Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690 - 0767

PRIORITY ROUTING

April 22, 1988

Mr. A. Bert Davis
Regional Administrator
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Quad Cities Station Units 1 and 2
Transmittal of Information Pertaining
to LER 87-025-Control Room Habitability
NRC Docket Nos. 50-254 and 50-265

Dear Mr. Davis:

In a response to a request made by C. Gill of your staff, attached please find a copy of a safety significance evaluation performed by NUS Corporation. This evaluation was performed at the request of Commonwealth Edison in response to the above referenced LER.

The evaluation was performed in order to determine if the Control Room Operator Dose would have been below the General Design Criterion (GDC) 19 limit had a Design Basis Accident (DBA) occurred when the Standby Gas Treatment System (SBGTS) efficiency was lower than that used in previous radiological analyses. The radiological analyses were based on a 99% SBGTS charcoal efficiency whereas the existing Quad Cities Technical Specifications allow the SBGTS efficiency to be 90%.

Quad Cities Station personnel reviewed previous charcoal efficiency test results which showed that the efficiency was generally above 99%. However, at one time the test results showed a efficiency of 92.871%. The safety significance evaluation determined what the effect would be if a DBA had occurred at the time that the charcoal efficiency was at this level.

The analysis performed used a containment leakage rate of 1% per day of which 0.15% per day leakage is allowed through the Main Steam Line Isolation Valves (MSIV). Plant personnel have reviewed the results of past containment leak rate tests and have determined that the highest leakage rate as determined from the previous outage was 0.45% per day of which 0.062% per day leakage occurred via the MSIVs. The 30-day control room thyroid dose (had a DBA occurred at this time) would have been 16.3 rem using the actual containment leakage rates and the lower SBGTS efficiency (91.871% was conservatively used in this analysis to allow for a 1% bypass penetration of the charcoal trays).

8805040206 880422
PDR ADOCK 05000254
P PDR

IE06

APR 26 1988

A second, and even more conservative calculation was done to verify that degradation of the leak tightness of the containment, between tests, would not have resulted in doses above the GDC limit. The analysis was also performed using a margin of 0.25% per day which was added to the actual containment leakage rate. This margin was utilized since it represents the same margin as presently allowed by the Quad Cities Technical Specifications when performing periodic testing. The acceptance criteria in the Technical Specification is 75% of the leak rate or 0.75% per day. With a margin of 0.25% per day (0.70% per day total leak rate of which 31.5 SCFH at 24 psig leaks through the MSIVs), the control room 30-day thyroid dose is still below the GDC-19 limit. In this case, the value calculated was 25.3 rem.

The methodology employed in the safety significance evaluation was presented to Mr. C. Gill in an April 12, 1988 conference call. Attached for the independent review of your staff, is a copy of the two calculations that were performed as well as curves which show operator doses as a function of SBGTS efficiency.

In consideration of the actual containment leakage rate, the control room operator doses would not have exceeded the GDC-19 limits had a design basis accident occurred when the SBGTS efficiency was 92.871%. Moreover, when an additional safety factor is included in the calculation for reasons of conservatism, the conclusions remain unchanged.

Please direct any questions you may have regarding this matter to this office.

Very truly yours,

Irene M. Johnson

I. M. Johnson
Nuclear Licensing Administrator

lm

cc: Quad Cities Resident Inspector (w/o Att.)

4510K

9 Pages

ENGINEERING CALCULATION

CLIENT/PROJECT CECO / CONTROL ROOM HVAC UPGRADE CALC. NO. 0376-M-03 REV. 0

TITLE QUAD CITIES, CONTROL ROOM DOSE ANALYSIS, LER SUPPORT (SAFETY SIGNIFICANCE OF LER)

AUTHOR/DATE	VERIFIED BY/DATE	APPROVED BY/DATE
[signature] 4/11/88	[signature] 4/13/88	MR Mychajliw 4-14-88

PURPOSE:

THE OBJECTIVE OF THIS ANALYSIS IS TO DETERMINE IF THE CONTROL ROOM 30-DAY THYROID DOSE WOULD HAVE BEEN LESS THAN THE GDC-19 LIMITS HAD A DESIGN BASIS ACCIDENT OCCURED WHEN THE SGTS EFF. WAS LOWER THAN THE VALUE USED IN THE RADIOLOGICAL ANALYSIS (99%).

RESULTS:

AS DISCUSSED ON PG. 1, THE C.R. DOSES WILL BE CALCULATED IN THIS ANALYSIS USING ACTUAL CONTAINMENT AND MSIV LEAKRATES

USING THE 12/86 UNIT 2 "AS LEFT" LEAKRATES (SEE ATTACHED TELECON) WITH A MARGIN EQUAL TO THAT APPLIED IN THE TECH. SPEC'S, THE 30-DAY CONTROL ROOM THYROID DOSE WOULD BE LESS THAN THE GDC-19 LIMIT WHEN USING THE LOWEST SGTS EFFICIENCY IDENTIFIED (92.87%). (SEE PLOT ON PG. 4)

SUPERCEDED BY	QUALITY CLASS	DISTRIBUTION	VERIFICATION METHOD
REV. ______	■ SAFETY RELATED	■ PROJECT ☐ DCC (2 copies (MJG))	☐ REVIEW
SUPPLEMENTED BY CALC. NO. ______	☐ NON-SR	☐ OTHER ______	☐ ALT. ANALYSIS
	☐ OTHER ______	______	

NUS CORPORATION AND SUBSIDIARIES			STANDARD CALCULATION SHEET
CLIENT: CECO	FILE NO.: 0376-M-03	BY: D. STUDLEY	PAGE 1 OF 9
SUBJECT: QC. DOSE ANALYSIS, LER SUPPORT		CHECKED BY:	DATE: 4/13/88

1.0 OBJECTIVE

THE OBJECTIVE OF THIS ANALYSIS IS TO DETERMINE IF THE CONTROL ROOM 30-DAY THYROID DOSE WOULD HAVE BEEN LESS THAN THE GDC-19 LIMITS HAD A DESIGN BASIS ACCIDENT (LOCA) OCCURED WHEN THE SGTS CHARCOAL EFFICIENCY WAS LOWER THAN WHAT WAS USED IN THE PREVIOUS RADIOLOGICAL ANALYSIS (99%).

THE SGTS EFFIC. WAS BELOW 99% BETWEEN 3/87 AND 11/87 AT WHICH TIME THE OPERATING PROCEDURES REQUIRED THE C.R. TO BE PLACED IN THE FILTERED PRESSURIZATION MODE WITHIN 8 HOURS OF THE ACCIDENT.

2.0 APPROACH

INSPECTION OF CURVE IN CALC. 5467-M-012 SHOWS THAT THE C.R. DOSE EXCEEDS THE GDC-19 LIMIT BY ≈ 5.0 REM WITH A SGTS EFFICIENCY OF 92% AND THE C.R. PRESSURIZED AT 8 HRS., HOWEVER THE RESULTING OPERATOR DOSES MAY HAVE BEEN BELOW THE GDC-19 LIMITS DUE TO SOME OF THE COMPONENTS THAT EFFECT THE DOSE BEING BELOW THE VALUE USED IN THE ANALYSIS. ONE SUCH PARAMETER IN WHICH TEST RESULTS ARE AVAILABLE IS THE CONTAINMENT & MSIV LEAKRATES. THE ATTACHED TELECON SHOWS THE TEST RESULTS OR "AS LEFT" CONDITION AT THE OUTAGE PRIOR TO THE PERIOD IN WHICH THE CHARCOAL WAS DEGRADED.

3.0 REFERENCES

3.1 NUS CALC. 5464-M-07/31 "QUAD CITIES CONTROL ROOM DOSE ANALYSIS, SUPPLEMENT TO 5464-M-07" DATED 10/5/87

3.2 ORNL-NSIC 5 "U.S. CONTAINMENT TECHNOLOGIES", OAK RIDGE NATIONAL LAB AND BECHTEL CORP., AUG. 1965.

3.3 TELECON BETWEEN BOB CESTRO OF QC TECH STAFF AND D. STUDLEY NUS (ATTACHED)

3.4 NUS CALC. 5464-M-02 "QUAD CITIES INFILTRATION ANALYSIS", DATED 4/17/87.

3.5 NUS CALC. 5464-M-012 "QUAD CITIES, CONTROL ROOM DOSE ANALYSIS, PLOT OF DOSE AS A FUNCTION OF SGTS EFF." DATED 1/11/88 (PLOT ATTACHED, pg 4)

3.6 NUS CALC. 0876-M-02 "QUAD CITIES CONTROL ROOM REANALYSIS DUE ....." DATED 3/11/88.

3.7 Q.C TECHNICAL SPECIFICATION, DPR-29 "3.7/4.7 CONTAINMENT SYSTEMS",

4.0 ASSUMPTIONS

THE ASSUMPTIONS USED IN THIS ANALYSIS ARE THE SAME AS IN CALC 5464-M-07/31

5.0 ANALYSIS

PER THE ATTACHED TELECON, THE UNIT 2 TOTAL INTEGRATED LEAKRATE WAS LEFT AT < 0.45 WT % /DAY IN LIEU OF THE TECH SPEC VALUE OF 1.0 WT. % /DAY WHICH WAS USED IN THE ANALYSIS TO DEVELOP THE ATTACHED PLOT.

PER THE ATTACHED TELECON, THE UNIT 2 MSIV LEAKAGE CONTRIBUTION AS LEFT WAS < 20 CFH @ 24 psig FOR THE SUM OF ALL FOUR MSIV'S IN LIEU OF 46 CFH (11.5 /VALVE) WHICH WAS USED IN THE ANALYSIS TO DEVELOP THE ATTACHED CURVE

THE DOSES WILL BE CALCULATED USING A SGTS EFF OF 91.871 % (92.871 % FROM THE ATTACHED TELECON LESS 1% BYPASS)

THE DOSE CONTRIBUTION FROM BOTH THE MSIV LEAKAGE AND STACK RELEASES ARE LINEAR WITH LEAKRATE AND WILL RESULT IN A ZERO DOSE @ ZERO LEAKRATE. THIS CAN BE SHOWN BY REVIEWING THE DOSE ANALYSIS EQUATIONS IN THE USER MANUAL FOR THE "AXIDENT" PROGRAM AND CAN BE VERIFIED BY REVIEWING THE RESULTS IN NUS CALCULATIONS 5164-M-07/81 AND 0876-M-02.

THE MSIV LEAKRATE WILL BE EXTRAPOLATED TO THE DESIGN BASIS PRESSURE OF 45 psig USING THE LAMINAR (VISCOUS) FLOW EXTRAPOLATION FACTOR IN ORNL NSIC-5 (SEE CALC. 5164-M-07/81, PG. 8)

$$\frac{L_a}{L_t} = \frac{62.7 - 1/62.7}{39.7 - 1/39.7} = 1.58$$

5.0 ANALYSIS (CONT.)

∴ THE TOTAL MSIV LEAKAGE

$= 1.58\,(20\ \text{CFH}) = 31.6\ \text{SCFH}$

THE %/DAY THROUGH THE MSIV'S @ 48 PSIG =

$$\left(\frac{14.7\ \text{psia}}{62.7\ \text{psia}}\right)\left(31.6\ \frac{\text{SCF}}{\text{HR}}\right)\left(24\ \frac{\text{HR}}{\text{day}}\right)\left(\frac{1}{286{,}234\ \text{CF}}\right)\times 100$$

$= 0.062\ \%/\text{DAY}$

A MARGIN SHOULD BE ADDED TO THE LEAKRATES TO ALLOW FOR THE DEGRADATION OF THE SEALS BETWEEN TESTING. THE Q.C. TECH. SPEC. LIMITS THE TOTAL INTEGRATED LEAKRATE AND MSIV LEAKRATE TO 75% OF THE TEXT SPEC VALUE. THE ANALYSIS WILL CONSERVATIVELY ADD THE ABSOLUTE VALUE OF THE MARGIN TO THE TEST RESULTS TO ALLOW FOR THE POSSIBILITY OF DEGRADATION OF THE SEALS AFTER THE LEAK TEST.

TOTAL INTEGRATED TECH. SPEC VALUE = 1% /DAY
∴ MARGIN = 0.25 %/DAY

MSIV TECH. SPEC. VALUE = 1.58(16 CFH) = 72.68 SCFH
∴ MARGIN = 18.17 SCFH

∴ REVISED MSIV LEAKAGE W/MARGIN = 31.6 + 18.17 = 49.77 SCFH

$$\%/\text{DAY} = \left(\frac{14.7\ \text{psia}}{62.7\ \text{psia}}\right)\left(49.77\ \frac{\text{SCF}}{\text{HR}}\right)\left(24\ \frac{\text{hr}}{\text{day}}\right)\left(\frac{1}{286{,}234\ \text{CF}}\right)\times 100 = 0.0978\ \%/\text{day}$$

LEAKAGE THROUGH STACK W/MARGIN = 0.45 + 0.25 − 0.0978

$= 0.602\ \%/\text{day}$

5.0 ANALYSIS

THE DOSE CONTRIBUTION FROM EACH LEAKAGE PATH WILL BE CALCULATED AT 99% AND 90% SGTS EFFICIENCY

* 30 DAY THYROID DOSE w/ 99% SGTS EFF. (w/ MARGIN)

0.602 %/DAY LEAKAGE TO SECONDARY
0.098 %/DAY MSIV LEAKAGE
260 CFM INFIL
8 hr PRESSURIZATION / FILTRATION
SWC ISOLATION

STOCK DOSE (SEE CALC. 5867-M-07/S1, PG 13)
= 3.61 REM x 0.602/0.85 = 2.56 REM

MSIV DOSE
= 7.03 REM x 0.098/0.15 = 4.59 REM

TOTAL = 7.15 REM

* 30 DAY THYROID DOSE w/ 90% SGTS EFF (w/ MARGIN)

STOCK DOSE
= 36.1 REM x 0.602/0.85 = 25.6 REM

MSIV DOSE
= 7.03 REM x 0.098/0.15 = 4.59 REM

30.2 REM

THE PLOT OF THE 30-DAY THYROID DOSE IS SHOWN ON PG 7.

5.0 ANALYSIS (CONT)

IN ADDITION, THE 30-DAY CONTROL ROOM THYROID DOSE WILL BE CALCULATED USING THE TEST RESULTS W/O THE MARGIN.

∴ SGTS LEAKAGE = 0.85 - 0.062 = 0.388 %/DAY

MSIV LEAKAGE = 0.062 %/DAY

• 30 DAY THYROID DOSE w/ 99% SGTS EFF (AS TESTED)

STACK DOSE

= 3.61 REM × 0.388/0.85 = 1.65 REM

MSIV DOSE

= 7.03 REM × 0.062/0.15 = 2.91 REM

4.56 REM

• 30 DAY THYROID DOSE w/90% SGTS (AS TESTED)

STACK DOSE

= 36.1 REM × 0.388/0.85 = 16.5 REM

MSIV DOSE

= 7.03 REM × 0.062/0.15 = 2.91 REM

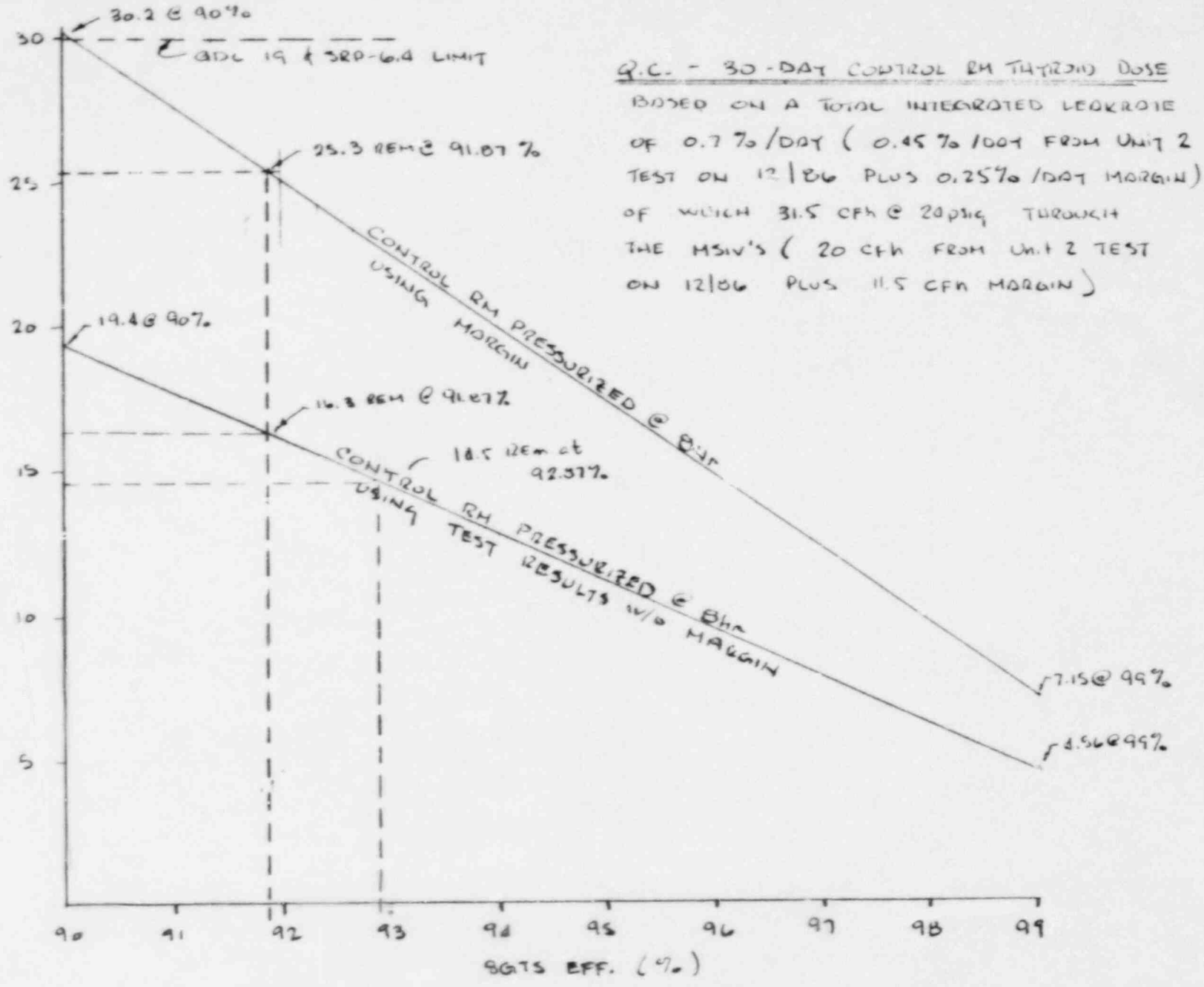
19.4 REM

NUS CORPORATION AND SUBSIDIARIES — STANDARD CALCULATION SHEET

CLIENT: CECO	FILE NO: 0870.11-03	BY: D. STUDNEY	PAGE 7 OF 9
SUBJECT: RC CONTROL RM DOSE ANALYSIS		CHECKED BY:	DATE: 4/13/88

Q.C. - 30-DAY CONTROL RM THYROID DOSE

BASED ON A TOTAL INTEGRATED LEAKRATE OF 0.7 %/DAY (0.45 %/DAY FROM UNIT 2 TEST ON 12/86 PLUS 0.25%/DAY MARGIN) OF WHICH 31.5 CFM @ 20 psig THROUGH THE MSIV's (20 CFM FROM UNIT 2 TEST ON 12/86 PLUS 11.5 CFM MARGIN)



NUS 1554 REVISED 0285

0876-M-23 BY: DNS CKD: pg 8 of 9

NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

CONTROL NO:	DATE:	TIME:
0876	4/8/88	4:50

DISTRIBUTION:
M. J. GIARRATANO
R. MACHAJLIW

BETWEEN:	OF:	PHONE:
BOB CASTRO	QC TECH STAFF	x-2166 (309) 654-2241

AND:
DAVE STUDLEY

DISCUSSION:
BOB CALLED WITH THE CONTAINMENT LEAKRATES AND MSIV LEAKRATES FOR BOTH UNITS 'AS LEFT' AFTER THE PREVIOUS OUTAGE.

* UNIT 1 - OPERATED FROM 3/86 TO 9/87
AS LEFT AT END OF 3/86 OUTAGE = < 0.25 WT%/DAY
(THIS IS TOTAL INTEGRATED & INCLUDES MSIV'S, etc)
MSIV LEAKRATE AS LEFT = < 7 CFH @ 24 PSIG FOR TOTAL OF ALL FOUR VALVES

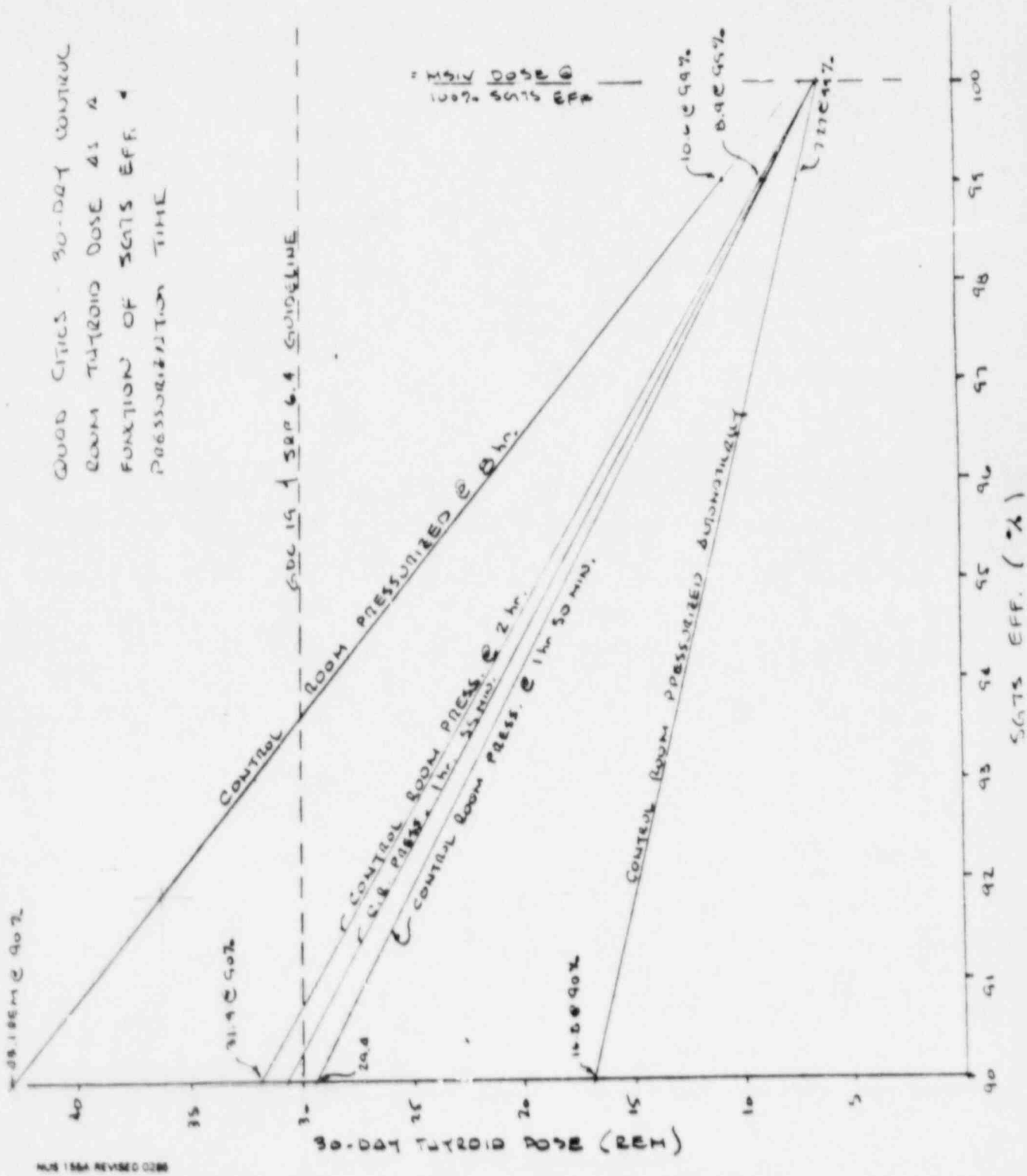
* UNIT 2 - OPERATED FROM 12/86 TO PRESENT
AS LEFT AT END OF 12/86 OUTAGE = < 0.45 WT%/DAY
MSIV LEAKAGE AS LEFT = < 20 CFH @ 24 PSIG FOR TOTAL OF ALL FOUR VALVES

BOB STATED THAT THE LOWEST TEST RESULTS ON THE SGTS SHOWED A CHARCOAL EFF. OF 92.87% (OTHER TESTS ON THE SAME TRAYS SHOWED EFF'S AS HIGH AS 99.985%)

ACTION ITEM - NUS TO VERIFY FOR BOB THAT THE OPERATOR DOSES WOULD HAVE BEEN BELOW THE GOC-19 LIMITS HAD A LOCA OCCURRED WHEN THE CHARCOAL WAS AT A DEGRADED CONDITION, UTILIZING THE ABOVE TESTED PARAMETERS.

NUS CORPORATION AND SUBSIDIARIES — STANDARD CALCULATION SHEET

CLIENT: CECO	FILE NO.: 5167-M-012	BY: D. STUDLEY	PAGE 4 OF 4
SUBJECT: G.C., C.R. DOSE ANALYSIS		CHECKED BY: [signature]	DATE: 1/8/85



NUS 1584 REVISED 0286