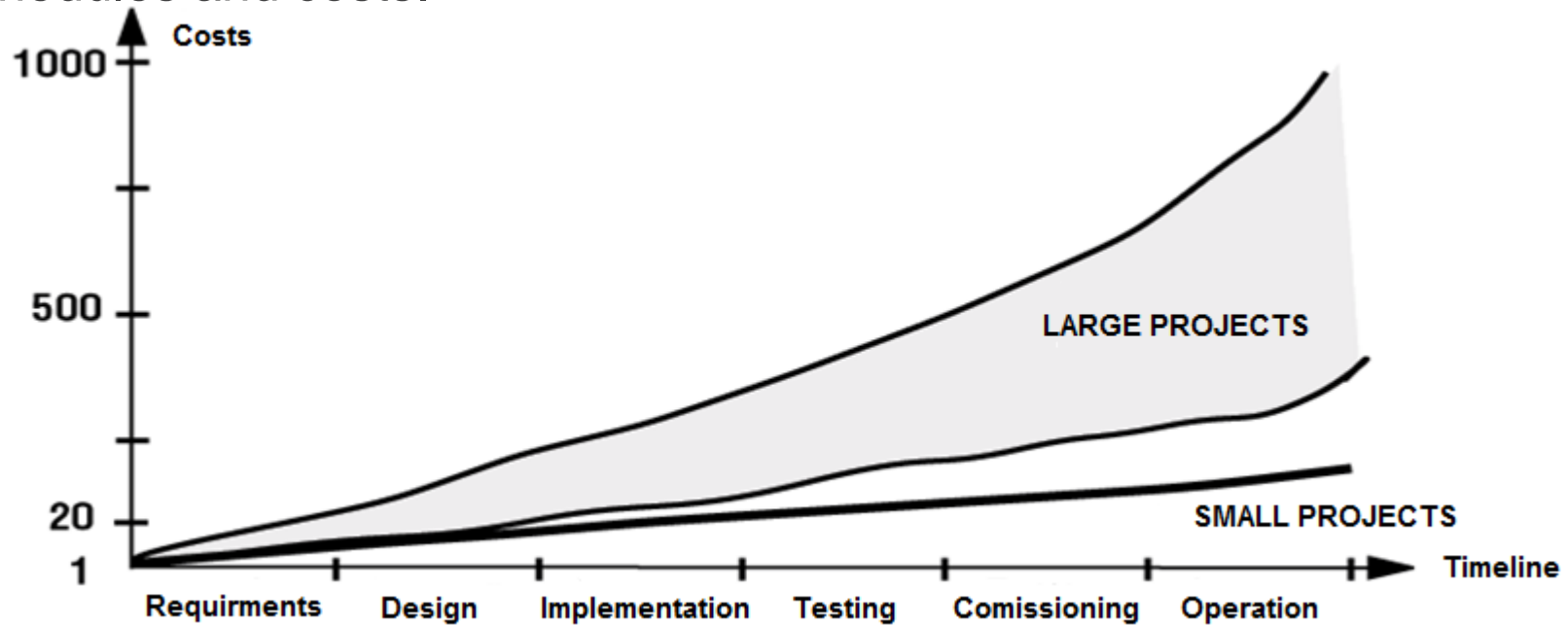




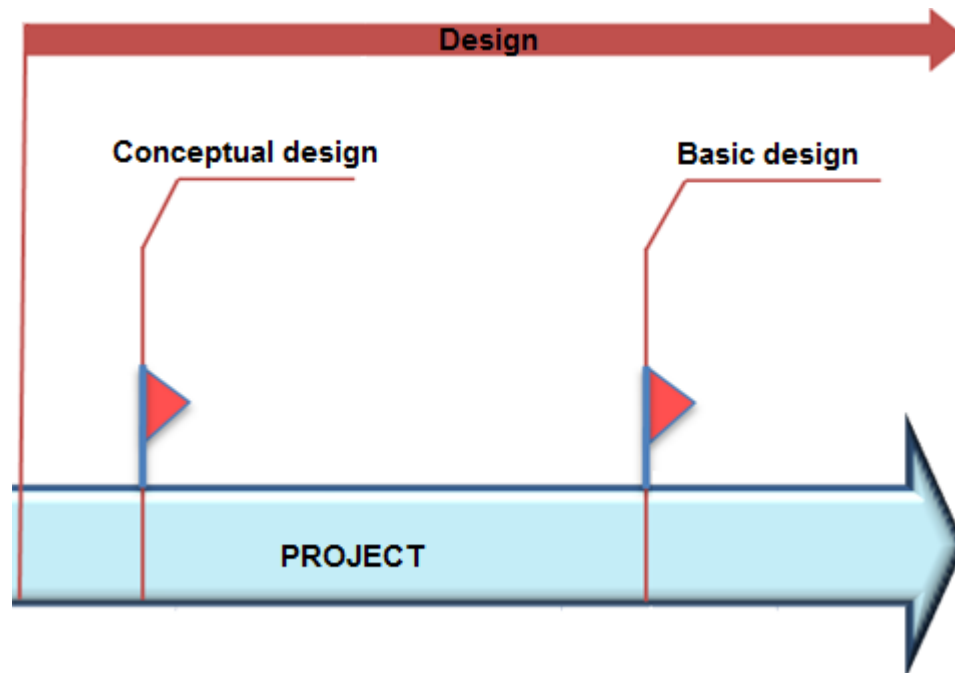
# Impact on Licensing

Certainly, design documentation for construction licensing application (PSAR, PSA, Basic Design) will be accessed for compliance with rules and regulations .

Errors and inconsistencies will have significant influence on project schedules and costs.



Risk of declining construction license application could be significantly reduced in case when a part of documentation submitted for analysis and approval in advance. In this case, the scope of information should be enough to evaluate architectural approach and safety criteria assessment (diversity, redundancy, independence).





Conceptual design documents contains technical solutions description for limited scope of I&C design aspects, like defense-in-depth or power supply. Moreover, these technical solutions should be described in a platform independent manner and does not take into account platform or project specific aspects, like a subsystem structure.

This improvement will speed up the whole design process due to reduction of coordination and approval time period in comparison with traditional design process.

Defense in depth concept for I&C

Independence concept for I&C

Diversity concept for I&C

Cabling concept for I&C

Protection against external factors concept for I&C

Ageing management concept for I&C

Power supply concept for I&C

Information security concept for I&C

Periodical testing concept for I&C systems

+

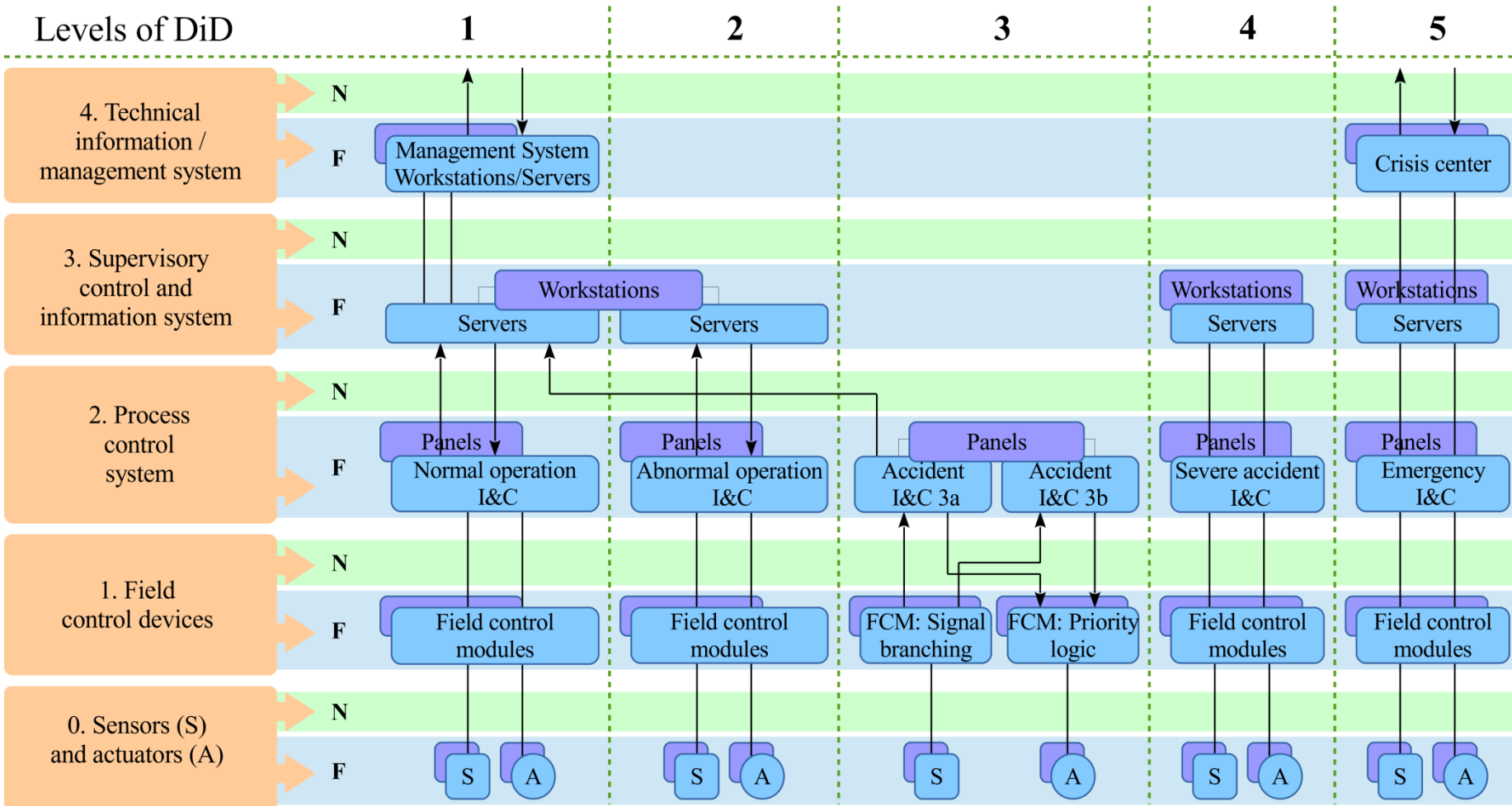
I&C Preliminary general architecture, Preliminary safety system architecture



# Example of Overall I&C Architecture



POCATOM



N – Network sublayer, F – Functional sublayer

- Compliance with stages of international standards (step-by-step clarification for basic solutions).
- Approval of architectural and some technical solutions at the very early stage of project (important for basic design approval).
- Reduction of risks associated with nuclear codes and standards incompliance during licensing process.
- Decrease in coordination time (due to reduction time of basic design approval).





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**Thank you very much for you  
attention!**

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