

RAS 14229

APPLICANT'S EXH. 22

In the Matter of AMERGEN ENERGY CO., LLC

Docket No. 50-7219-LR Official Exhibit No. 22

08/22/00 09:45:22

OFFERED by Applicant/Licensee Intervenor

NRG Staff Other

IDENTIFIED on 7/21/07 Witness/Panel N/A



Calculation Sheet

Action Taken: ADMITTED REJECTED WITHDRAWN

Subject	STATISTICAL ANALYSIS OF DRYWELL THICKNESS DATA THRU 12-31-88	Calc No	Reporter/Clk	Rev No	Sheet #
Originator	<u>J. J. Moore Jr</u>	Date	<u>1-31-89</u>	Reviewed by	Date
				<u>A. D. Lechnoff</u>	<u>2/1/89</u>
				<u>Fred P. Barbieri</u>	<u>2/2/89</u>

1.0 PROBLEM STATEMENT

1.1 Background

DOCKETED  
USNRC

October 1, 2007 (10:45pm)

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

The design of the carbon steel drywell includes a sand bed which is located around the outside circumference between elevations 8'-11-1/4" and 12'-3". Leakage was observed from the sand bed drains during the 1980, 1983 and 1986 refueling outages indicating that water had intruded into the annular region between the drywell shell and the concrete shield wall.

The drywell shell was inspected in 1986 during the 10R outage to determine if corrosion was occurring. The inspection methods, results and conclusions are documented in Ref. 3.1, 3.2, and 3.3. As a result of these inspections it was concluded that a long term monitoring program would be established. This program includes repetitive Ultrasonic Thickness (UT) measurements in the sand bed region at a nominal elevation of 11'-3" in bays 11A, 11C, 17D, 19A, 19B, and 19C.

The continued presence of water in the sand bed raised concerns of potential corrosion at higher elevations. Therefore, UT measurements were taken at the 51' and 87' elevations in November 1987 during the 11R outage. As a result of these inspections, repetitive measurements in Bay 5 at elevation 51' and in Bays 9, 13 and 15 at the 87' elevation were added to the long term monitoring program to confirm that corrosion is not occurring at these higher elevations.

A cathodic protection system is being installed in selected regions of the sand bed during the 12R outage to minimize corrosion of the drywell. The long term monitoring program was also expanded during the 12R outage to include measurements in the sand bed region of Bays 1D, 3D, 5D, 7D, 9A, 13A, 13C, 13D, 15A, 15D and 17A which are not covered by the cathodic protection system. It also includes measurements in the sand bed region between Bays 17 and 19 which is covered by the cathodic protection system, but does not have a reference electrode to monitor its effectiveness in this region.

Some measurements in the long term monitoring program are to be taken at each outage of opportunity, while others are taken during each refueling outage. The functional requirements for these inspections are documented in Ref. 3.4. The primary purpose of the UT measurements in the sand bed region is to determine the corrosion rate and monitor it over time. When the cathodic protection system is installed and operating, these data will be used to monitor its effectiveness. The purpose of the measurements at other locations is to confirm that corrosion is not occurring in those regions.

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Template=SECY-028

SECY-02

1.2 Purpose

The purpose of this calculation is to:

- (1) Statistically analyze the thickness measurements for Bays 11A, 11C, 17D, 19A, 19B and 19C in the sand bed region to determine the mean thickness and corrosion rate.
- (2) Statistically analyze the thickness measurements for Bay 5 at elevation 51' and Bays 9, 13 and 15 at elevation 87' to determine the mean thickness corrosion rate.
- (3) To the extent possible, statistically analyze the limited data for the 6" x 6" grids in the sand bed region of Bays 9D, 13A, 15D and 17A to calculate the mean thickness and determine if there is ongoing corrosion.
- (4) To the extent possible, statistically analyze the limited data for the 6" x 1" horizontal strips in the sand bed region of Bays 1D, 3D, 5D, 7D, 9A, 13C and 15A to calculate the mean thickness and determine if there is ongoing corrosion.

Statistically compare the thickness data from December 1986 and December 1988 for the trench in Bay 17D to calculate the mean thickness at various elevations in the trench and determine if there is ongoing corrosion.

- (5) Statistically analyze the thickness data from December 1988 for the Frame Cutout between Bays 17 and 19 to calculate the mean thickness.

2.0 SUMMARY OF RESULTS

<u>Bay &amp; Area</u>	<u>Location</u>	<u>Corrosion Rate**</u>	<u>Mean Thickness***</u>
2.1 <u>6"x6" Grids in Sand Bed Region at Original Locations</u>			
11A	Sand Bed	Not significant	908.6 +5.0 mils
11C	Sand Bed	Indeterminable	916.6 +10.4 mils
17D	Sand Bed	-27.6 +6.1 mpy	864.8 +6.8 mils
19A	Sand Bed	-23.7 +4.3 mpy	837.9 +4.8 mils
19B	Sand Bed	-29.2 +0.5 mpy	856.5 +0.5 mils
19C	Sand Bed	-25.9 +4.1 mpy	860.9 +4.0 mils
2.2 <u>6"x6" Grids in Sand Bed Region at New Locations</u>			
9D	Sand Bed	Indeterminable*	1021.4 +9.7 mils
13A	Sand Bed	Not significant*	905.3 +10.1 mils
15D	Sand Bed	Possible*	1056.0 +9.1 mils
17A	Sand Bed	Indeterminable*	957.4 +9.2 mils
2.3 <u>6"x6" Grids at Upper Elevations</u>			
5	51' Elev.	-4.3 +0.03 mpy	750.0 +0.02 mils
9	87' Elev.	Not significant	620.3 +1.0 mils
13	87' Elev.	Not significant	635.6 +0.7 mils
15	87' Elev.	Not significant	634.8 +0.7 mils
2.4 <u>Multiple 6"x6" Grids in Trench</u>			
17D	Trench	Not significant*	981.2 +6.7 mils
17/19	Frame Cutout	Indeterminable*	981.7 +4.4 mils
2.5 <u>6" Strips in Sand Bed Region</u>			
1D	Sand Bed	Indeterminable*	1114.7 +30.6 mils
3D	Sand Bed	Not significant*	1177.7 +5.6 mils
5D	Sand Bed	Not significant*	1174.0 +2.2 mils
7D	Sand Bed	Possible*	1135.1 +4.9 mils
9A	Sand Bed	Indeterminable*	1154.6 +4.8 mils
13C	Sand Bed	Not significant*	1147.4 +3.7 mils
13D	Sand Bed	Not significant*	962.1 +22.3 mils
15A	Sand Bed	Not significant*	1120.0 +12.6 mils
2.6 <u>Evaluation of Individual Measurements Below 800 Mils</u>			

One data point in Bay 19A and one data point in Bay 5 Elev. 51' fell outside the 99% confidence interval and thus are statistically different from the mean thickness.

\*Based on limited data. See text for interpretation.

\*\*Mean corrosion rate in mils per year + standard error of the mean

\*\*\*Current mean thickness in mils + standard error of the mean

3.0 REFERENCES

- 3.1 GPUN Safety Evaluation SE-000243-002, Rev. 0, "Drywell Steel Shell Plate Thickness Reduction at the Base Sand Cushion Entrenchment Region"
- 3.2 GPUN TDR 854, Rev. 0, "Drywell Corrosion Assessment"
- 3.3 GPUN TDR 851, Rev. 0, "Assessment of Oyster Creek Drywell Shell"
- 3.4 GPUN Installation Specification IS-328227-004, Rev. 3, "Functional Requirements for Drywell Containment Vessel Thickness Examination"
- 3.5 Applied Regression Analysis, 2nd Edition, N.R. Draper & H. Smith, John Wiley & Sons, 1981
- 3.6 Statistical Concepts and Methods G.K. Bhattacharyya & R.A. Johnson, John Wiley & sons, 1977