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USNRC

The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

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June 5, 1981
ST-HL-AE-678
SFN: V-0530

Mr. Karl Seyfrit
Director, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

Dear Mr. Seyfrit:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
First Interim Report Concerning
Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company, pursuant to 10CFR50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lack adequate visibility to the user as to whether or not the program versions in use have been verified.

An assessment of computer codes used on the South Texas Project is in progress. This assessment includes a review of the computer program verification reports (CPVR) to evaluate the qualification of the computer codes used on the South Texas Project and a review of calculations for appropriate application of computer codes. To date, there has been no technical inadequacy identified in the use of computer programs which would preclude the safe operations of the plant. The next interim report concerning this item will be submitted to your office by August 28, 1981.

If you have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 676-8592.

Very truly yours,

8510290334 850808
PDR ADOCK 05000498
G PDR

G. W. Uprea, Jr.
G. W. Uprea, Jr.
Executive Vice President

MEP/amj

App # 73

NUCLEAR REGULATORY COMMISSION
Official File No. 57N50-49804
In the matter of 7412
Applicant 7412
Interviewer 7412
Contractor 7412
Witness 7412
DATE 8/8/85
RECEIVED ✓
RECEIVED ✓
APPROVED ✓
#73

Houston Lighting & Power Company

cc: J. H. Goldberg
D. G. Barker
C. G. Robertson
Howard Pyle
R. L. Waldrop
H. R. Dean
D. R. Beeth
J. D. Parsons
L. K. English
J. W. Briskin
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H. S. Phillips (NRC)
J. O. Read (Read-Poland, Inc.)
M. D. Schwarz (Baker & Botts)
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J. R. Newman (Lowenstein, Newman, Reis, & Axelrad)
Director, Office of Inspection & Enforcement
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Washington, D. C. 20555

June 5, 1981
ST-HL-AE-678
SFN: V-0530
Page 2

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The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

August 27, 1981
ST-HL-AE-720
SFN: V-0530

Mr. Karl Seyfrit
Director, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

Dear Mr. Seyfrit:

South Texas Project
Units 1&2
Docket Nos. STN 50-498, STN 50-499
Second Interim Report Concerning
Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company, pursuant to 10CFR50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lack adequate visibility to the user as to whether or not the program versions in use have been verified.

An assessment of computer codes used on the South Texas Project is in progress. This assessment is divided into two phases. The Phase I activities are being directed at computer work and program usage by the Brown & Root Nuclear Analysis discipline. This area has been selected for the initial assessment because of the significant interdisciplinary usage of data developed by Brown & Root Nuclear Analysis. Phase II of the assessment will focus on computer program usage by Brown & Root disciplines other than Nuclear Analysis.

For Phases I and II activities, Brown & Root has engaged an independent agency to review existing computer program verification reports (CPVR's) in order to specifically judge the qualification of codes used on the South Texas Project. This review will address the appropriateness of the modeling options, acceptability of code usage, and acceptability and adequacy of the methods selected for computer program verification.

Subsequent to review of CPVR's, the independent agency will review calculations. This review will address the appropriateness of the computer codes selected (including options), adequacy of technical approach, and sensitivity of results. The objective of the above activities is to determine the status and adequacy of the South Texas Project computer program application as well as computer program qualification.

Houston Lighting & Power Company

August 27, 1981

ST-HL-AE-720

SFN: V-0530

Page 2

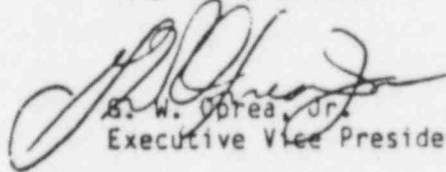
In addition to the assessment of Brown & Root's previous usage of computer programs, procedural requirements are being revised and/or established to strengthen Brown & Root's existing program for the control, usage, and application of computer codes. The need for a technical reference document (TRD) to augment procedural requirements aimed at preventing a recurrence of this concern is being evaluated.

To date, there has been no technical inadequacy identified in the use of computer programs which would preclude the safe operations of the plant.

The next report concerning this item will be submitted to your office by December 15, 1981.

If there are any questions concerning this item, please contact Mr. Michael E. Powell at (713) 676-8592.

Very truly yours,


B. W. Oprea, Jr.
Executive Vice President

MEP/amj

Houston Lighting & Power Company

cc: J. H. Goldberg
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D. G. Barker
C. G. Robertson
Howard Pyle
R. L. Waldrop
H. R. Dean
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August 27, 1981
ST-HL-AE-720
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Page 3

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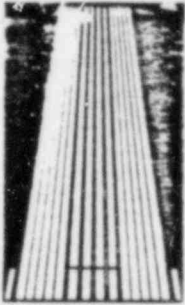
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Houston
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& Power
Company

Electric Tower
P.O. Box 1700
Houston, Texas 77001

#96

December 18, 1981
ST-HL-AE-769
SFN: V-0530

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

South Texas Project
Units 1&2
Docket Nos. STN 50-498, STN 50-499
Third Interim Report Concerning
Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company, pursuant to 10CFR50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lack adequate visibility to the user as to whether or not the program versions in use had been verified. As stated in our Second Interim Report, the assessment of computer codes has been divided into two phases.

The Phase I activities have been directed at computer work and program usage by the Brown & Root (B&R) Nuclear Analysis discipline. Phase II was to have been a review of codes used by other disciplines.

To assist in the Phase I assessment a consultant firm was engaged by B&R. The review by the consultant firm addresses the appropriateness of the modeling options, acceptability of code usage, and acceptability and adequacy of the methods selected for computer program verification. The consultant has submitted to B&R a preliminary report on the Computer Program Verification Reports. B&R is in the process of reviewing these preliminary comments. A final report by the consultant is scheduled for March, 1982.

Phase I also includes a review of certain calculations that used the subject computer programs. This review would address the appropriateness of the computer codes selected (including options), adequacy of technical approach, and sensitivity of results. The consultant is in the process of performing this review and is scheduled to issue a final report in March, 1982. This report will be studied by both B&R as well as Bechtel Power Corporation to determine what problems, if any, may exist in the nuclear analysis computer codes. To date, there continues to be no technical inadequacy which would represent a safety hazard identified by B&R or the consultant firm with the use of computer programs on STP.

Houston Lighting & Power Company

December 18, 1981

ST-HL-AE-769

SFN: V-0530

Page 2

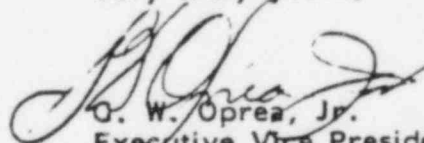
Planned Phase II activities have been modified. In the earlier report we stated that the consultant would assist in the Phase II assessment of computer program usage by B&R disciplines other than Nuclear Analysis. Because of our decision to use Bechtel Power Corporation (BPC) as our Architect/Engineer, the Phase II activity is a part of the transition work package effort.

As discussed with you and your staff, BPC Engineering will perform design reviews necessary to satisfy BPC of the adequacy of the work it accepts and relies upon for use in further design. If there is insufficient evidence of their adequacy, calculations or design verifications that were performed by B&R will be identified as work to be completed by BPC as part of the post-transition design work.

Our next report which will be submitted by June 1, 1981, will provide the results of the consultant's final report and the status of the Bechtel review as it pertains to this item.

If there are any questions concerning this item, please contact Mr. Michael E. Powell at (713) 676-8592.

Very truly yours,


G. W. Oprea, Jr.
Executive Vice President

JGW/mm

Houston Lighting & Power Company

cc: G. W. Oprea, Jr.

J. H. Goldberg

J. G. Dewease

D. G. Barker

C. G. Roberts

H. Pyle, III

R. A. Frazar

D. R. Beeth

J. W. Williams

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J. E. Geiger

D. E. Sells (NRC)

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STP RMS

Director, Office of Inspection & Enforcement

Nuclear Regulatory Commission

Washington, D. C. 20555

December 18, 1981

ST-HL-AE-769

SFN: V-0530

Page 3

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Revision Date 10-29-81

The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

April 22, 1982
ST-HL-AE-819
SFN: V-0530

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Fourth Interim Report
Concerning Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company (HL&P), pursuant to 10CFR50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lacked adequate visibility to the user as to whether or not the program versions in use had been verified. The information supplied in this report represents our Fourth Interim Report concerning this item. This report was previously scheduled to be submitted to your office by June 1, 1982.

As previously discussed in our Third Interim Report, a consultant firm was engaged by Brown & Root, Inc. (B&R) to address the appropriateness of the modeling options, acceptability of code usage, and acceptability and adequacy of the methods selected for computer program verification. As a result of a review by BPC of B&R subcontract activities, BPC recommended that the consultant's work be terminated to avoid unnecessary duplication of BPC transition reviews of past B&R engineering work. Based on the BPC recommendation and additionally, in recognition that the consultant's scope of work was not dispositive of the computer program verification issue; HL&P directed B&R to terminate the consultant's work in December 1981 except for preparation of a report covering the work already accomplished. The consultant has prepared and submitted a report on the work completed prior to contract termination.

Houston Lighting & Power Company

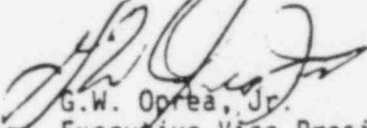
April 22, 1982
ST-HL-AE-819
SFN: V-0530

cc:
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HL&P has provided BPC with a copy of the report for their use in review of B&R work as part of the transition work package effort. A copy of the consultant's report is retained in the HL&P files and is available for inspection by the Nuclear Regulatory Commission (NRC). The next report concerning this item will be submitted to your office by September 3, 1982.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 877-3281.

Very truly yours,


G.W. Oprea, Jr.
Executive Vice President

MEP/lmf

Houston Lighting & Power Company

cc: G. W. Oprea, Jr.

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D. G. Barker

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STP RMS

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Revision Date 03-30-82

The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

September 13, 1982
ST-HL-AE-880
File Number: G12.96
SFN: V-0530

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Fifth Interim Report
Concerning Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company (HL&P), pursuant to 10 CFR 50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lacked adequate visibility to the user as to whether or not the program versions in use had been verified. The information supplied in this report represents our Fifth Interim Report.

As previously discussed in our Third and Fourth Interim Reports, a consultant firm was engaged by Brown & Root, Inc. (B&R) to address the appropriateness of the modeling options, acceptability of code usage, and acceptability and adequacy of the methods selected for computer program verification. As a result of a review by Bechtel of B&R subcontract activities, Bechtel recommended that the consultant's work be terminated to avoid unnecessary duplication of Bechtel transition reviews of past B&R engineering work. Based on the Bechtel recommendation and, additionally, in recognition that the consultant's scope of work was not dispositive of the computer program verification issue, HL&P directed B&R to terminate the consultant's work in December 1981 except for preparation of a report covering the work already accomplished. The consultant prepared and submitted a report on the work completed prior to contract termination. This consultant's report was transmitted to BPC for resolution of this item.

As part of Bechtel's efforts to resolve this issue, a method was developed for use by the various Bechtel engineering disciplines during their review of B&R computer calculations. Details of the Bechtel method for finalizing B&R computer calculations are provided in Attachment 1 to this report.

September 13, 1982
ST-HL-AE-880
File No.: G12.96
SFN: V-0530
Page 2

The consultant's review of B&R's Nuclear Analysis Disciplines computer program verification reports (CPVR's) and calculations included 26 CPVR's and 147 calculations. However, there was not necessarily a one-to-one correlation of calculations and CPVR's (i.e. QAD CPVR's were reviewed, but no calculations using these codes were). Therefore, status of CPVR's and calculations is presented separately.

The consultant's report reviewed 147 B&R calculations performed by the B&R Nuclear Analysis Discipline that had utilized computer codes. Of that number 54 had been revised, not used in the design or had been superseded by other calculations primarily performed by NUS. Ten calculations have been or are in the process of being superseded by Bechtel calculations either because the design has changed or inadequate computer program verification was found. There are currently 43 calculations that have been identified as requiring change primarily for design criteria reasons. Four calculations have been identified as desirable to keep pending verification of the computer programs. Thirty-six calculations are still undergoing review.

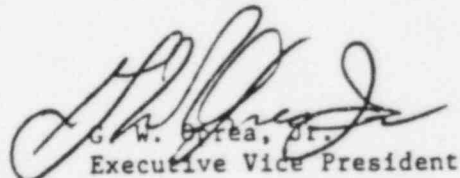
Of the 26 CPVR's reviewed by the consultant, Bechtel is considering retaining 5 codes, not retaining 13 codes and has not completed its evaluation on the remaining 8 codes. The 13 codes are not being considered for retention because the calculations utilizing them have been redone by NUS, require rework because of design changes or the CPVR is inadequate. For those codes not retained the calculations will be redone using a verified code. For those codes retained the CPVR will either be made consistent with paragraph 5 of Bechtel Engineering Department Procedure (EDP) 4.36 to the satisfaction of the Engineering Group Supervisor (EGS) or the calculation verified to EDP 4.37 as is shown in the figure in Attachment 2.

B&R also identified 57 significant computer programs used by the remaining disciplines on the South Texas Project (STP). Of this number BPC is considering retaining 34 codes, not retaining 17 codes and has not completed its evaluation of the remaining 6 codes. Of those not being retained, 10 cases result from deficient CPVR's and 7 cases from a need to redo calculations for other reasons.

The next report concerning this item will be submitted to your office by December 22, 1982.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713)877-3281.

Very truly yours,



G.W. Boreas, Jr.
Executive Vice President

MEP/mg

Attachment

Houston Lighting & Power Company

cc: G. W. Oprea, Jr.

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STP RMS

Director, Office of Inspection & Enforcement

Nuclear Regulatory Commission

Washington, D. C. 20555

September 13, 1982

ST-HL-AE-880

File Number: G12.96

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Page 3

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Revision Date 08-23-82

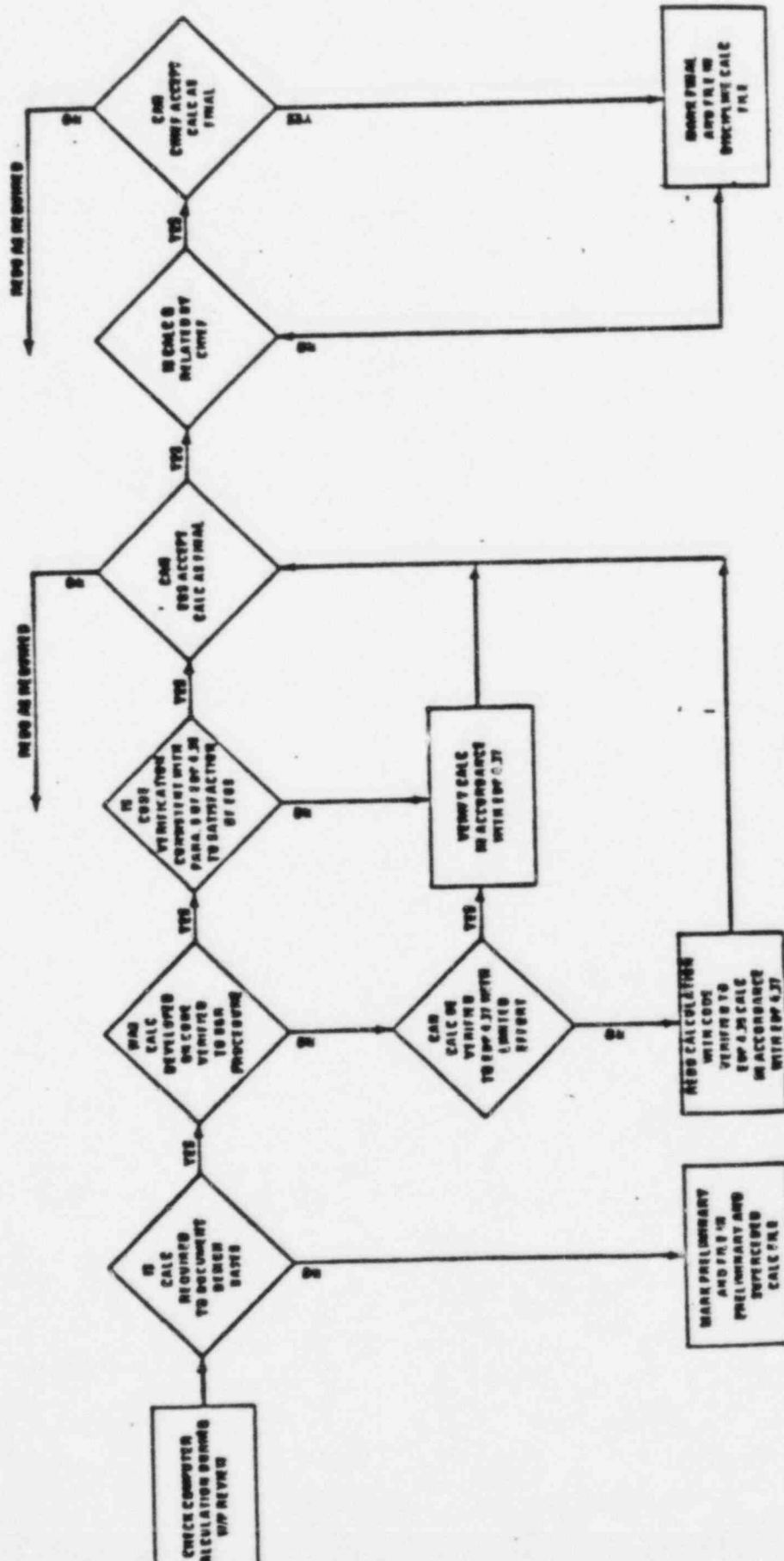
BECHTEL'S PROGRAM TO FINALIZE
BROWN & ROOT, INC. COMPUTER CALCULATIONS

Each Bechtel discipline will review the Brown & Root, Inc. (B&R) calculations and associated Computer Program Verification Reports (CPVR's), turned over during the Transition Phase as part of the work package reviews, and develop their status. As a result of this effort along with his previous experience, the Bechtel Engineering Group Supervisor (EGS) will establish which calculations are required to document his design effort. In order to minimize the recalculation effort the EGS will use B&R calculations previously transmitted in all cases where their appropriateness and correctness can be verified in line with the attached flow chart and as discussed below.

- A. If the calculation is not required as part of the design bases documentation it will be marked Preliminary and filed under Preliminary or Superseded Calculations.
- B. If the calculation is required as part of the design documentation and, in the judgement of the EGS, is appropriate and meets all other Industry Codes or Standards associated with the design, it must still meet certain standards of acceptability as delineated in Bechtel Engineering Department Procedures (EDP's) 4.36 and 4.37 before it can be marked Final.
 1. B&R calculations developed using codes with documented CPVR's consistent with B&R procedures may be marked Final if, in the judgement of the EGS, the verification adequately meets the requirements of Paragraph 5 of EDP 4.36. This level of acceptance is to be used only in the case of relatively simple "one of a kind" solutions and where, in the judgement of the EGS, the reasonableness of the solution is self evident.
 2. B&R calculations not meeting the "one of a kind" criteria of Paragraph 1 or calculations which, while meeting B&R criteria for code verification, do not meet the requirements of EDP 4.36 but, in the judgement of the EGS, were made with the valid codes, must be verified before acceptance as final in accordance with EDP 4.37. As a minimum this verification can be accomplished using limited reruns or bounding calculations of the design problems on the similar verified versions of BPC or contractor codes. If, in the judgement of the EGS, the reruns provide reasonable and consistent results, he can accept as Final, single or groups of calculations encompassed by this verification.
 3. B&R calculations which, in the judgement of the EGS, do not meet the criteria of Paragraph 1 or 2 above, must be redone in accordance with EDP 4.36 or 4.37 before they can be accepted as Final by the EGS.

In addition to the above verification effort, from time to time, Discipline Chiefs, at their discretion, may require that calculations be given additional review prior to acceptance, and will so advise the EGS.

VERIFICATION PROGRAM FOR B&R COMPUTER CALCULATIONS



The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

December 22, 1982
ST-HL-AE-916
File Number: G12.96
SFN: V-0530

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

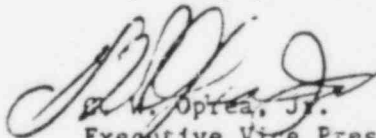
Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Sixth Interim Report Concerning
Computer Program Verification

On May 8, 1981, Houston Lighting & Power Company (HL&P), pursuant to 10CFR50.55(e), notified your office of an item concerning computer program (code) verification. The verification methods lacked adequate visibility to the user as to whether or not the program versions in use had been verified. Attached is the sixth interim report concerning this item. Our next report will be submitted to your office by May 12, 1983.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 877-3281.

Very truly yours,



J. S. Oprea, Jr.
Executive Vice President

MEP/mg

Attachment

Houston Lighting & Power Company

cc: G. W. Oprea, Jr.

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STP RMS

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December 22, 1982

ST-HL-AE-916

File Number: G12.96

Page 2

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Chairman, Atomic Safety & Licensing Board
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Citizens for Equitable Utilities, Inc.
c/o Ms. Peggy Buchorn
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Brazoria, Texas 77422

Revision Date 10-18-82

Sixth Interim Report Concerning Computer Program Verification

I. Summary

Bechtel has developed a method for the review of Brown & Root, Inc. (B&R) computer calculations. This method is in place and is being successfully addressed by the various Bechtel engineering disciplines. This report constitutes our sixth interim report concerning this item.

II. Description of the Incident

On May 8, 1981, Houston Lighting & Power Company (HL&P) notified the Nuclear Regulatory Commission (NRC), pursuant to 10CFR50.55(e), of a concern relative to computer program (code) verification. The verification methods lacked adequate visibility to the user as to whether or not the program versions in use had been verified.

The concern was raised as the result of an independent engineering review conducted of Brown & Root (B&R). The findings of this review stated that computer program verification reports (CPVR's) were not in place for all programs, and that non-verified programs may have been applied to safety-related design calculations. The findings of this independent review however, did not define technical inadequacies which would have compromised the safety of the plant.

Interim reports concerning this item were submitted by letters dated June 15, 1981, August 27, 1981, December 18, 1981, April 22, 1982 and September 13, 1982 (reference ST-HL-AE-678, 720, 769, 819, and 880 respectively).

III. Corrective Action

As part of Bechtel's efforts to resolve this issue, a method was developed for use by the various Bechtel engineering disciplines for review of B&R computer calculations. Details of the Bechtel method for finalizing B&R computer calculations were provided in our fifth interim report.

The independent review of B&R's Nuclear Analysis Disciplines computer program verification reports (CPVR's) and calculations included 26 CPVR's and 147 calculations. However, there was not necessarily a one-to-one correlation of calculations and CPVR's (i.e. QAD CPVR's were reviewed, but no calculations using these codes were). Therefore, status of CPVR's and calculations is presented separately.

The report by the independent reviewer identified 147 B&R calculations performed by the B&R Nuclear Analysis Discipline that had utilized computer codes. Of that number 56 were not used in the design or had been superseded by other calculations primarily performed by NUS. Sixty-Six (66) calculations have been or are in the process of being superseded by Bechtel calculations either because the design has changed or inadequate computer program verification was found. Seventeen (17) calculations have been

identified as desirable to keep pending verification of the computer programs. The remaining eight (8) are still awaiting completion of the review.

Of the 26 CPVR's reviewed by the independent reviewer, Bechtel will retain 12 codes and not retain 14 codes. The calculations utilizing the 14 retained codes may be superseded by Bechtel calculations. The 14 codes are not being considered for retention because the calculations utilizing them have been redone by NUS, require rework because of design changes or the CPVR is inadequate. For those codes not retained the calculations will be redone using a verified code.

B&R also identified 57 significant computer programs used by the remaining disciplines on the South Texas Project (STP). Of this number BPC will retain 37 codes and not retaining 20 codes. The reasons for not retaining the 20 codes are either deficient CPVR's or a need to redo calculations for other reasons.

IV. Recurrence Control

Well established Bechtel Engineering Department Procedures, regarding the verification of computer codes and calculations, are strictly in force at this time. These procedures will insure against any recurrence of this deficiency.

V. Safety Analysis

A detailed safety analysis was not performed; however the findings of the independent review did not define technical inadequacies which would have compromised the safety of the plant.

526

The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

June 13, 1983
ST-HL-AE-955
File Number: G12.96

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

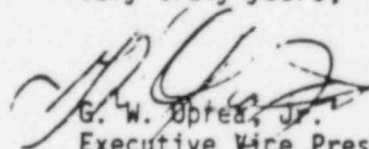
South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Seventh Interim Report Concerning Computer Program Verification

On May 8, 1981, pursuant to 10CFR50.55(e), Houston Lighting & Power Company (HL&P) notified your office of an item concerning computer program verification. The sixth interim report, submitted on December 22, 1982, indicated that the next report would be submitted by May 12, 1983. In a subsequent conversation between M. E. Powell of HL&P and W. A. Crossman of your office, an extension of the submittal date to June 13, 1983 was obtained. The extension to June 13, 1983 was based on our plans to submit a final report at that time. However, all action items necessary to prepare a final report were not completed. In particular, further corrective action related to certain codes used by the civil disciplines and pipe stress and supports group is required.

Enclosed is our seventh interim report concerning this item. We anticipate submitting our next report by October 14, 1983.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 877-3281.

Very truly yours,



G. W. Oprea, Jr.
Executive Vice President

SSR/kr
Attachment

Houston Lighting & Power Company

June 13, 1983

cc: G. W. Oprea, Jr.

ST-HL-AE-955

J. H. Goldberg

File Number: G12.96

J. G. Dewease

Page 2

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J. R. Newman

(Lowenstein, Newman, Reis, & Axelrad)

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Hearing Attorney

Office of the Executive Legal Director

U. S. Nuclear Regulatory Commission

Washington, D. C. 20555

Revision Date 04-29-83

Seventh Interim Report
Concerning
Computer Program Verification

I. Summary

A review of the Brown & Root, Inc. (B&R) engineering effort on STP indicated that computer program verification methods lacked adequate visibility to the user as to whether or not the program versions in use were verified. The findings of the review did not define technical inadequacies that would compromise the safety of the plant.

Subsequent to assuming design responsibility for STP, Bechtel developed and implemented a verification program for review and acceptance of, B&R's computer calculations and Computer Program Verification Reports (CPVRs). The results and status of this verification program are given in Section III of this report.

II. Description of Deficiency

Refer to interim reports transmitted to the NRC by letters dated June 15, 1981, August 27, 1981, December 18, 1981, April 22, 1982, September 13, 1982, and December 22, 1982 (reference ST-HL-AE-678, 720, 769, 819, 880, and 916 respectively). In the Sixth Interim Report, a larger number of computer codes and calculations were reported as being considered for retention. Bechtel's corrective actions, (described below), have eliminated many of these from further consideration.

III. Corrective Action

Bechtel implemented a program utilizing its Engineering Department Procedures (EDPs) for the review and acceptance of B&R's computer calculations and CPVRs which is described in detail in the Fifth Interim Report (ST-HL-AE-880) to the NRC. This program has been audited by the NRC (Inspection Report 50-498 and 499/82-12, dated January 7, 1983). The program was found to be adequate and to conform to ANSI N45.2.11.

- A. The Bechtel corrective action activities were directed towards first separating the computer codes into various categories of need for retention based upon a review a calculations using the program. This categorization involved a determination of the following:
- (1) Was the code utilized in design basis calculations? If not, do not complete the CPVR documentation.
 - (2) Were the calculations subsequently superseded/replaced by calculations using different acceptable computer codes? If yes, do not complete the CPVR documentation.
 - (3) Are the calculations currently scheduled for revision by Bechtel using Bechtel calculational codes because of design evolution, or finalization of input data? If yes, do not complete the CPVR documentation.

- (4) Upon review of the CPVR documentation, are significant documentation deficiencies identified? If yes, a parallel calculation will be completed by Bechtel to verify the calculation itself.
- (5) Finally, for the remaining computer codes, supplement any missing documentation or provide for code verification using Bechtel EDP methods. If satisfactory, retain the computer code. If not, revise the calculation.

Retention of a computer code for the design basis of the plant is defined to mean that the program verifications were found to meet the essential elements of Bechtel EDPs 4.36 and/or 4.37 and therefore can be generically utilized in accepting the entire body of B&R calculations using that code and supporting the existing design.

As a result of this evaluation logic, relatively few computer codes were designated for retention under this strict definition. It has been found that because of design evolution, identification of as-built conditions, and the need to revise design to meet new regulatory requirements, most codes, and therefore most related calculations, were eliminated from formal CPVR upgrading actions.

- B. As part of a previous program, 147 calculations and 26 CPVRs used by the B&R Nuclear Analysis discipline had received an independent review by Energy Incorporated (EI) as described in ST-HL-AE-819. The status of these items as a result of the Bechtel evaluation described in paragraph A is as follows:

Fifty-eight calculations were not used in the design or were superseded by other calculations primarily performed by NUS. Eighty-three (83) calculations have been or are being superseded by Bechtel calculations because the design has changed or computer program verification was inadequate. Six (6) calculations are being maintained in support of existing project design as a result of completing verifications of the computer code and/or the calculation itself.

Review of the 26 Nuclear Analysis CPVR's resulted in only one code being retained and in 25 codes not being required for project use for various reasons. If necessary to support the design basis, the calculations which utilized the codes not retained will be redone using verified codes or alternate methods.

- C. In addition Brown & Root had identified 57 significant computer programs used by the remaining disciplines (other than Nuclear Analysis) which had not been part of the EI review. Bechtel's review of the programs has resulted in 32 not being required for project use and 7 being retained for project use.

The remaining 18 have been evaluated and determined to warrant further action since calculations which the project intends to maintain utilize these codes. Two (2) of these codes are industry-standard codes in the pipe stress analysis and pipe

support design area, and merely require confirmation through the code vendor/sponsor of certain documentation and retrievability requirements. The remaining sixteen (16) are all in the civil/structural design or geotechnical scope of responsibility. Each has been evaluated and a worklist of remaining activities has been established to accomplish necessary action to allow retention of the computer program and any calculations based upon them.

- D. In addition, to the 57 codes identified by B&R, Bechtel has identified 6 more codes requiring evaluation. One (1) code has been identified as not being used for design. The other five (5) have been evaluated and added to the worklist described above for the remaining eighteen (18) B&R identified codes, resulting in a total of twenty-three (23) codes.

IV. Recurrence Control

Bechtel Engineering Procedures require that computer verification be performed either generically (for standard programs) or individually before a calculation using the program be approved as final. In addition, they define the required elements of such a verification. They thus provide adequate recurrence control.

V. Safety Analysis

Review of the B&R engineering effort during the transition program has not uncovered any technical inadequacies which resulted from the lack of computer verification that would have compromised the safety of the plant. The program described above will provide final assurance that the safety of the plant is not affected.

The Light company

Houston Lighting & Power P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

#96

October 14, 1983
ST-HL-AE-1017
File Number: G12.96

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

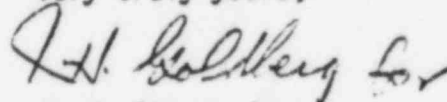
Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Final Report Concerning Computer Program Verification

On May 8, 1981, pursuant to 10CFR50.55(e), Houston Lighting & Power Company (HL&P) notified your office of an item concerning computer program verification. Enclosed is our final report regarding this item.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 877-3281.

Very truly yours,



G. W. Oprea, Jr.
Executive Vice President

SSR/mg
Attachments

Houston Lighting & Power Company

cc: G. W. Oprea, Jr.

J. H. Goldberg

J. G. Dewease

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D. G. Barker

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ST-HL-AE-1017

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Revision Date 10-10-83

Final Report Concerning
Computer Program Verification

I. Summary

A review of the Brown & Root, Inc. (B&R) engineering activities on STP indicated that computer program verification methods lacked adequate visibility to the user as to whether or not the program versions in use had been verified. The findings of the review did not disclose technical inadequacies that would compromise the safety of the plant.

Subsequent to assuming design responsibility for STP, Bechtel developed and implemented a verification program for review and acceptance of B&R's computer calculations and Computer Program Verification Reports (CPVRs). The results of this verification program are given in Section III of this report.

II. Description of Deficiency

Refer to interim reports transmitted to the NRC by letters dated June 15, 1981, August 27, 1981, December 18, 1981, April 22, 1982, September 13, 1982, December 22, 1982 and June 13, 1983 (Reference ST-HL-AE-678, 720, 769, 819, 880, 916 and 955 respectively).

III. Corrective Action

Bechtel has completed a program for the review and acceptance of B&R's computer calculations and CPVRs in accordance with approved Engineering Department Procedures (EDPs). This program is described in detail in ST-HL-AE-880. The program has been audited by the NRC (Inspection Report 82-12, dated Jan. 7, 1983). The program was found to be adequate and to conform to ANSI N45.2.11.

The Bechtel corrective actions were directed first towards separating the computer codes into various categories of need for retention based upon a review of calculations using the program. This procedure was described in ST-HL-AE-955.

Retention of a computer code for the design basis of the plant is defined to mean that the program verifications were found to meet the essential elements of Bechtel EDPs 4.36 and/or 4.37 and therefore can be utilized in accepting the entire body of B&R calculations using that code and supporting the existing design.

Because of design evolution, a better description of as-built conditions, and the need to revise the design to meet new regulatory requirements, most codes, and therefore most related calculations, were eliminated from formal CPVR upgrading actions and thus were not retained.

As part of a previous program, 147 calculations and 26 CPVR's used by the B&R Nuclear Analysis discipline had received an independent review by Energy Incorporated (EI) as described in ST-HL-AE-819. The status of these items as a result of the Bechtel evaluation described above is as follows:

Fifty-eight (58) calculations were not used in the design or were superseded by other calculations primarily performed by NUS. Eighty-three (83) calculations have been or are being superseded by Bechtel calculations because the design has changed or computer program verification was inadequate. Six (6) calculations are being maintained in support of existing project design as a result of completing verifications of the calculation itself.

Review of the 26 Nuclear Analysis CPVR's resulted in none being retained. Two (2) additional Nuclear Analysis codes, not included in the EI review, have been reviewed and are being retained to support the design basis. If necessary to support the design basis, the calculations which utilized the codes not retained will be redone using verified codes or alternate methods.

In addition Brown & Root had identified 57 significant computer programs used by the remaining disciplines (other than Nuclear Analysis) which had not been part of the EI review. Bechtel's review of the programs has resulted in 29 not being required and 27 being retained for project documentation of design calculations. The 27 programs being retained include three (3) programs which were preliminarily reported as being rejected in ST-HL-AE-955. One (1) additional code identified among the 57 was not used in design calculations but was retained because it may have been used to develop information contained in responses to other licensing questions. Therefore, of the 57 significant codes identified by B&R, a total of 28 are being retained for project documentation.

In addition to the 57 codes identified by B&R, Bechtel has identified 15 codes requiring evaluation. Nine (9) of these codes are maintained by vendors whose Quality Assurance programs have been included as part of this or other previous review programs. Of the remaining 6 codes, one was not used in design calculations but was included because it may have been used to develop information contained in responses to other licensing questions. All 15 of these codes were found acceptable and are being retained for project documentation.

IV. Recurrence Control

Bechtel Engineering Department Procedures require that computer verification be performed either generically (for standard programs) or individually before a calculation using the program be approved as final. They define the required elements of such a verification and provide visibility to the user as to whether the program version

being used has been verified. These EDP's were included in the NRC audit (Inspection Report 50-498 and 499/82-12, dated January 7, 1983) and determined to be adequate.

V. Safety Analysis

Review of the B&R engineering effort during the transition program has not uncovered any technical inadequacies which resulted from the lack of computer verification that would have compromised the safety of the plant. The program described above provides final assurance that the safety of the plant is not affected.

RETAINED CALCULATIONS AND PROGRAMS

I. NUCLEAR ANALYSIS

A. Calculations

3L099NC724-B

3L099NC727-B

3L099NC728-A

3L099NC729-A

2N179NC783-A

3C799NC0807-A

B. Programs

NUCONTEMP3 MOD3

COMPARE MOD1, MOD1A

II. REMAINING DISCIPLINE SIGNIFICANT PROGRAMS

ES-017 Fourier Series Expansion Program

ES-101 ICES COGO - Coordinate Geometry

ES-209 Calculate Spring Constants for Mats

CP-291 Structural Welds*

ES-213 Stress and Displacement in Elastic Half-Space

ES-214 STP SYS - Settlement in Multi-Layer Soil

BASEPLATE

ES-408 ICES STRUDL/Dynal Structural Space Frame Analysis

ES-417 NASTRAN

ES-418 Static Shell Stress Analysis

*Not used in design but may have been used in response
to NRC request for additional information.

ES-423 Interaction Diagram Plot - Working Stress
ES-424 Interaction Diagram Plot - Ultimate Stress
ES-428 Penetration Tendon Analysis/NASTRAN Data Management
ES-431 Response Envelope
ES-432 Shear Flow
ES-433 Composite Damping
ICES STRUDL II
NPS Baseplate
EM-900 ADL Pipe
Superpipe
CW-501 Hydrograph (Unit, Inflow, Outflow)
LIQSS Liquid Steady State Piping System Analysis Program
CW-527 Water Surface Profile (HEC-2)
ES-420 Static Stress Analysis of Shells
BOSOR - 4 Buckling of Shells of Revolution
ES-415 Cross Section Properties and Weight System Resultant
ES-434 Generation of New Time History Loads
Slope - Stability Analysis

III. BECHTEL IDENTIFIED PROGRAMS

Stardyne

ES-401

ES-419

ES-439

ES-212

TRANS2A

SPECTIA

PRINS

EDSLIN

EDSSAAS

EDSMESH

TAPAS

TDISTRI

ABAQUS

CP-244*

*Not used in design but may have been used in response
to NRC request for additional information.