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MARCH 09 1990

L-90-87

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

Re: St. Lucie Units 1 and 2  
Docket Nos. 50-335 & 50-389  
Dose Assessment Computer Program

During the January 24, 1990 NRC Evaluated Exercise at the St. Lucie Plant, an error was detected in the dose assessment results. As a result of this error, an investigation of this problem was initiated. The results of the investigation are as follows:

- A. The erroneous results were not a result of operator error. However, operator error did cause the keyboard hangup requiring a computer restart.
- B. The computer program error was not a result of the revision to the program since the original program (1983) performs in exactly the same manner.
- C. The "Correct and Re-Run" subroutine does recalculate the doses correctly (rates and cumulatives).
- D. The root cause of the problem is described in the enclosed Software Change Request.

As a result of the investigation, corrective actions have been initiated. The immediate corrective action was to issue a memo on the use of the Emergency Dose Calculation Model. The long term corrective action was the initiation of a software change request which has been approved. The software vendor has been contacted to assist in the code work. The corrective action is estimated to be completed by April 30, 1990.

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an FPL Group company

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St. Lucie Units 1 and 2  
Docket Nos. 335 & 50-389  
L-90-87

Should you have any questions, feel free to contact us.

Yours truly,



R. J. Acosta  
Acting Vice President  
Nuclear Energy

RJA/GRM/sh

Enclosure

cc: Stewart D. Ebnetter, Regional Administrator, Region II, USNRC  
Senior Resident Inspector, USNRC, St. Lucie Plant  
Eldon Testa, USNRC, Region II

SOFTWARE CHANGE REQUEST: FPL CLASS A

PART A

Pursuant to JNS-HP 5.0, this document (Part A) is the request for approval to revise the code. This part will describe:

- I. Circumstances Indicating the Need for Change
- II. The Desired Change
  - A) Basis for change
  - B) Description of code to be changed
- III. Proposed Acceptance Test Activities
- IV. Control of Revised Code
- V. Approval or Denial of Revision to Code

I. CIRCUMSTANCES INDICATING NEED FOR CHANGE

During the PSL Evaluated Exercise, Emergency off-site dose calculations were performed in the TSC while people were arriving to the EOF. During the TSC's solo operation, default meteorology (in accordance with procedure for the existing scenario) was used in the calculation of step 5. Upon completion of step 5, the TSC controller supplied meteorological data to be used to keep the off-site dose values within the desired scenario boundaries. The TSC used the Correct & Rerun option of the program to edit the meteorological data and rerun step 5. The Correct & Rerun method correctly recalculated step 5. At this time the program automatically reverts to the actual mode via selecting Continue Calculations. The TSC correctly entered step 6 information but the answers came out wrong. For example,

	THYROID DOSE RATES				
	1 mi	2 mi	5 mi	7.5 mi	10 mi
TSC Results:	1.416E+1	1.229E-2	1.014E0	2.462E-1	8.247E-2
Should be:	1.416E+1	6.296E0	5.775E-1	1.940E-1	2.490E-2
If step 5 not corrected:	1.416E+1	1.229E-2	1.014E0	2.462E-1	8.247E-2

This would lead one to suspect that the 'Correct & Rerun' does not correct. Upon further investigation, it was determined that the 'Correct & Rerun' option does correct the information but does not leave the corrections available for subsequent actual, or forecast, calculations.

## II. THE DESIRED CHANGE

### A. Basis of Change

The program writes/reads/appends numerous data (.DAT) files during the course of operation. Two of those files, PUFFINFO and STRXOQ, are the pivotal files for performing dose calculations. STRXOQ holds the current XOQ (Chi-Over-Que) field; That is, where the puffs are now (Xpos, Ypos) and what are their concentration profiles (sigY, sigZ). PUFFINFO is the 'historical' file of STRXOQ. Both files are written to during each actual step; STRXOQ is re-written, PUFFINFO is appended. This was determined by examining the date-time stamp, generated by the computer - not FPL, listed in the file directory. Investigation found that after steps were corrected & recalculated the PUFFINFO file date-time stamp matched that of the other .DAT files except STRXOQ; It's date-time stamp was that of the last actual step performed before entering the Correct & Rerun option.

Review of the source code found that the only time data is written to STRXOQ is upon return from a routine called EDOSES, in the actual mode, to MENUS routine. EDOSES is the routine that calculates the puffs new position and concentration profiles (XOQ data). EDOSES calculates the new XOQ data, holds it in memory.

'MENUS' is a dispatcher routine that sends program control to various modules (other routines) in response to the users key strokes. MENUS, when seeing a return from EDOSES, writes the XOQ data to STRXOQ.

When in the Correct & Rerun mode, however, a different dispatcher is used. This is done to keep rerun control. Correct & Rerun also calls upon EDOSES to recalculate and correct the XOQ data, which it does and holds it in memory (as it always does). When the rerun actions are complete, Correct & Rerun sends program control back to MENUS, to the Continue Calculations level. This level does not write the corrected XOQ data; The first action is to read STRXOQ, which was never re-written. The desired fix is to have MENUS write the corrected XOQ data to STRXOQ on the way to continue calculations.

### B) Description of Code To Be Changed

The code change will occur in the module MENUS. The module currently runs from (L: = Line) L:10 to L:13480, any added code must be L:14000 or greater.

Currently L:1110 Reads:

```
ON KRETURN GOTO 1130, 1220, 1400, 1400, 1460, 1470,  
1140
```

B) Description of Code To Be Changed (cont.)

The interpretation of this line is: If KRETURN is equal to one, go to step 1130 and continue the program from there. If KRETURN is equal to two, go to step 1220 and continue the program from there. When returning from Correct & Rerun, the KRETURN is assigned a value of 7 which means go to step 1140 and continue the program from there. Step 1140 is the entry level for a menu that allows the operator to continue calculations.

The Revised code would be:

```
(REVISE) L:1110    ON KRETURN GOTO 1130, 1220, 1400, 1400, 1460,
           1470, 15000

(ADD)    L:15000   '* Back From Rerun, Save Corrected XOQ DATA

(ADD)    L:15010   IDOSERW=1 'Enable Writing To a File

(ADD)    L:15020   GOSUB 12000 'Sub to Read/Write STRXOQ.DAT

(ADD)    L:15030   GOTO 1140 'Go to the MAIN MENU to Continue
           Calcs
```

(NOTE: The Info after the apostrophe, which signals a remark, serves to document the purpose of the step. Remarks do not affect program operation.)

The call to the subroutine at L:15020, is the subroutine used in MENUS to write XOQ data from STRXOQ upon return from EDOSES or read XOQ data form STRXOQ upon Continue Calculations; IDOSERW=1, WRITE; =0, READ.

Additionally, the following change to STRINGS are proposed. NOTE: STRINGS are not used in calculations; their purpose are banners and titles for displays and printouts. The change is in module FPL, the startup module.

PRESENT CODE:

```
L:1070    FPL$="F P & L EMERGENCY DOSE CALCULATION
           SYSTEM"
           This phrase appears on some menus and is
           printed at the top of a print-out.

L:2084    CHRLN1$(4)="*** Welcome to FP&L Emergency Dose
           Calculation System V:02/89 ***"
           This phrase appears on the start-up screen and
           contains the version number.
```

B) Description of Code to Be Changed (cont.)

PROPOSED CHANGE:

L:1070 FPL\$="FPL EMERGENCY DOSE CALCULATION SYSTEM"  
+VER\$  
(ADD) L:1071 VER\$="VO3/90"  
L:2084 CHRLN1\$(4)="\*\*\* WELCOME TO "+FPL\$+VER\$+" \*\*\*"

PURPOSE:

This will allow the version number to appear on the various menus and on the print-out. Although not required (or committed to), the NRC presented this concept as a "good idea" during the various follow-up meetings after the enforcement conference.

III. ACCEPTANCE TEST PROGRAM

- A) Use PSL evaluated exercise data (01/24/90), steps 1 through 7
- B) Use EOF results as baseline (Printouts step 1 through 7)
- C) Using revised code, run steps 1 through 7. Compare via CRT displays, dose rate results of step 1 through 6. Print out step 7, compare all results to baseline. Acceptance criteria: exact equivalence, no tolerance. This verifies no undesirable change to dose calculations.  

(NOTE: Verify version date on screens and printouts.)
- D) Using revised code, start over. Run steps 1,2,3 and print step 3 results. Compare to baseline, acceptance criteria: exact results, no tolerance
- E) Use DEFAULT MET data for step 4, print results
- F) Correct step 4, print results, compare to baseline. Acceptance criteria: exact results, no tolerance
- G) Run & Print steps 5,6,7. Compare to baseline. Acceptance criteria: exact results  
This verifies Correct & Rerun of pervious step and no undesirable effect on subsequent steps.
- H) Using revised code, start over. Run steps 1 and 2. Print step 2 results compare to baseline. Acceptance criteria: exact results, no tolerance.
- I) Run step 3 with DEFAULT MET data, as in E. Print



III. ACCEPTANCE TEST PROGRAM (cont.)

- J) Run step 4 with DEFAULT release rate data. Print results.
- K) Run and print step 5.
- L) Correct & Rerun step 3, print results. Compare to baseline. Acceptance criteria: exact results.
- M) Correct & Rerun step 4, print results. Compare to baseline. Acceptance criteria: exact results.
- N) Rerun & Print step 5. Compare results to baseline. Acceptance criteria: exact results
- O) Run step 6. Print results. Compare to baseline. Acceptance criteria: exact results
- P) Run step 7. Print results. Compare to baseline. Acceptance criteria: exact results  
This verifies that Correct & Rerun of many steps, including corrections to meteorological and release rate performs correctly and has no undesirable effects on subsequent steps.

IV. CONTROL OF REVISED CODE

The revised code in executable form, including source code, will not be distributed until approved by the Section Manager of Health Physics/Chemistry.

V. APPROVAL OR DENIAL OF REVISION TO CODE

"The proposed revision to Class A, as described in this document, and the acceptance test is:"

(circle one)

Approved

Not Approved