ELECTRIC HYDROGEN RECOMBINERS

LIMITING CONDITION FOR OPERATION

3.6.4.2 Two separate and independent containment hydrogen recombiner systems shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTION:

With one hydrogen recombiner system inoperable, restore the inoperable system to OPERABLE status within 30 days or be in HOT STANDBY within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.6.4.2 Each hydrogen recombiner system shall be demonstrated OPERABLE:

a. At least once per 6 months by verifying during a recombiner system functional test using outside atmospheric flow rate of $\geq$ 42 scfm that the heater outlet temperature increases to $\geq$ 700°F within 90 minutes and is maintained for at least 2 hours.

b. At least once per 18 months by:

1. Performing a CHANNEL CALIBRATION of all recombiner instrumentation and control circuits.

2. Verifying through a visual examination that there is no evidence of abnormal conditions within the recombiners (i.e., loose wiring or structural connections, deposits of foreign materials, etc.).

3. Performing a hydrogen recombiner system functional test using containment atmospheric air to verify the following:

a. The recombiner blower flow when corrected to 13 psia and 130°F is $\geq$ 42 scfm, and

b. The heater temperature increases to $\geq$ 1100°F within 5 hours and is maintained for at least 4 hours while operating at a recombiner blower flow that when corrected to 13 psia and 130°F is $\geq$ 42 scfm.

SURVEILLANCE REQUIREMENTS (Continued)

4. Verifying the integrity of all heater electrical circuits by performing a continuity and resistance to ground test immediately following the above required functional test. The resistance to ground for any heater phase shall be ≥ 10,000 ohms.

c. Verifying that the hydrogen recombiner isolation valves (2HCS-MOV110A&B and 2HCS-MOV113A&B) are closed and de-energized after every surveillance test (per 4.6.4.2.a) is completed or after their use, post-accidents, to recombine hydrogen in the containment is completed.

3/4.6.3 CONTAINMENT ISOLATION VALVES

The OPERABILITY of the containment isolation valves ensures that the containment atmosphere will be isolated from the outside environment in the event of a release of radioactive material to the containment atmosphere or pressurization of the containment. Containment isolation within the time limits specified ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for both a LOCA and major secondary system breaks.

The opening of locked or sealed closed containment isolation valves on an intermittent basis under administrative control includes the following considerations: (1) stationing an operator, who is in constant communication with the control room, at the valve controls, (2) instructing this operator to close these valves in an accident situation, and (3) assuring that environmental conditions will not preclude access to close the valves and that this action will prevent the release of radioactivity outside the containment.

3/4.6.4 COMBUSTIBLE GAS CONTROL

The OPERABILITY of the equipment and systems required for the detection and control of hydrogen gas ensures that this equipment will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. Either recombiner unit is capable of controlling the expected hydrogen generation associated with 1) zirconium-water reactions, 2) radiolytic decomposition of water, and 3) corrosion of metals within containment. These hydrogen control systems are consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA."

The hydrogen recombiner system is designed to maintain the hydrogen concentration in the containment structure below 4 volume percent following a LOCA. The required system flow rate (42 scfm) is the flow at post LOCA containment conditions (13 psia and 130°F) assumed in the design analysis to assure the hydrogen concentration is maintained below 4 volume percent following a LOCA.

The equation specified below shall be used when performing Surveillance 4.6.4.2.b.3 to correct the flow measured under test conditions to the corresponding flow at design basis post accident containment conditions of 13 psia and 130°F.

3/4.6.4 COMBUSTIBLE GAS CONTROL (Continued)

$$scfm_{PA} = scfm_{Test}\,(0.00154)\,\frac{T_C}{P_{Blower}}\left(1+2682.45\,\frac{P_C}{T_C^2}\right)\left(13-0.022\,T_C\left(1-\frac{P_{Blower}}{P_C}\right)\right)$$

where:

T_C = average containment temperature during testing (°R)

P_{Blower} = blower suction pressure during testing (psia)

P_C = containment pressure during testing (psia)