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April 10, 1996

MFN 048-96
Docket 52-004

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington DC 20555

Attention: Theodore E. Quay, Director
Standardization Project Directorate

Subject: **SBWR - GIRAFFE HELIUM TESTS APPARENT TEST RESULTS REPORTS (ATRs) Non-Proprietary**

Reference:
1. Letter from J.E. Quinn (GE) to T.E. Quay (NRC), SBWR - Updated Status of Test Documentation Submittals, MFN 125-95, July 24, 1995

2. Letter from J.E. Quinn (GE) to T.E. Quay (NRC), SBWR- Giraffe Helium Tests Apparent Test Results Reports (ATRs) Proprietary and Non-Proprietary and Data Transmittal for Tests H3 & H4, MFN 038-96, March 14, 1996

The attachments to this letter supply the non-proprietary Apparent Tests Results (ATR) Reports for the four helium tests and the two tie-back tests. Reference 2 supplied the electronic test data for the GIRAFFE Helium Tests H3 & H4 and the proprietary ATRs. This transmittal satisfies item numbers 29, 31 and 33 of Reference 1.

Should you have any questions concerning the attachments please contact Maryann Herzog of our staff on 408-925- 1921.

Sincerely,

for James E. Quinn
MFN 038-96

Attachments: GIRAFFE Test ATR for Tests H1 & 2, GENE-T1500013-001
GIRAFFE Test ATR for Tests H3 & 4, GENE-T1500013-002
GIRAFFE Test ATR for Tests T1 & 2, GENE-T1500013-003

cc: S. Q. Ninh (NRC) (2 paper copies of letter & ATRs plus E-Mail)

MFN 048-96

bcc:

GE Master File	(1 paper copy of letter and ATRs plus E-Mail)
SBWR Project File	(1 paper copy of letter and ATRs plus E-Mail)

GENE-T1500013-001
DRF No. T15-00013
March 1996

GIRAFFE TEST

Apparent Test Results Report (ATR)

Helium Series Tests (H)

H-1 & H-2 Tests

Prepared by: Maryann Herzog
M. Herzog, Senior Engineer
SBWR Test Responsible Engineer

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LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

D/W	Drywell
GE	General Electric
GIRAFFE	Gravity-Driven Integral Full-Height Test for Passive Heat Removal
LOCA	Loss-of-Coolant Accident
PCC	Passive Containment Cooling (System)
SBWR	Simplified Boiling Water Reactor
S/C	Suppression Chamber
TOGE	Toshiba/GE
W/W	Wetwell

1.0 TEST SUMMARY

The objectives of tests H-1 and H-2 are to demonstrate the operation of a passive containment cooling system with the presence of a lighter-than-steam non-condensable gas and to provide a database for computer codes used to predict SBWR containment system performance in the presence of a lighter-than-steam non-condensable gas.

The H-1 and H-2 test initial conditions are provided in Reference 1. The test procedures and instrument locations are proprietary information.

Test H-1 is a base case with nominal initial conditions for the SBWR containment at one hour from the initiation of a LOCA caused by a guillotine rupture of one of the main steam lines. At the start of Test H-1, the drywell contains a mixture of steam and nitrogen at a total pressure of approximately 0.3 MPa. Test H-2 is a repeat of Test H-1, except helium replaces the total volume of nitrogen in the drywell.

2.0 CONCLUSION

For both tests H-1 and H-2, the D/W peak pressures were confirmed to be well below the design limit. These tests demonstrated the successful operation of the PCCS with the presence of a heavier-than-steam and a lighter-than-steam non-condensable gas.

3.0 MAJOR TEST RESULTS

3.1 Test H-1 Results

The test results provided in Figures 1 through 6 are proprietary information.

The figure 1 plots of the measured D/W and W/W pressures are proprietary information.

The figure 2 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information. The figure 5B locations of the differential pressure measurement locations are proprietary information.

The figure 3 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 4 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

The figure 5A plot of the measured suppression pool surface temperature is proprietary information.

The figure 6 plot of the preliminary measured PCC inlet flow rate is proprietary information.

3.2 Test H-2 Results

The test results provided in Figures 7 through 12 are proprietary information.

The figure 7 plots of the measured D/W and W/W pressures are proprietary information.

The figure 8 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information.

The figure 9 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 10 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

The figure 11 plot of the measured suppression pool surface temperature is proprietary information.

The figure 12 plot of the preliminary measured PCC inlet flow rate is proprietary information.

4.0 TEST ANOMALIES and FAILED INSTRUMENTS

There were no test anomalies or failed instruments

5.0 REFERENCES

1. GIRAFFE Helium Test Specification, General Electric Company Specification 25A5677, rev. 1, May 1995

FIGURE 1 TEST H-1 D/W and W/W PRESSURES

w

FIGURE 2 TEST H-1 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

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FIGURE 3 TEST H-1 D/W TEMPERATURE

FIGURE 4 TEST H-1 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 5A TEST H-1 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 5B DIFFERENTIAL PRESSURE MEASUREMENT LOCATIONS IN S/C

FIGURE 6 TEST H-1 PCC INLET FLOW RATE

FIGURE 7 TEST H-2 D/W and W/W PRESSURES

FIGURE 8 TEST H-2 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

FIGURE 9 TEST H-2 D/W TEMPERATURE

FIGURE 10 TEST H-2 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 11 TEST H-2 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 12 TEST H-2 PCC INLET FLOW RATE

GENE-T1500013-002
DRF No. T15-00013
March 1996

GIRAFFE TEST

Apparent Test Results Report (ATR)

Helium Series Tests (H)

H-3 & H-4 Tests

Prepared by: Maryann Herzog
M. Herzog, Senior Engineer
SBWR Test Responsible Engineer

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PCC	Passive Containment Cooling (System)
SBWR	Simplified Boiling Water Reactor
S/C	Suppression Chamber
TOGE	Toshiba/GE
W/W	Wetwell

1.0 TEST SUMMARY

The objectives of tests H-3 and H-4 are to demonstrate the operation of a passive containment cooling system with the presence of a high concentration of lighter-than-steam non-condensable gas and to provide a database for computer codes used to predict SBWR containment system performance in the presence of a lighter-than-steam non-condensable gas.

Test H-3 and H-4 initial conditions are provided in Reference 1. The test procedures and instrument locations are proprietary information.

Test H-3 started with a mixture of nitrogen, helium and steam in the drywell. Helium is used to simulate the hydrogen that could be generated as the result of a fuel-clad metal water reaction. The total initial drywell pressure and all other initial test conditions for test H-3 were the same as those for the base case, test H-1.

Test H-4 started with the same initial test conditions as those for the base case, test H-1. Helium was injected into the drywell at a constant rate for the first hour of the test. The mass of helium injected for test H-4 was equal to the initial mass of helium in the drywell for test H-3.

2.0 CONCLUSION

For both tests H-3 and H-4, the D/W peak pressures were confirmed to be well below the design limit. These tests demonstrated the successful operation of the PCCS with the presence of a heavier-than-steam and a high concentration of a lighter-than-steam non-condensable gas.

3.0 MAJOR TEST RESULTS

3.1 Test H-3 Results

The test results provided in Figures 1 through 6 are proprietary information.

The figure 1 plots of the measured D/W and W/W pressures are proprietary information.

The figure 2 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information. The figure 5B locations of the differential pressure measurement locations are proprietary information.

The figure 3 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 4 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

3.1 Test H-3 Results (Continued)

The figure 5A plot of the measured suppression pool surface temperature is proprietary information.

The figure 6 plot of the preliminary measured PCC inlet flow rate is proprietary information.

3.2 Test H-4 Results

The test results provided in Figures 7 through 12 are proprietary information.

The figure 7 plots of the measured D/W and W/W pressures are proprietary information.

The figure 8 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information.

The figure 9 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 10 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

The figure 11 plot of the measured suppression pool surface temperature is proprietary information.

The figure 12 plot of the preliminary measured PCC inlet flow rate is proprietary information.

4.0 TEST ANOMALIES and FAILED INSTRUMENTS

There were no test anomalies or failed instruments

5.0 REFERENCES

1. GIRAFFE Helium Test Specification, General Electric Company Specification 25A5677, rev. 1, May 1995

FIGURE 1 TEST H-3 D/W and W/W PRESSURES

FIGURE 2 TEST H-3 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

FIGURE 3 TEST H-3 D/W TEMPERATURE

FIGURE 4 TEST H-3 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 5A TEST H-3 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 5B DIFFERENTIAL PRESSURE MEASUREMENT LOCATIONS IN S/C

FIGURE 6 TEST H-3 PCC INLET FLOW RATE

FIGURE 7 TEST H-4 D/W and W/W PRESSURES

FIGURE 8 TEST H-4 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

FIGURE 9 TEST H-4 D/W TEMPERATURE

FIGURE 10 TEST H-4 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 11 TEST H-4 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 12 TEST H-4 PCC INLET FLOW RATE

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GIRAFFE TEST

Apparent Test Results Report (ATR)

Helium Series Tests (H)

T-1 & T-2 Tests

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SBWR	Simplified Boiling Water Reactor
S/C	Suppression Chamber
TOGE	Toshiba/GE
W/W	Wetwell

1.0 TEST SUMMARY

The objectives of tests T-1 and T-2 are to demonstrate the operation of a passive containment cooling system with the presence of high concentrations of a heavier-than-steam non-condensable gas and to provide a tie-back test which includes the appropriate quality assurance procedures.

The T-1 and T-2 test initial conditions are provided in Reference 1. The test procedures and instrument locations are proprietary information.

Test T-1 is a repeat of a previous GIRAFFE main steam line break test. At the start of Test T-1, the drywell contains a mixture of steam and nitrogen at a total pressure of 0.188 MPa. The initial concentration of nitrogen in the drywell is 28 % by volume. Test T-2 has an initial concentration of nitrogen in the drywell that is approximately midway between that for tests H-1 and T-1, and an initial total drywell pressure of 0.266 MPa.

2.0 CONCLUSION

For both tests T-1 and T-2, the D/W peak pressures were confirmed to be well below the design limit. These tests demonstrated the successful operation of the PCCS with the presence of high concentrations of a heavier-than-steam non-condensable gas.

3.0 MAJOR TEST RESULTS

3.1 Test T-1 Results

The test results provided in Figures 1 through 6 are proprietary information.

The figure 1 plots of the measured D/W and W/W pressures are proprietary information.

The figure 2 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information. The figure 5B locations of the differential pressure measurement locations are proprietary information.

The figure 3 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 4 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

The figure 5A plot of the measured suppression pool surface temperature is proprietary information.

3.1 Test T-1 Results (Continued)

The figure 6 plot of the preliminary measured PCC inlet flow rate is proprietary information.

3.2 Test T-2 Results

The test results provided in Figures 7 through 12 are proprietary information.

The figure 7 plots of the measured D/W and W/W pressures are proprietary information.

The figure 8 plots of the measured water levels in the non-condensable gas vent line and the LOCA vent line are proprietary information.

The figure 9 plots of the measured D/W temperatures at the seven thermocouple locations are proprietary information.

The figure 10 plots of the measured PCC tube bulk fluid temperatures are proprietary information.

The figure 11 plot of the measured suppression pool surface temperature is proprietary information.

The figure 12 plot of the preliminary measured PCC inlet flow rate is proprietary information.

4.0 TEST ANOMALIES and FAILED INSTRUMENTS

There were no test anomalies or failed instruments

5.0 REFERENCES

1. GIRAFFE Helium Test Specification, General Electric Company Specification 25A5677, rev. 1, May 1995

FIGURE 1 TEST T-1 D/W and W/W PRESSURES

FIGURE 2 TEST T-1 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

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FIGURE 3 TEST T-1 D/W TEMPERATURE

FIGURE 4 TEST T-1 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 5A TEST T-1 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 5B DIFFERENTIAL PRESSURE MEASUREMENT LOCATIONS IN S/C

FIGURE 6 TEST T-1 PCC INLET FLOW RATE

FIGURE 7 TEST T-2 D/W and W/W PRESSURES

FIGURE 8 TEST T-2 NON-CONDENSABLE GAS VENT and LOCA VENT WATER LEVELS

FIGURE 9 TEST T-2 D/W TEMPERATURE

FIGURE 10 TEST T-2 PCC TUBE BULK FLUID TEMPERATURE

FIGURE 11 TEST T-2 SUPPRESSION POOL SURFACE TEMPERATURE

FIGURE 12 TEST T-2 PCC INLET FLOW RATE