WORLD NUCLEAR ASSOCIATION

Session # 2 Digital Instrumentation and Control

Current and Emerging Technical Challenges

Current Status and Outlook of WNA CORDEL DICTF workload on Digital I&C topics

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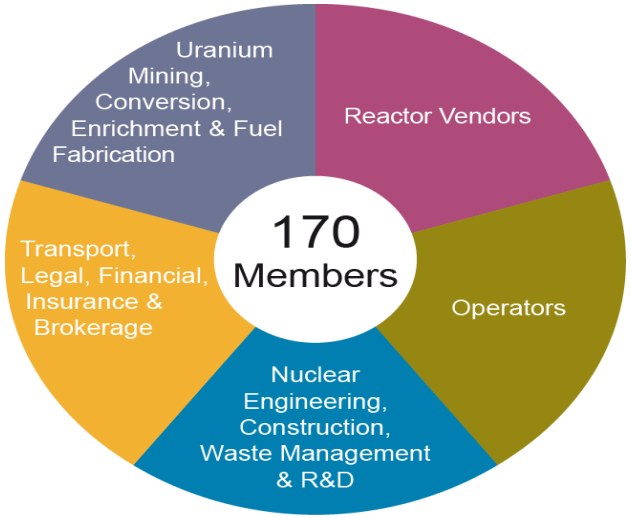
The World Nuclear Association in Brief



- Founded in 2001 on the basis of the Uranium Institute [itself founded in 1975]
- International organization that *promotes* nuclear energy and *supports* the companies that comprise the global nuclear industry.
- Membership: encompasses all aspects of nuclear energy

- World's leading online news service on developments related to nuclear power - Reaching 100,000 readers per week

- Global partnership, committed to training and education, of nuclear industry leaders

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CORDEL in Brief

CORDEL = Cooperation in Reactor Design, Evaluation & Licensing

Mission: Promote the standardization of nuclear reactor designs

- Every reactor vendor offers one or more standard designs (EPR, AP1000, ESBWR, AES2006, APR1400, etc.). These '*standardized'* designs would be adapted to comply with the national safety standards in each country where they are built.

- If the regulatory requirements in all countries were harmonized, the design could go through the licensing process without adaptions or changes (other than those dictated by site specific circumstances) and would therefore be internationally standardized design.

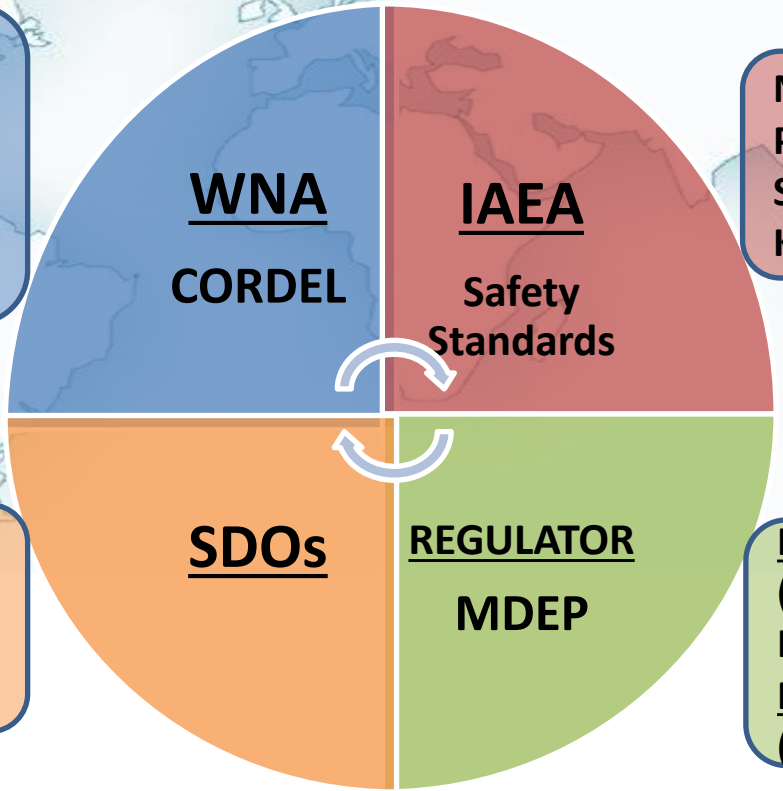
- A standardized design approval process and worldwide nuclear power plant designs would boost investment attractiveness and predictability of nuclear new build worldwide, both in established nuclear countries and in emerging nuclear countries. In addition, safety would be improved though more efficient sharing of operating experience, enabling more cost effective licensing and safety analysis and providing more effective nuclear power plant monitoring.

International Cooperation Framework

Industry

Government

International
(WNA: Supply Chain, Nuclear Law, Capacity Optimization; WANO)
Regional
(EPRI, INPO, FORATOM, EUR, ENISS)



NUSSC
Probabilistic Safety Goals
SMRs
Knowledge Management

ASME, AFCEN, KEPIC, JSME, NIKIET, CSA, IEC, IEEE and ISO

International
(OECD/NEA, OECD/IEA, ICRP, IAEA, EC)
Regional
(WENRA, ENSREG)

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CORDEL: DIGITAL INSTRUMENTATION & CONTROL TASK FORCE

Aims to promote the understanding of inconsistencies in the licensing requirement of DIC systems and components, and promote the international convergence of these requirements

The group has identified a number of key issues that needs to be tackled by a series of DICTF papers:

- Safety Classification of I&C Systems
    - *I. Current status & difficulties – Sept 2015 (Update: 2017/2018)*
    - *II. Comparison of Definitions of Key Concepts – soon to be published*
    - *III. Classification of I&C support functions – in development*
    - *IV. Safety Classification process – under discussion*
- Defense-in-Depth & Diversity (DiD&D)
    - *I. Challenges related to the I&C architecture - soon to be published*
    - *II. Country specific approaches – in development*
- Modernization of I&C SSCs (Systems, Structures & Components)
    - *I. Current status & difficulties – in development*

Safety Classification of I&C Systems

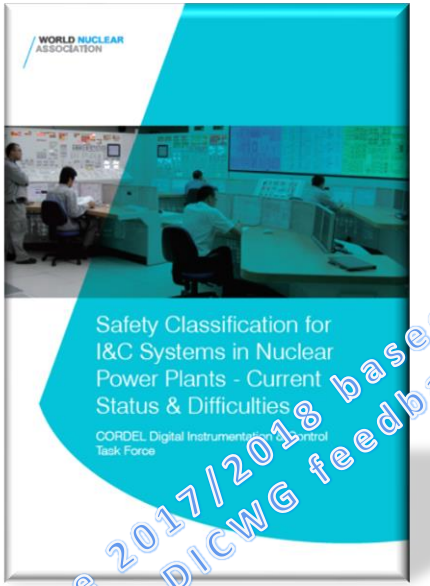
I. Current Status & Difficulties

Objectives:

Identify topics that create difficulty for CORDEL members when developing and applying safety classification for I&C systems in nuclear power plants.

The paper identifies the following difficulties:

- Inconsistency between international standards and local regulations
- Ambiguous requirements for safety classification
- Incomplete rules for I&C function categorization
- Inconsistent requirements for systems provided specifically as diverse backup to protection systems



Update 2017/2018 based on MDEP DICWG feedback

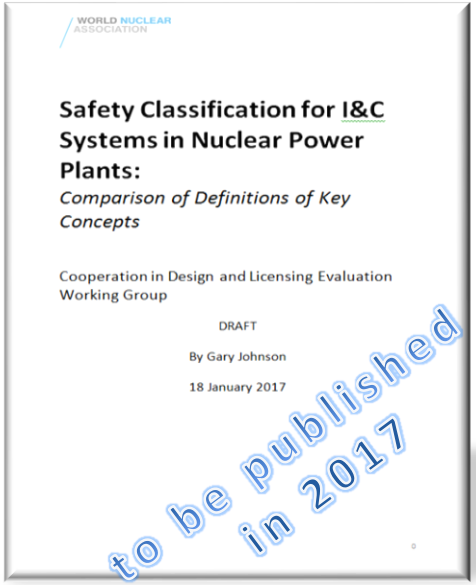
http://www.world-nuclear.org/our-association/publications/online-reports/cordel-safety-classification-for-i-c-systems-in-nu.aspx

Safety Classification of I&C Systems

II. Comparison of Definitions of Key Concepts

Objectives:

Presents a comparison of the definitions that various regulatory organizations and standards development organizations give for key concepts which are important for the industry to understand and implement correctly in order to meet licensing requirements but which are vaguely or inconsistently defined.



The paper identifies the following conclusions:

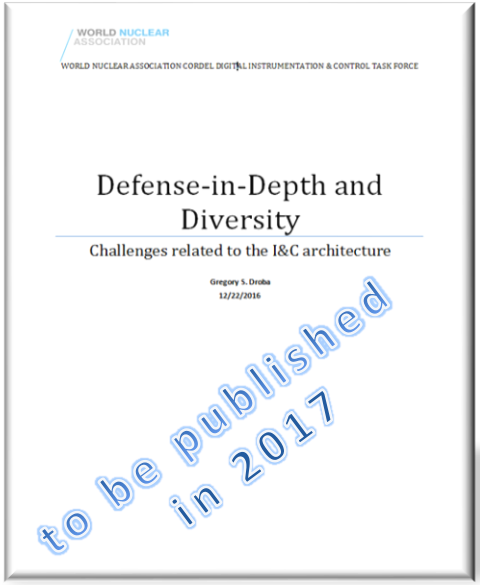
- different organizations examined use different terms and assign significantly different definitions to the concepts considered in this report
- clear understanding of the terms used to describe important concepts and of how these terms are used in regulation
- CORDEL should encourage the various organizations represented to harmonize terminology where possible. Harmonization of terms and definitions will not always be quick or easy.

Defence in Depth & Diversity

I. Challenges related to the I&C architecture

Objectives:

Various regulatory agencies have different views about how to apply defence-in-depth to nuclear power plant designs. These differences have had significant consequences for reactor vendors. The paper documents the discussion of the DICTF members on the specific challenges they face in the application of Defence-in-Depth and Diversity techniques to I&C activities.



The paper identifies the following conclusions:

- Defining the current landscape by compiling and comparing Defense-in-Depth and Diversity terminology and definitions used in different regions,
- Tabulating the challenges in defining Defense-in-Depth and Diversity,
- Challenges related to the application of Defense-in-Depth and Diversity such upgrading existing NPPs or the implementation of regulatory guidance, and
- Identifying and recommending potential solutions

Modernization of I&C SSCs

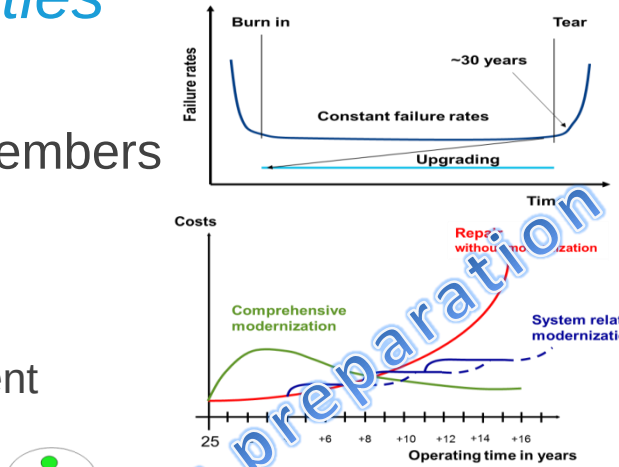
I. Current Status and Difficulties

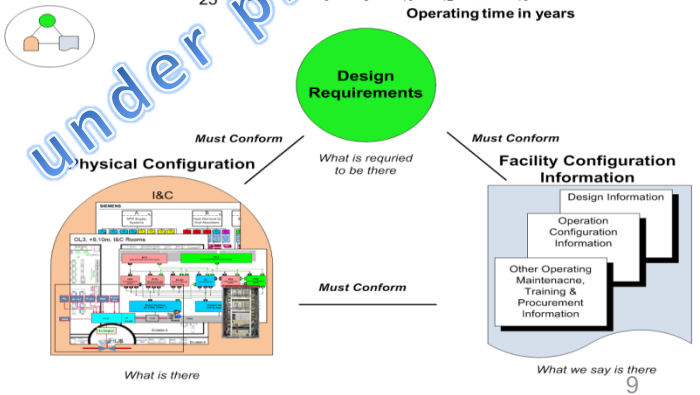
Objectives:

Identify topics that create difficulty for CORDEL members on modernization of I&C Systems, Structures and Components in nuclear power plants.

The paper identifies the following conclusions:

- NPP Life Time Management / I&C Life Time Management
- Types of I&C modernization projects
- Causes of I&C modernization difficulties:
  - I&C Equilibrium (Triangle)
  - I&C life cycle phases
  - Time slot(s) for modernization
  - Lack of key NPP knowledge holders
  - High level of complexity





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