Fire Protection regulation for NPP in Korea

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Summary

Purpose of NPP fire protection at NPP in Korea is to minimize both probability of occurrence and consequence of fire. To meet this object operating plants are designed to provide reasonable assurance through defense in depth. Ultimate goal is nuclear safety and Radioactive release to be minimized in event of a fire.
The Korea regulatory framework for nuclear plant is based on number for US regulations and supporting guidelines. In accordance with Korea nuclear regulation Atomic Energy include fire protection program to protect structure, system and component important to safety. It also states about requirement for Fire Hazard Analysis and fire prevention, fire detection system and suppression, building design and etc.

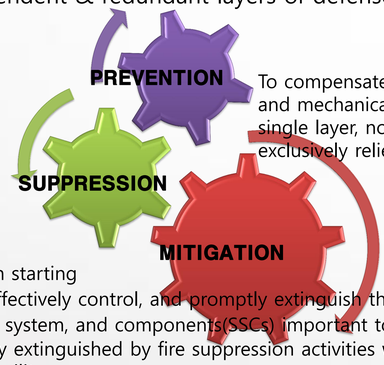
Conception of Fire Protection

Purpose of NPP Fire Protection

- Nuclear Safety
- Radioactive Release
- Life Safety
- Plant Damage/Business Interruption

Defense-in-Depth Philosophy for Fire Protection

Multiple independent & redundant layers of defense



To compensate for potential human and mechanical failure so that no single layer, no matter how robust, is exclusively relied upon.

- Prevent fires from starting
- Rapidly detect, effectively control, and promptly extinguish those fire that do occur.
- Protect structure, system, and components(SSCs) important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of facility.
- Design fire protection system such that their failure or inadvertent operation dose not adversely impact the ability of SSCs important to safety to perform their safety functions.

NUREG 0800 — Standard Review Plan[SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants

Background

Fire

Browns Ferry Nuclear Power Plant On March 22, 1975
- Fire started when plant workers were testing fire barriers for leak
- Candle is used for check leaks
- Burn for seven hours, More than 1,600 electrical cables affected

Fire damaging electrical cables in metal trays passing through a concrete wall

Fire regulation changed Fundamentally

NRC revised Fire protection regulation to reasonably ensure a reactor maintains the ability to shutdown safely in the event of a fire by;
- Minimizing the potential for fire and explosions;
- Rapidly detecting, controlling and extinguishing fires that do occur;
- Ensuring that operators can shut down reactor safely despite a fire to minimize the risk of significant radioactive releases to the environment

Fire Protection Regulation for NPP in US

Federal Regulation

Operated before 1979. 1. 1	Operated after 1979. 1. 1	PRESENT
10CFR 50.48(b) (1980. 10)	10CFR 50.48(a) (1980. 10)	10CFR 50.48(a) (1980. 10)
10CFR 50 App.A GDC 3(1971. 2)	10CFR 50 App.A GDC 3(1971. 2)	10CFR 50 App.A GDC 3(1971. 2)
10CFR 50 App.R GDC 3(1980. 10)		10CFR 50 App.R GDC 3(1980. 10)
		10CFR 50.48(c) (2004. 7)

Guidelines

BTP APCSB 9.5-1 (1975. 5)	BTP CMEB 9.5-4 (1981. 7)	BTP SLPB 9.5-1 (2003. 12)
		R.G. 1.189 (2001. 4)
		R.G. 1.205 (2006. 3)

Industrial Standards

NFPA 803 (1978)	NFPA 805 (2001. 1)
NFPA 804 (1995. 8)	NFPA 804 (1995. 8)

NFPA 11, 11A, 12, 12A, 12B, 13, 15, 16, 17, 20, 22, 24, 30, 70, 72,0 90A, 2001, IEEE 328, ASTM E1119

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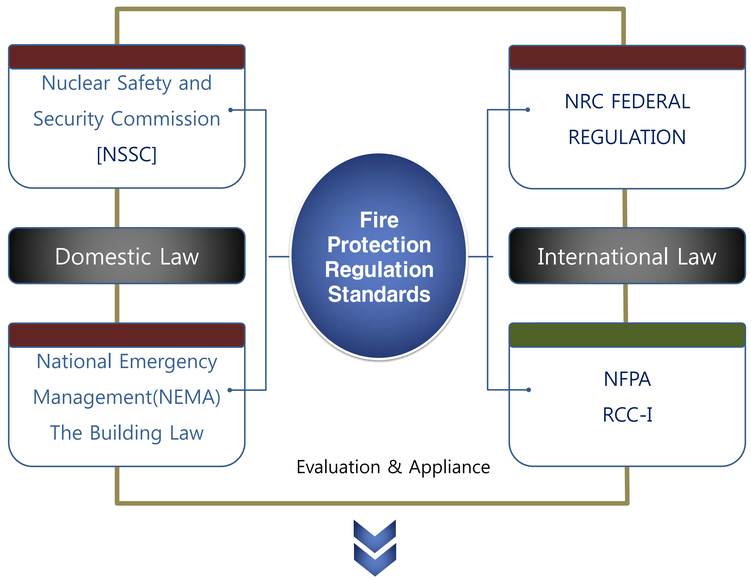
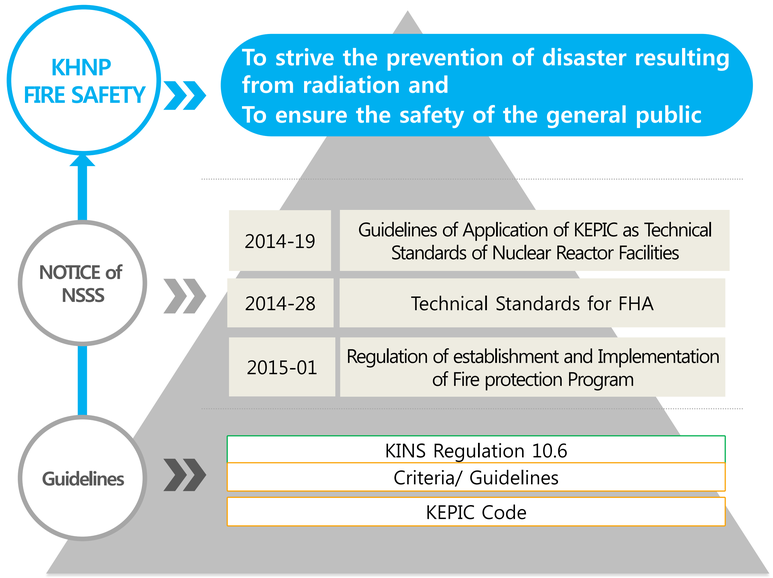




KINS : KOREA INSTITUTE OF NUCLEAR SAFETY
KEPIC : Korea Electric Power Industry

Fire Protection Programs(FPP) in KHNP

Organization, Staffing Responsibilities

Describe the organizational structure and responsibilities for its establ-ishment and implementation
- Program management
- Fire protection staffing and qualification
- Engineering and modification
- Inspection, testing and maintenance of fire protection SSCs
- Fire prevention, emergency response

Fire Protection Training And Qualification

Training and Experience in fire protection and in nuclear plant safety
Fire brigade training and Qualification
General employee training
- Appropriate action to take upon discovering a fire. Etc..
- Fire watch training

Fire Hazard Analysis

Perform to demonstrate that the plant will maintain the ability to
Perform safe-shutdown functions and minimize radioactive materials
Release to the environment in the event of a fire
- Consider potential in situ and transient fire hazards
- Determine the effects of a fire to safely shutdown
- Specify measures for fire prevention, fire detection, fire suppression, and fire containment for each fire area containing SSCs important to safety

Fire Prevention Fire Detection/ Suppression

Safe Shutdown Analysis

Identify safe shutdown components Circuits
Demonstrate capability of safe shutdown

House Keeping

Building Design
Interior finish, HVAC Design
Compartmentalization

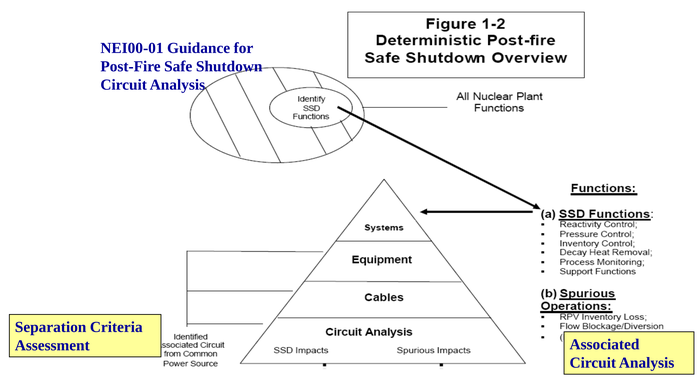
Passive Fire-Resistive Feature
Structure fire barrier
Electrical raceway fire barrier system

Approach for fire safety

Deterministic Fire Protection

Ensuring system needed shut down
System-based tool for considering fire
(Rather than today's more detailed component based information)
10CFR50.48(b) Appendix R of 10CFR 50
REG guide1.189

Deterministic Post Fire Safe Shutdown Over View



Risk-informed performance-based fire protection

Risk Insights
Rely on required outcome
(rather than a specific process or technique to achieve outcome)
10CFR50.48(c)
NFPA805
REG guide1.205
Approval : Shearon Harris Plant in North Carolina, in June 2010
Oconee plant in South Carolina, in Dec, 2010

Fire Modeling