C. CONVENTIONAL AND RADIOLOGICAL HAZARDS

ENABLING OBJECTIVES:

3.15 Describe the major hazards associated with the boiler, turbine, generator, steam and feedwater system.

On the conventional side of the station, there are a number of different kinds of hazards. We will categorize them according to their type of energy.

CHEMICAL ENERGY

In the feedwater system we use different chemicals to treat the boiler feedwater. These chemicals include hydrazine, ammonia and morpholine. Proper protection and careful handling of these chemicals will prevent injury.

Hydrogen used for generator cooling is potentially explosive in the range of 4% to 76% in air. Hydrogen can leak out of the generator or air can leak into the generator. This requires very good seals on the generator to minimize the explosion hazard.

THERMAL ENERGY

Steam and hot feedwater leaks are thermal hazards. Steam leaks are often invisible therefore once found a leak location should be roped off immediately. In most cases it is necessary to shutdown a unit before the steam leak can be repaired. Equipment that handles hot feedwater or steam will have high temperatures. Insulation and/or physical barriers are installed to prevent personnel from being exposed to the heat.

ELECTRICAL ENERGY

Most equipment and controls associated with the conventional side of the station will require electrical energy to operate. This includes numerous DC and AC electrical hazards. This energy is either produced by the generator or supplied by different sources. If not controlled and handled properly, it can cause shock, burns or even cardiac arrest.

MECHANICAL ENERGY

This hazard is found in anything that moves or is capable of moving. Generator and turbine rotating parts and other major components in pumps and motors are hazards that can cause cuts, abrasions, and crushing injuries.

NOISE ENERGY

The main hazard here is excessive noise from unexpected opening of boiler safety valves which could cause temporary loss of concentration and risk of injury. Personal hearing protection will reduce this risk somewhat.

PRESSURIZED FLUID ENERGY

This hazard is found in most of the conventional systems. Uncontrolled release of pressurized fluid can cause punctures, fractures, abrasions and crushing injuries. Excessive pressure can cause equipment to fail. This could lead to broken components flying around causing injury to personnel and damage to other equipment.

Oil supplied to the hydraulic valves and bearings is pressurized. Any rupture in the oil lines can result in fire, if ignition sources are present.[10]

RADIATION ENERGY

Failure of boiler tubes during operation may result in loss of D_2O to the boiler feedwater system[11], along with radioactive tritium, activated corrosion products and, possibly, fission products. In this case steam leaks from the main steam system could result in radiological hazards. Tube leaks should be repaired during unit outages.

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[10] Fire Retardent Fluid (FRF) is used for operating the valves that control the turbine.

[11] There is a large pressure difference across the tubes. The HTS is at 10MPa and the boiler at 4MPa, hence the leak will always occur into the feedwater.

ASSIGNMENT

1. What are the major hazards associated with the conventional side of the station?