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## **NUCLEAR INSURANCE FIRE RISK**

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Nuclear facilities operate under the constant risk that radioactive materials could be accidentally released off-site and cause injuries to people or damages to the property of others. Management of this nuclear risk, therefore, is very important to nuclear operators, financial stakeholders and the general public. Operators of these facilities normally retain a portion of this risk and transfer the remainder to others through an insurance mechanism. Since the nuclear loss exposure could be very high, insurers usually assess their risk first-hand by sending insurance engineers to conduct a nuclear insurance inspection. Because a serious fire can greatly increase the probability of an off-site release of radiation, fire safety should be included in the nuclear insurance inspection. This paper reviews essential elements of a facility's fire safety program as a key factor in underwriting nuclear third-party liability insurance.

### **Introduction**

For all Operators of nuclear facilities, nuclear liability is one of several loss exposures that must be carefully managed. Nuclear liability may include damages the plant owners are legally obligated to pay for off-site property damage or bodily injury caused by the nuclear energy hazard. Two techniques used to manage this risk are risk financing and risk control. Finance techniques plan for payment of losses that do occur. Control techniques manage loss severity and loss frequency.

### **Nuclear Third-Party Liability Insurance**

Planning for the payment of third-party nuclear liability losses usually involves an insurance mechanism such as that available from nuclear insurers worldwide. Because the nuclear hazard is unique and is characterized by the potential for a significant liability loss, the resources of many insurers and reinsurers are needed to generate the financial capacity to insure this large loss exposure.

### **Fire Risk Control**

A catastrophic fire loss at a nuclear power plant could potentially curtail the plant's ability to safely shutdown, leading to the overheating of the nuclear fuel in the reactor core and a release of large amounts of radioactive material off-site. This could occur if a fire prevented the normal operation of both primary and backup equipment needed for safe shutdown of the nuclear reactor. Using a second example, a fire event could involve radioactive material released off-site as smoke particles or in firewater runoff.

Because either scenario could trigger insurance policy coverage, insurers need to understand and manage exposures caused by the fire hazard. This can be accomplished with an underwriting plan that includes an inspection of each facility for risk assessment and risk control purposes. When insurance coverage is requested, a team of insurance specialists experienced with the nuclear hazard should inspect the facility. An assessment of the nuclear fire risk should be part of the inspection effort. This can be done using recognized fire safety standards, good fire safety practices and the insurer's own risk control guidelines.

The inspection should produce a report that describes the risk and contains recommendations, prioritized by relative importance, to correct perceived deficiencies.

There are several elements in a well-managed fire risk. A good fire protection plan, a thorough fire hazards analysis and rigorous quality assurance oversight are three elements that are essential.

### **Fire Protection Plan**

The plan states management's policy on fire prevention and fire protection. It incorporates all the commitments, activities, programs and procedures that together form the fire protection program. Philosophical objectives of the plan are commonly stated as:

- Prevent fires from starting
- Rapidly detect, control and extinguish fires that do occur
- Provide sufficient protection for nuclear safety systems so that a single fire cannot impair safe shutdown of the plant
  - Prevent bodily injury to employees and the public and minimize financial impact on the organization

The plan should describe the fire protection organization. Responsibility for implementing all aspects of the plan should be clearly defined, including the interface between fire protection and other departments. Lines of communication should be illustrated with organizational charts. Key positions should be described including:

- Senior management position with overall responsibility for the program
- Management position responsible for daily implementation of the program
- Positions needed to accomplish day-to-day activities, such as training, inspections and maintenance
- The fire brigade
- Position responsible for measuring program effectiveness

Procedures and programs used to manage the risk should include:

- Procedures to control storage of combustible and flammable materials
- Procedures to control ignition sources, such as cutting and welding

- Controls for the placement of temporary combustible structures
- Inspection, testing and maintenance of fire protection systems
- Fire protection impairment management
- Plant fire safety inspections
- Administrative controls to ensure plant modifications are reviewed from a fire protection viewpoint

A description of the fire brigade program should include:

- Training
- Equipment
- Pre-fire plans
- Coordination with outside entities, such as the public brigades
- Fire investigations and reports

### **Fire Hazards Analysis**

A current fire hazards analysis (FHA) should be available. The FHA should demonstrate that any single fire event would not cause the loss of a reactor safe shutdown function or a significant release of radioactive materials from the facility. It should include the following:

- Evaluation of physical construction and layout of buildings and equipment including the fire resistance rating of the fire compartment boundaries
- An inventory of combustibles within a fire compartment, including the maximum anticipated transient combustibles
- A description of fire protection equipment, including detection systems and manual and automatic extinguishing systems in each fire compartment
- An analysis of the postulated fire in each fire compartment, considering fire growth rates, response of fire protection and detection and fire resistance rating
- The effect the fire will have on safe shutdown functions
- The effect the fire will have on the potential release of radioactive materials

### **Quality Assurance**

A rigorous quality assurance program is needed to provide a reasonable level of confidence that fire protection systems will function as intended. The program should assure that material and equipment purchased is approved for the intended application and designed and installed in accordance with recognized standards. Records should be available to show that inspections and tests were performed as needed. Quality assurance should arrange for periodic independent audits of the fire protection program to assess overall program effectiveness.

### **Conclusion**

The fire hazard is a large component in the nuclear liability insurance risk. It must be assessed and managed with an underwriting plan that includes an on-site inspection



of the facility.

### **References**

Nuclear Pools' Forum, 1997, "International Guidelines for the Fire Protection of Nuclear Power Plants"