

Westinghouse Technology Systems Manual

Section 14.2

Generic Service Water and Essential Service Water Systems

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14.2 SERVICE WATER AND ESSENTIAL SERVICE WATER SYSTEMS

Learning Objectives:

1. State the purposes of the service water system.
2. List two loads supplied by the service water system.
3. State the purposes of the essential service water (ESW) system portion of the service water system.
4. List four safety-related loads supplied by the ESW system.

14.2.1 Introduction

The purposes of the service water system are:

1. To provide cooling water to nonsafety-related auxiliary components, and
2. To supply the essential service water system during normal operations.

The purposes of the essential service water (ESW) system are:

1. To provide cooling water to safety-related components following a loss-of-coolant accident (LOCA) or loss of offsite power, and
2. To provide a backup source of water for the auxiliary feedwater system (Sections 5.7 and 5.8), the component cooling water system (Sections 14.1 and 14.5), and the spent fuel pool (Section 14.4).

The essential service water system is used during all phases of plant operation. It is a safety-related system, while the service water system is not safety related. During normal operations, the service water system supplies ESW loads.

14.2.2 Service Water System

The service water system as shown in Figure 14.2-1 has three pumps that take suction on the cooling tower basin, discharge through strainers to its loads, and return flow to the cooling tower. Normally, only two pumps are running, with the third pump in standby. The discharge valves operate automatically, opening when the pumps start and closing when the pumps stop. The pumps are vertical centrifugal pumps with a capacity of 17,500 gpm at 100-psig discharge pressure. They are located in the circulating water pump house and are powered from the service load buses. The loads supplied are:

- Essential service water,
- Closed cooling water heat exchangers,
- Turbine building chiller condensers,

- Steam packing exhausters,
- Air compressor and after cooler,
- Generator hydrogen coolers,
- Generator stator water cooler system coolers,
- Turbine-generator lube oil coolers,
- Boron thermal regeneration system chiller,
- Steam generator blowdown heat exchanger, and
- Condenser vacuum pump seal water coolers.

During normal operations, the service water system supplies the essential service water system through valves HV-23 and HV-25 for the A train, and through HV-24 and HV-26 for the B train. The return flow is through HV-39 and HV-41 for the A train, and through HV-40 and HV-42 for the B train.

All of these valves close to isolate ESW from service water on a safety injection actuation signal or a loss of offsite power.

14.2.3 Essential Service Water System

The essential service water system (Figure 14.2-2) is a safety-related system with two independent and redundant loops. Each train has one pump with a discharge strainer, piping, and two mechanical draft cooling towers. The two trains could be cross connected, but are normally kept independent.

During normal operations, the ESW pumps are idle, with the service water system supplying ESW loads. A safety injection actuation signal or loss of offsite power will isolate service water from ESW and start the ESW pumps. The ESW pumps are vertical centrifugal pumps with a capacity of 15,000 gpm at 142-psig discharge pressure and are powered from the Class 1E electrical distribution system.

The water supply for the ESW system is the ultimate heat sink, a large enough supply to provide cooling for 30 days without the need for makeup. Safety-grade mechanical draft cooling towers are used to help satisfy the 30 day requirement. The loads supplied by ESW are:

- Component cooling water heat exchangers,
- Diesel generator coolers,
- Containment air coolers,
- Pump room coolers,
- Air compressors and after coolers,
- Control building air conditioning condensers, and
- Fuel building coolers.

ESW is also the backup water source for the auxiliary feedwater system. ESW is the emergency backup supply for the component cooling water system and for the spent fuel pool.

14.2.4 Summary

The service water system is a nonsafety system that supplies auxiliary equipment. It also supplies the essential service water system during nonaccident and normal at-power conditions.

The ESW system is a safety system that supplies equipment necessary for the safe shutdown of the plant following an accident. It consists of two redundant trains, with a 100% capacity pump in each train. These pumps are normally idle; they start upon a safety injection actuation signal or loss of offsite power. The normal water supply, service water, is then isolated from the ESW system.

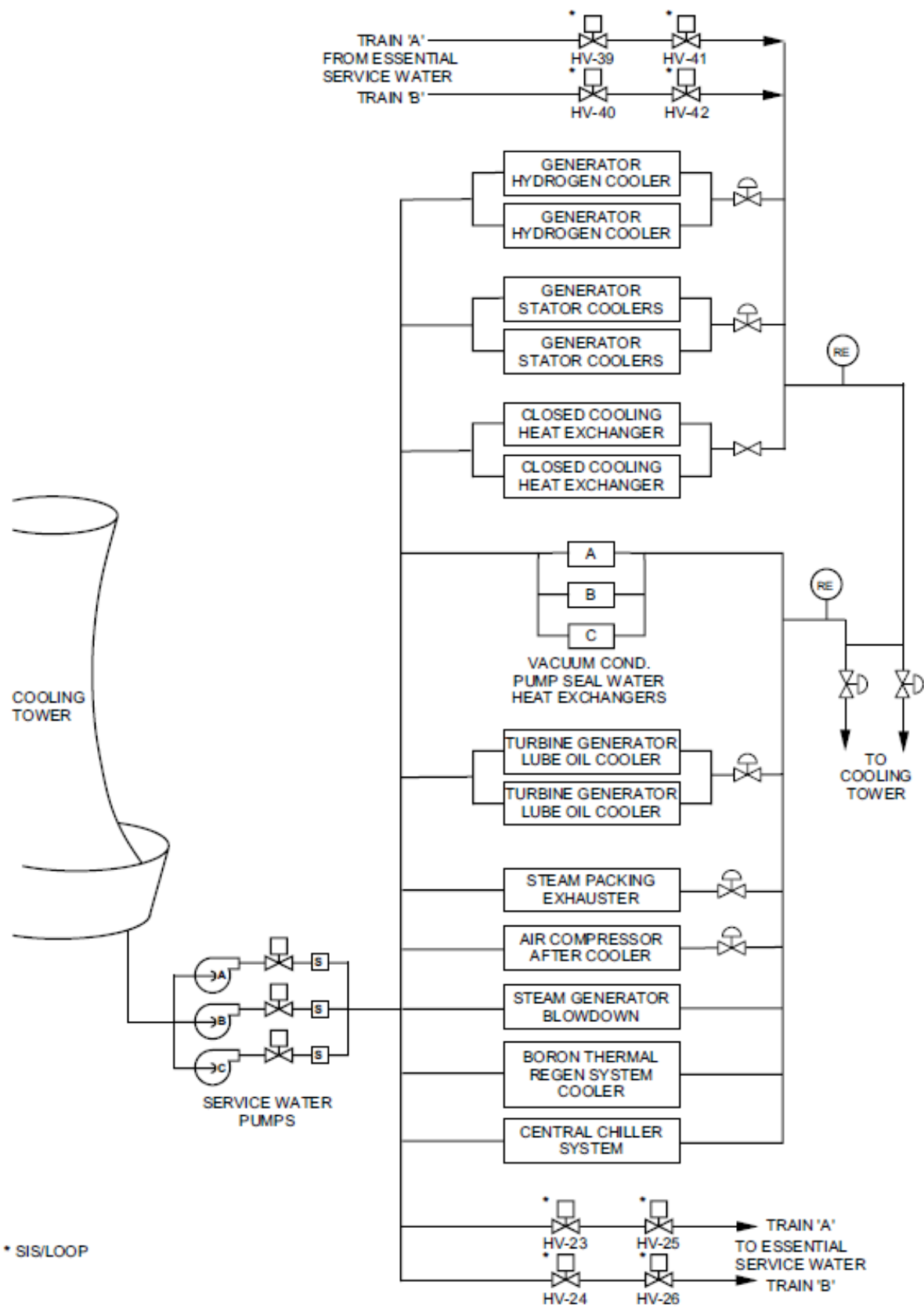


Figure 14.2-1 Service Water

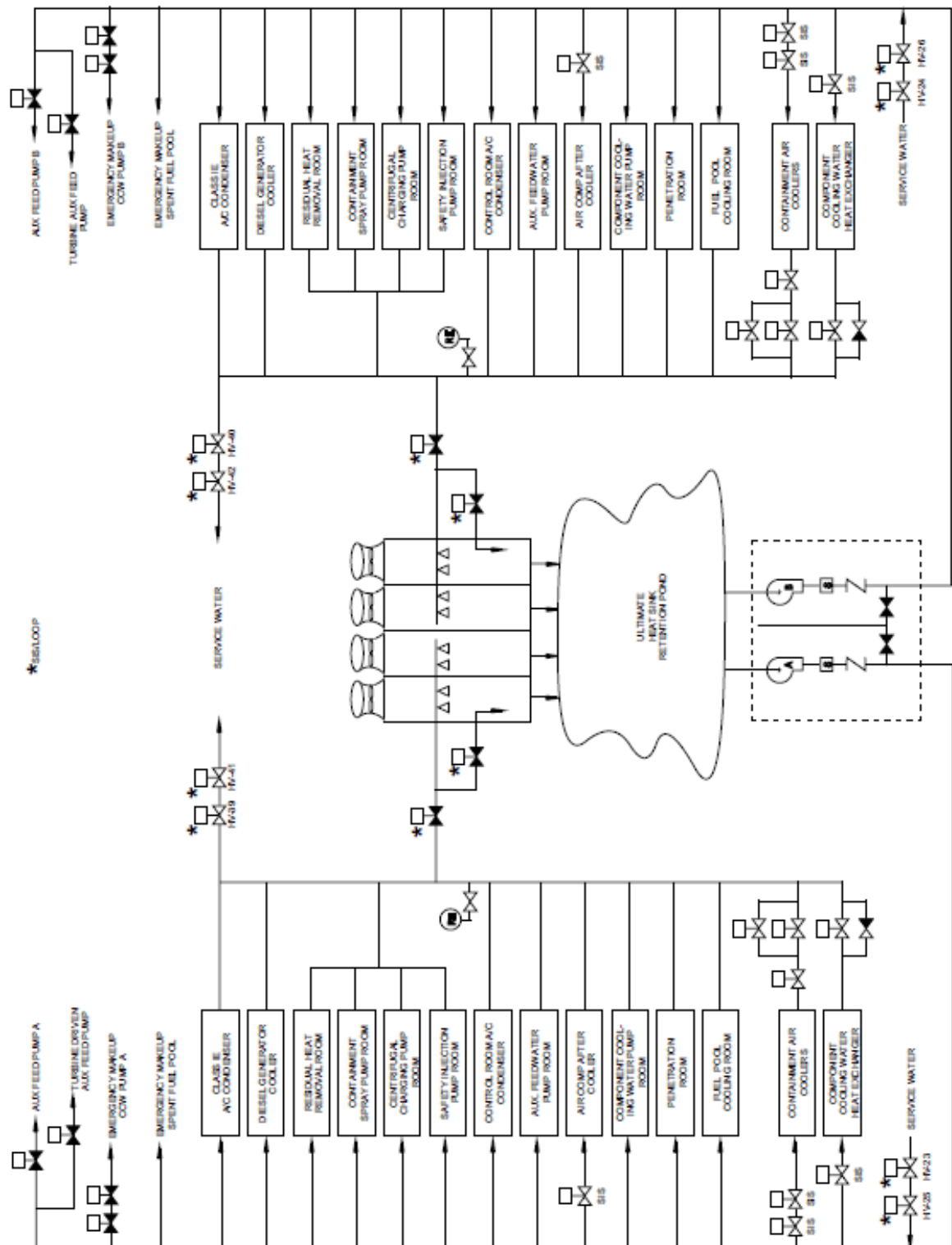


Figure 14.2-2 Essential Service Water