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Rev. 1

Procedures Evaluation Checklist for Maintenance, Test and Calibration Procedures Used in Nucle[illegible] Power Plants

Prepared by R. L. Brune, M. Weinstein/HPT

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Sandia National Laboratories

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ABSTRACT

This report describes a checklist to be used by the United States Nuclear Regulatory Commission (NRC) inspectors during their evaluation of maintenance, test, and calibration procedures. The objective of the checklist is to aid inspectors in identifying procedural characteristics that can lead to human performance deficiencies. A companion document, Development of a Checklist for Evaluating Maintenance, Test, and Calibration Procedures Used in Nuclear Power Plants, NUREG/CR-1368, SAND80-7053, describes how the checklist was developed.

Revision 1 of the checklist, presented herein, is the result of a one-year field test by NRC inspectors in all five NRC regions. It incorporates improvements that were suggested by inspectors based on their experience with the checklist in performing evaluations of licensee procedures.

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CHECKLIST FOR EVALUATING MAINTENANCE, TEST, AND CALIBRATION PROCEDURES USED IN NUCLEAR POWER PLANTS

INTRODUCTION

This document describes the checklist to be used by United States Nuclear Regulatory Commission (NRC) inspectors for evaluating maintenance, test, and calibration procedures and provides guidelines for its application. The checklist is intended to aid inspectors in identifying procedural deficiencies that can lead to errors in performance. The procedures evaluation checklist is the product of an extensive study of nuclear power plant operations and procedures sponsored by the Office of Inspection and Enforcement. A detailed description of the study is provided in a companion document, Development of a Checklist for Evaluating Maintenance, Test, and Calibration Procedures Used in Nuclear Power Plants, NUREG/CR-1368, SAND80-7053.

As part of the study, abstracts of licensee event reports (LERs) submitted by all plants during the four-year period 1975-1978 were reviewed. The purpose of the review was to identify the specific kinds of procedures-related personnel error that have been associated with the performance of maintenance, test, and calibration activities. A total of 751 LERs was attributable to procedural deficiencies. An analysis identified eight categories of performance errors resulting from procedural deficiencies. They are summarized in Table 1. Each of the procedures evaluation criteria contained in the checklist deals with procedural characteristics related to one or more categories of performance error. The use of a procedure that is deficient with respect to these criteria can lead to errors in performance.

The checklist was distributed to the NRC regional offices for a field test by NRC inspectors who used it in evaluating licensee maintenance, test, and calibration procedures. As a result of inspector experiences with the checklist in field situations, the regional offices suggested that a number of changes be made in its content and method of application. Most of their suggestions have been incorporated in Revision 1 of the checklist described herein, resulting in an improved checklist and a more efficient procedure evaluation process. The checklist begins on page 3. An explanation of the checklist items begins on page 8. A suggested method of applying the checklist is described beginning on page 18.

Table 1. Performance Errors Associated with Maintenance, Test, and Calibration Activities

Category	Definition
Non-Compliance	Unauthorized Action. A procedure was available but not used or followed. An action not in the procedure was performed or a step was performed out of the sequence specified in the procedure.
	Omission. A procedure was used but steps were not performed.
	Incorrect Action. A procedure was used but an error was committed in the performance of a step.
Misalignment	Valves, switches, jumpers, relays, fuses, breakers, or solenoids were incorrectly positioned before, during, or after a procedure.
Preparation of Inaccurate Procedures	Personnel prepared inaccurate procedures. As a consequence, users performed incorrect actions.
Preparation of Incomplete Procedures	Personnel prepared incomplete procedures. Information needed by users was missing from procedures. As a consequence, users omitted important actions.
Failure to Revise Procedures	Personnel were not informed of necessary actions following completion of a procedure, e.g., a test following repair.
Communication	An extra-procedural communication, e.g., phone, intercom, was misunderstood.
Comprehension	The user misinterpreted the instructions in a procedure.

CHECKLIST FOR EVALUATING
MAINTENANCE, TEST, AND CALIBRATION PROCEDURES

Procedure Title/No.____

Revision_________Reviewed by__________________________Date_________

Review the procedure for each of the following characteristics. If it possesses the characteristic, check Yes; if it lacks the characteristic, check No. Check N/A (Not Applicable) if the characteristic does not apply to the procedure.

The ratings (A,B,C,D) indicate the relative impact of the characteristic on the performance of personnel using the procedures. If a procedure lacks a characteristic rated A, performance error is most likely; if it lacks a characteristic rated D, performance error is less likely.

Perform Document Review Evaluation for Items #1—#26.

Item	Rating	Yes	No	N/A
1. Does the title describe the purpose of the procedure? (Also, if the procedure is for scheduled maintenance or tests, the title should state the frequency, e.g., weekly, monthly.)	C			
2. Does the procedure provide the following information on a cover page or first page? 2.1 Procedure title and number 2.2 Revision number 2.3 Unit number (if applicable) 2.4 Approval signature and date	D			
3. Does each page provide the following identification information? 3.1 Procedure number and/or title 3.2 Revision number 3.3 Unit number (if applicable) 3.4 Page number	D			
4. If this is a temporary procedure, is it clearly marked with the expiration date?	D			
5. Is the last page of the procedure clearly identifiable by marking, e.g., Page____of____; Final Page?	D			

Item	Rating	Yes	No	N/A
6. Does the procedure provide a statement of purpose or brief description which clearly specifies the function it performs? The description should appear in an introductory section preceding the instructions.	D	___	___	___
7. Does the procedure provide the following job planning information in an introductory section preceding the instructions?				
7.1 Other actions or procedures which must be completed prior to use.	B	___	___	___
7.2 Plant, system, or equipment conditions which must exist prior to use.	B	___	___	___
7.3 Precautions which must be observed in the performance of the procedure. For example, are applicable radiological requirements and precautions specified?	C	___	___	___
7.4 The specific equipment (by part number and/or unique nomenclature) to which the procedure is applicable.	D	___	___	___
7.5 Special tools and test equipment required to perform the procedure (by part number and/or unique nomenclature).	B	___	___	___
7.6 Other documents, e.g., procedures, drawings, schematics, required to perform procedure.	C	___	___	___
8. If critical coordination of activities of two or more persons is required to perform the procedure, does the procedure provide a means for coordinating their activities? For example, is critical communication between persons located remotely from each other specified?	C	___	___	___
9. Does the procedure provide adequate quality control hold points?	C	___	___	___
10. Does the procedure provide for verification and signoff of actions?	B	___	___	___
11. If the answer to Item #10 is Yes, are the verifications predominantly performed by persons other than those performing the action?	C	___	___	___
12. If the procedure refers to a skill of the craft task, i.e., is general rather than specific, go directly to Item #30 to evaluate the procedure.				
13. Are the instructions written in short, concise, identifiable steps as opposed to multi-step paragraphs?	B	___	___	___

Item	Rating	Yes	No	N/A
14. Complexity Index (CI): Evaluate the complexity of the instructions by determining the average number of actions (verbs) called out per step. Base estimate on a sample of 20% of the steps or, if the sample size is less than 10, use all steps. Is the average number of actions per step 1.5 or less?	B			
15. Specificity Index (SI): Evaluate the level of specificity of a procedure by determining the percent of steps in a selected sample that meet all of the following criteria. 15.1 The action to be taken is specifically identified (open, close, torque, etc.). 15.2 Limits (if applicable) are expressed quantitatively (2 turns, 100 inch lbs., etc.). 15.3 The equipment or parts are identified completely (HPCI-MO-17, etc.). Base the estimate on a sample of 20% of the steps in a given procedure or a minimum of 10 steps. Do at least 90% of the steps evaluated meet all the above criteria?	B			
16. If precautions or explanations are applicable to the performance of specific steps or series of steps, are they placed immediately ahead of the step(s) to which they apply?	C			
17. Are graphs, charts, and tables adequate for readability and interpolation or extraction of values?	C			
18. Do worksheets provide enough space to record data and perform necessary calculations? For example, in calibration procedures are there provisions for an "as found" column and an "as left" column?	C			
19. Does the procedure (or related data sheets or worksheets) provide for the independent verification and signoff of computations?	C			
20. Are acceptance criteria and limits stated in quantitative terms?	C			
21. Are units expressed as ranges rather than point values whenever possible?	C			
22. Are the acceptance criteria and limits compatible with limits specified in requirements documents?	A			

Item	Rating	Yes	No	N/A
23. If computations are required by the procedure, are they based on technically accurate, complete, and up-to-date formulas?	A			
24. If items (valves, breakers, relays, solenoids, jumpers, fuses, switches) require alignment to perform the procedure, do the alignment instructions in the procedure meet all of the following criteria?	B			
24.1 Each item requiring alignment is individually specified. (Note—It is not acceptable to refer personnel to previous steps).				
24.2 Each item is identified with a unique number or nomenclature.				
24.3 The position in which the item is to be placed is specified.				
24.4 The position in which the item is placed is verified and checked off or signed off.				
25. If any of the above alignment instructions are for system restoration, is the verification performed by someone other than the person performing the alignment?	B			
26. If any follow-on action, test, or procedure must be performed upon the completion of this procedure, does the procedure or a related document (e.g., work order) instruct the user regarding what follow-on action is required and whom to notify?	C			
27. Does the procedure provide instructions for reasonable contingencies? For example, if equipment is operating outside the range specified by the procedure, is the person instructed what action to take?	C			
Perform a Walk-Through of Procedure for Items #28 and #29				
28. Are equipment numbers and/or nomenclature used in the procedure the same as those which are displayed on the equipment?	B			
29. Are the units of measurement used in the procedure the same as those displayed on equipment?	B			

Observe Licensee Simulate a Performance of Procedure or Observe Performance of Procedure for Items #30 and #31

Item	Rating	Yes	No	N/A
30. Determine whether the amount and kind of information (level of detail) provided by the procedure are adequate for the intended users.				
Are the following criteria met?:				
30.1 Can the procedure be performed in the sequence it is written?	A	___	___	___
30.2 Can the user locate and identify all equipment referred to in the instructions?	A	___	___	___
30.3 Where general rather than specific instructions are provided, can the user explain in detail how to perform the general instructions?	A	___	___	___
30.4 Can the user perform the procedure without obtaining additional information from persons or documents not specified by the procedure?	B	___	___	___
30.5 Can the user perform the procedure without obtaining direct assistance from persons not specified by the procedure?	B	___	___	___
31. Is the sensitivity of the test instruments and tools being used adequate and are they in proper calibration?	B	___	___	___

Action:____

____

____

Disposition:____

____

____

DISCUSSION OF THE CHECKLIST

Item Format

The procedures evaluation criteria are expressed in question form so that they can be answered by Yes or No. They are constructed so that a Yes answer indicates that the procedure possesses a desirable characteristic. A No answer indicates a procedural deficiency. In some cases, it will not be possible to evaluate a procedure on a characteristic because it is not applicable to the procedure. For example, a procedure cannot be evaluated regarding the adequacy of graphs, charts, or tables if it does not contain any of these items.
In this case, check Not Applicable rather than leave the item unanswered.

Explanation of Checklist Items

The checklist items are listed below. In cases where the relationship between a procedural characteristic and the quality of human performance might not be apparent, an explanation is provided

1. Does the title describe the purpose of the procedure? (Also, if the procedure is for scheduled maintenance or tests, the title should state the frequency, e.g., weekly, monthly.)

Explanation. The title is the first information read by the user and therefore should be descriptive of the contents of the procedure. A clear, unique title will make it easier to identify a given procedure among other similar procedures. The use of titles that are descriptive of the purpose of the procedure will reduce the probability of incorrect procedure selection.

2. Does the procedure provide the following information on a cover page or first page?

   2.1 Procedure title and number
   2.2 Revision number
   2.3 Unit number (if applicable)
   2.4 Approval signature and date

Explanation. Performance errors have occurred because users have selected incorrect or out-of-date procedures. Descriptive titles and revision information will aid in the selection of correct and current procedures. If this is a multiple-unit site, separate, identifiable procedures for each unit will reduce the probability of performing procedures on the wrong unit.

3. Does each page provide the following identification information?

   3.1 Procedure number and/or title
   3.2 Revision number
   3.3 Unit number (if applicable)
   3.4 Page number

Explanation. Page identification information facilitates effective document control and allows users to check that their procedures are complete and that the pages are in the correct order.

4. If this is a temporary procedure, is it clearly marked with the expiration date?

Explanation. None.

5. Is the last page of the procedure clearly identifiable by marking, e.g., Page____of____; Final Page?

Explanation. The last page of a procedure is most vulnerable to becoming detached and lost. It should be made obvious to the user if the last page is missing.

6. Does the procedure provide a statement of purpose or brief description which clearly specifies the function it performs? The description should appear in an introductory section preceding the instructions.

Explanation. None.

7. Does the procedure provide the following job planning information in an introductory section preceding the instructions?

   7.1 Other actions or procedures which must be completed prior to use.
   7.2 Plant, system, or equipment conditions which must exist prior to use.
   7.3 Precautions which must be observed in the performance of the procedure. For example, are applicable radiological requirements and precautions specified?
   7.4 The specific equipment (by part number and/or unique nomenclature) to which the procedure is applicable.
   7.5 Special tools and test equipment required to perform the procedure (by part number and/or unique nomenclature).
   7.6 Other documents, e.g., procedures, drawings, schematics, required to perform procedure.

Explanation. The provision of job planning information will enable personnel to make adequate preparations for performing the procedure and reduce the probability of taking on-the-job "shortcuts" or innovations due to incomplete job planning.

8. If critical coordination of activities of two or more persons is required to perform the procedure, does the procedure provide a means for coordinating their activities? For example, is critical communication between persons located remotely from each other specified?

Explanation. Many procedures require close coordination of actions among several persons located remotely from each other. However, by reading the procedure, it is frequently not possible to determine which person is being instructed by a particular step. Also, the procedure might not specify critical communications to ensure that the step has been initiated or completed. To the extent that complex, multi-man activities are not specified, errors in communications and omissions of actions can result.

9. Does the procedure provide adequate quality control hold points?

Explanation. Maintenance procedures should provide for inspecting equipment at appropriate points during the repair or service process to verify that the procedure is being performed correctly. For example, an assembly procedure might specify that a physical check of bearing installation be performed before a cover or other parts are installed that would prevent access to the bearing.

10. Does the procedure provide for verification and signoff of actions?

Explanation. See Item #11.

11. If the answer to Item #10 if Yes, are the verifications predominantly performed by persons other than those performing the action?

Explanation. Verification is the primary method for ensuring compliance with procedures. Self-verification by checking, initialling or signing steps serves as an aid or reminder to the procedure user to perform the step. However, it is too easily subject to abuse to serve as a compliance control. If it is important to ensure compliance with an action because of the consequences of a performance error, verification by someone other than the person performing the action is in order. It is required if an error might otherwise remain undetected.

12. If the procedure refers to a skill of the craft task, i.e., is general rather than specific, go directly to Item #30 to evaluate the procedure.

Explanation. Many procedures that are intended for use by skilled craftsmen lack detail. The performance of Item #30 enables the procedure evaluator to check the adequacy of a procedure with respect to the qualifications of the personnel permitted to use it.

13. Are the instructions written in short, concise, identifiable steps as opposed to multi-step paragraphs?

Explanation. Studies have shown that the speed of reading and comprehension of written instructions are improved if the instructions are presented in short, concise sentences. Ideally, an instruction should consist of an action verb and the object of the action—plus action limits and object identifiers, and, if necessary, object locators. Additional information (such as that contained in explanations and descriptions) that is intended to aid the user to accomplish the action more effectively should ordinarily be presented in the form of a note preceding the action instruction.

14. Complexity Index (CI): Evaluate the complexity of the instructions by determining the average number of actions (verbs) called out per step. Base estimate on a sample of 20% of the steps or, if the sample size is less than 10, use all steps.

    Is the average number of actions per step 1.5 or less?

Explanation. The complexity index (CI) of a procedure is defined as the average number of actions stated in the instructional steps or paragraphs. The average is computed from a random sample of steps or paragraphs in a procedure.

$$CI = \frac{\text{Number of Actions in a Sample of Steps or Paragraphs}}{\text{Number of Steps or Paragraphs Sampled}}$$

The number of actions is simply the number of verbs in a step or paragraph. For example, the instruction "Turn switch XXX to position No. 2, observe value on pressure gauge XX, and record value" has three actions. The more actions that are expressed, the less likely they will be recalled accurately, particularly if they are unrelated actions. Ideally, a step should contain only one action unless the actions are related, in which case up to three actions in a step are acceptable. Related actions are a group of actions required to produce a single result. The example illustrates three related actions. Their single object is to obtain a value.

15. Specificity Index (SI): Evaluate the level of specificity of a procedure by determining the percent of steps in a selected sample that meet all of the following criteria.

    15.1 The action to be taken is specifically identified (open, close, torque, etc.).

15.2 Limits (if applicable) are expressed quantitatively (2 turns, 100 inch lbs., etc.).
15.3 The equipment or parts are identified completely (HPCI-MO-17, LPV-6, etc.).

Base the estimate [illegible] a sample of 20% of the steps in a given procedure or a minimum of 10 steps.

Do at least 90% of the steps evaluated meet all the above criteria?

Explanation. The above criteria list the basic characteristics of a specific (versus general) instruction. Fewer errors of interpretation or omission result from instructions with high specificity.

16. If precautions or explanations are applicable to the performance of specific steps or series of steps, are they placed immediately ahead of the step(s) to which they apply?

Explanation. None.

17. Are graphs, charts, and tables adequate for readability and interpolation or extraction of values?

Explanation. Misinterpretation of graphs, charts, and tables has resulted in performance errors. It is often traceable to poor readability of these materials—which, in turn, is attributable to 1) inadequate reproduction or 2) inadequate original construction. The following guidelines are provided to evaluate readability.

Reproduction—In some cases, copies are so many generations removed from the original or master copy that lines in graphs, charts, and tables have deteriorated or disappeared, making it difficult to track or interpolate values. Letters and numbers can undergo similar deterioration. Also, materials have sometimes been reduced in size so that readability is impaired. Letters and numbers should be at least 1/8 in. in height, unbroken, and unfilled. All lines in the reproductions should be as visible as they are in the original or master copies. First, compare the reproductions to the originals or master copies. Then evaluate the readability of the reproductions under the conditions of illumination in which personnel use them.

Original construction—Letters and numbers should be typed rather than handwritten. Lines on graph paper should be reproducible on licensee reproduction equipment. On graphs, units of measurement used in plotted values should be compatible with divisions on graph paper. That is, if plotted values progress in units of five (e.g., 5, 10, 15, etc.) it is better to separate the values by five lines than by four lines. To facilitate accuracy of locating values in charts and tables look for such aids as 1) partitioning tables with lines, 2) arranging values in subgroups, e.g., inserting spaces between subgroups of five values, and 3) placing connecting lines between values or between nomenclature and values.

18. Do worksheets provide enough space to record data and perform necessary calculations? For example, in calibration procedures are there provisions for an "as found" column and an "as left" column?

Explanation. None.

19. Does the procedure (or related data sheets or worksheets) provide for the independent verification and signoff of computations?

Explanation. None.

20. Are acceptance criteria and limits stated in quantitative terms?

Explanation. None.

21. Are units expressed as ranges rather than point values whenever possible?

Explanation. When equipment does not permit the setting of point values, or when a range of values is acceptable, the acceptance criteria should be expressed in terms of ranges. However, they should be expressed in a form to avoid errors of addition, subtraction, or conversion. Example:

Preferable	Not Preferable
119 to 131	125 ± 6 gpm
(Best) 125 gpm (119 - 131)	125 ± 4.8% gpm (Worst)

22. Are the acceptance criteria and limits compatible with limits specified in requirements documents?

Explanation. Acceptance criteria and limits can be found in Technical Specifications as well as other documents, e.g., equipment technical manuals.

23. If computations are required by the procedure, are they based on technically accurate, complete, and up-to-date forumulas?

Explanation. None.

24. If items (valves, breakers, relays, solenoids, jumpers, fuses, switches) require alignment to perform the procedure, do the alignment instructions in the procedure meet all of the following criteria?

    24.1 Each item requiring alignment is individually specified.
    (Note—It is not acceptable to refer personnel to previous steps).
    24.2 Each item is identified with a unique number or nomenclature.
    24.3 The position in which the item is to be placed is specified.
    24.4 The position in which the item is placed is verified and checked off or signed off.

Explanation. Two of the primary factors associated with misalignment are lack of specificity of instructions and lack of physical verification of position. The criteria listed above are aimed at improving specificity and verification. In some procedures it was found that instructions were adequate for initial alignment but shortchanged realignment by simply directing personnel to "Reposition valves listed in Step 5". In this instance, personnel were not provided a means within the procedure for verifying valve positions. The instruction should have relisted the valves, specified their new positions, and provided for checkoff or signoff for each valve.

25. If any of the above alignment instructions are for system restoration, is the verification performed by someone other than the person performing the alignment?

Explanation. It was found that up to three-fourths of undetected alignment errors occur during restoration. Independent physical verification of position is less likely to be performed during this process. The requirement for independent verification is aimed at reducing this error. The independent verification should involve physically checking the positions—not be confined to simply checking log entries and tags.

26. If any follow-on action, test, or procedure must be performed upon the completion of this procedure, does the procedure or a related document (e.g., work order) instruct the user regarding what follow-on action is required and whom to notify?

Explanation. None.

27. Does the procedure provide instructions for reasonable contingencies? For example, if equipment is operating outside the range specified by the procedure, is the person instructed what action to take?

Explanation. Many procedures are written as though all acceptance criteria will be met. They do not address the exceptions. Personnel should be instructed within the procedure what actions to take in the event criteria are not met.

Perform a Walk-Through of Procedure for Items #28 and #29

28. Are equipment numbers and/or nomenclature used in the procedure the same as those which are displayed on the equipment?

Explanation. None.

29. Are the units of measurement used in the procedure the same as those displayed on equipment?

Explanation. None.

Observe Licensee Simulate a Performance of Procedure or Observe Performance of Procedure for Items #30 and #31

30. Determine whether the amount and kind of information (level of detail) provided by the procedure are adequate for the intended users.

Are the following criteria met?

30.1 Can the procedure be performed in the sequence it is written?
30.2 Can the user locate and identify all equipment referred to in the instructions?
30.3 Where general rather than specific instructions are provided, can the user explain in detail how to perform the general instructions?
30.4 Can the user perform the procedure without obtaining additional information from persons or documents not specified by the procedure?
30.5 Can the user perform the procedure without obtaining direct assistance from persons not specified by the procedure?

Explanation. NRC inspectors are required to evaluate whether or not procedures are adequate for use by qualified personnel. Because of lack of definitions of adequacy and personnel qualifications, this assessment cannot be made definitively. There is considerable room for different interpretations and disagreement between inspectors and licensees. The above observations permit an objective assessment of procedural adequacy.

31. Is the sensivity of the test instruments and tools being used adequate and are they in proper calibration?

Explanation. Personnel may mistakenly use "equivalent" tools and instruments that do not meet sensitivity or calibration requirements.

Item Ratings

The ratings A, B, C, or D indicate the impact of an item on the quality of human performance. If a procedure is deficient with respect to the characteristic referred to by the item, a performance deviation is more likely to occur than if the procedure possesses the characteristic. The absence of some procedural characteristics is more likely to result in performance deviations than the absence of others. It is therefore necessary to develop a method of rating the checklist items to indicate to the evaluator the relative importance of the characteristic stated in the item. The rating considerations are shown in Table 2. These ratings, integrated with the inspector's own knowledge of the consequences of error associated with the performance of a specific procedure or action, should enable the inspector to assess the importance of correcting a particular procedural deficiency. In general, it should be considered mandatory to correct a deficiency rated A or B. Correction of a deficiency rated C may or may not be considered mandatory, depending upon the inspector's judgment regarding the consequences of error and situational stress factors associated with use of the procedure. A rating of D would not ordinarily be regarded as a mandatory change. However, correction is desirable if the intent is to reduce the frequency of performance error to the minimum rate attainable by means of procedures.

Table 2. Rating Scale for Procedural Deficiencies

	Probability of Performance Deviation Under:		
Rating	Low Stress*	Moderate Stress*	High Stress*
A	Moderate	High	High
B	Moderate	Moderate	High
C	Low	Moderate	Moderate
D	Low	Low	Moderate

*These terms are defined with descriptions and examples in Swain, A.D. and Guttmann, H.E., Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications, NUREG/CR-1278, SAND80-0200, United States Nuclear Regulatory Commission, Washington, D.C., May 1980.

Description of Ratings

A—Errors are likely to occur during low stress (normal) conditions and will be frequently made under moderate and high stress conditions.

B--Errors are likely to occur during low and moderate stress conditions and will occur frequently under high stress.

C—Errors are not very likely under low stress but could occur readily under moderate and high stress.

D—Errors are not very likely to occur under low and moderate stress but could readily occur during high stress.

Evaluation Methods

The checklist employs three methods for evaluating procedures. The Document Review method is used to evaluate a procedure on Items #1 through #27. The Walkthrough Method is used for a procedure on Items #28 and #29 and the Observation Method applies to Items #30 and #31. The methods are described below.

Document Review. This method consists of collecting a sample of the procedures of interest and their related documents and then examining their contents and interrelationships. Typically, related documents will consist of 1) all drawings, procedures, schematics, etc. specifically referred to by the procedure, 2) technical specifications and other basic requirements documents which reasonably might affect the content of the procedures, and 3) corporation policies and station directives dealing with procedures contents, development, and implementation. These documents together comprise the information system affecting the performance of a maintenance, test, or calibration activity. If an inspector cannot evaluate a characteristic from the available documents alone when a document review has been specified, it can be assumed that the information system is deficient with respect to completeness or with respect to organization. Either deficiency will affect the quality of procedural content adversely. At the least, an information system must be auditable.

Walk-through. Some evaluations such as determining the correspondence between equipment nomenclature or identification numbers used in a procedure and the nomenclature or numbers actually displayed on equipment, can be performed only by walking through the facility with the procedure in hand and comparing the two. During the walk-through it might be desired to make selected human factors observations of the work environment, the facility layout, and the equipment, all of which bear upon the effectiveness and safety of personnel performance. For example, the inspector might wish to assess the readability of legends and displays from the perspective of the person performing the procedure.

Observation. Unlike the preceding methods, the performance of this evaluation requires the direct support of licensee personnel. The objective of this method is to judge whether the amount and kind of information provided by the procedure is complete with respect to the information needs of the user. That is, the inspector seeks to evaluate the adequacy of the "level of detail" of the procedure. This attribute of a procedure is the most difficult of all procedural characteristics to evaluate. Judgments of adequacy of level of detail are based on assumptions about the qualifications of the personnel for whom the procedure is provided. Such assumptions are often tenuous at best because, unlike operators, documentation detailing the qualifications of personnel who perform these procedures—particularly maintenance procedures, is inadequate or non-existent.

To reduce the probability of human error in the performance of an activity, a procedure must be designed to be usable for the least qualified person permitted to use the procedure. This requirement implies that the procedure must provide all of the information needed by persons representative of that skill level and, furthermore, must express the information in understandable language (vocabulary, sentence structure). Partial evidence of the completeness of a procedure can be obtained by observing a person who is representative of the minimum skill level perform a walk-through of the procedure, simulating the actions specified in the instructions.

Typically, a procedure is composed of general and specific instructions. The user should be able to explain in detail how to perform a general instruction. The user should be able to perform the entire procedure without seeking information from other personnel, unless they are specified by the procedures, and without referring to documents that are not specified by the procedures. If either of these criteria is not met, the procedure is incomplete.

APPLICATION OF THE CHECKLIST

The checklist can be applied to serve either or both of two distinctly different purposes. They are:

1. To identify deficiencies in a sample of procedures with the objective of correcting the deficiencies in that specific sample of procedures, and/or

2. To identify deficiencies in a sample of procedures with the objective of correcting the process that produced the deficient procedures.

In the first case, the inspector is basically performing the function of an editor, and, as a result, the impact of the inspection process will be confined for the most part to the procedures being evaluated. The rate at which existing procedures are modified and new procedures are prepared far outpaces the rate at which they can be evaluated by NRC inspectors. Therefore, if only changes in identified deficiencies are sought, the objective of improving the effectiveness and safety efficiency of the inspection process will not be attained.

In the second case, the impact of the inspector on the quality of licensee procedures will be maximized. Here, the procedures are viewed primarily as indicators of the quality of the procedures development process. Although the inspector should also seek to have the specific procedures corrected, the main objective of the inspection is to determine the quality of the licensee's procedures. If the samples of procedures exhibit particular deficiencies in common with each other, a change in the process used by the licensee to prepare (or revise) procedures, or a change in the licensee's specification governing the format or content of the procedures is in order.

Based on inspector experience in evaluating procedures with the checklist, the following method of application is suggested.

1. To determine deficiencies that are common to a set of procedures, sample a small number of procedures that is representative of the licensee's maintenance, test, or calibration procedures. Evaluate the procedures in detail with the checklist to determine whether they have deficiencies in common with each other. After they have been identified, it may be unnecessary to review subsequent procedures on these generic characteristics.

2. To identify deficiencies specific to a particular procedure perform a review for the following characteristics in the order listed below. Complete the review of a procedure on one characteristic before proceding to the next characteristic.

    a. Proper procedure and page identification information

    b. Statement of purpose

    c. Job planning information

    d. Verification provisions (e.g., quality control hold points, independent verification)

    e. Clarity and specificity of instructions

    f. Adequacy of cautionary information

    g. Quantitative acceptance criteria

    h. Instructions for post-maintenance and system restoration

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This report describes a checklist to be used by the United States Nuclear Regulatory Commission (NRC) inspectors during their evaluation of maintenance, test, and calibration procedures. The objective of the checklist is to aid inspectors in identifying procedural characteristics that can lead to human performance deficiencies. A companion document, Development of a Checklist for Evaluating Maintenance, Test, and Calibration Procedures Used in Nuclear Power Plants, NUREG/CR-1368, SAND80-7053, describes how the checklist was developed.

Revision 1 of the checklist, presented herein, is the result of a one-year field test by NRC inspectors in all five NRC regions. It incorporates improvements that were suggested by inspectors based on their experience with the checklist in performing evaluations of licensee procedures.

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Quarterly Management Report

ORNL Programs for the NRC Office of Nuclear Regulatory Research

A. L. Lotts

September 1982

Prepared for the
U.S. Nuclear Regulatory Commission
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PROGRAM DIRECTOR'S SUMMARY

Technical Highlights

The highlights of technical progress for each division during the past quarter are as follows:

Division of Engineering Technology

An analysis of risks associated with recycle of decommissioned materials from nuclear facilities was performed under the project assessing the Technology and Costs of Termination Surveys Associated with Decommissioning of Nuclear Facilities. The conclusion of this study was that the fatalities associated with use of recycled materials are more than balanced by the avoided fatalities associated with the savings in energy production. The CONDOS computer code was used to estimate direct radiation exposure from soil on decommissioned nuclear fuel cycle sites. Soil on sites contaminated to 10 mrem/yr levels as established in NUREG/CR-2241 gave the following direct exposure levels: PWR, 0.67 μR/h; mixed oxide fuel fabrication facility, 0.07 μR/h; UO_2 fuel fabrication facility, 0.3 μR/h; UF_6 production, 0.3 μR/h; reprocessing plant, 0.3 μR/h; and spent fuel storage, 0.5 μR/h.

In the Additional Requirements for Materials project, further slow-bend testing of precracked Charpy specimens from Intermediate Test Vessels 7B and 8 (from the HSST Program) has begun to define the heat-affected zone fracture toughness behavior below -100°C. Specimen testing was completed under Subtask 7 (Effect of Poor Practice During Half-Bead Weld Repair). A report on this work was completed and is in review, entitled "Effects of Off-Specification Procedures on the Mechanical Properties of Half-Bead Weld Repairs." Under Subtask 8 (Underclad Cracking) initial metallographic examination of the clad A-508 class 2 section did not reveal underclad cracks. However, a series of samples varying in depth around the overlap region of two weld passes is in progress and will provide more definitive information.

Material studies for the Heavy Section Steel Technology (HSST) project (Task 3, Thermal Shock) to evaluate the effects of irradiation on thermal conductivity were completed on irradiated samples machined from previously tested Charpy specimens of HSST Plate 02. The results clearly show that neutron irradiation does not degrade the thermal conductivity of this steel under the conditions of interest. Fracture-mechanics design calculations performed for TSE-7 and -8 indicate increases in the

K_I due to the cladding of 35% at the inner surface and 15% at a depth corresponding to the cladding thickness. The difference between the K_I value at the inner surface of the unclad cylinder and at the interface of the clad cylinder was only 2%. These results mean that a difference in crack behavior between TSE-7 (no cladding) and TSE-8 (clad) will be a clear indication of the effect of cladding on crack propagation.

In other tasks of the HSST project, major test parameters were determined for the first two tests (PTSE-1 and -2) of the Pressurized Thermal Shock (PTS) task. These parameters are (1) initiation of a shallow flaw in 6-8 minutes at a stress intensity level of about 110 $MPa(m)^{1/2}$ with a projected arrest on the upper shelf at a/w = 0.4 and (2) initiation of a shallow flaw (a/w about 0.05) in two minutes and arrest at a/w = 0.15. Decreasing thermal stresses then induce warm prestressing (WPS) from about 3 to 6 minutes. WPS is overcome about 6 minutes into the transient by the application of pressure. In the task on cladding evaluation, one unclad plate, three plates clad with T308/309 stainless steel and one plate clad with T312 stainless steel have been tested. Two of the T308/309 clad plates and the T312 plate failed prematurely during the loading cycle, apparently due to the remaining stainless steel in the flaw region, which was intended to be completely removed prior to electron-beam welding. One T308/309 clad plate which was loaded to yield and hydrogen charged fractured upon pop-in of the electron-beam weld. Results to date suggest that stainless steel cladding has a limited capacity for arresting a running flaw on the surface.

Under the project on Improved Eddy Current In-Service Inspection for Steam Generator Tubing, a sample 1.65-mm mean radius pancake coil was constructed and trained on new fretting standards that were recently machined. This coil was demonstrated at the EPRI Steam Generator Workshop in Charlotte, North Carolina.

Division of Accident Evaluation

Three tests (C-3, HI-1, C-4) were performed in the Fission Product Release from Fuel project. Tests C-3 and C-4 were control tests to calibrate the system under known releases. Test HI-1 was a release test with the fuel specimen held at 1400°C for 30 minutes. The dominant released materials were ^{85}Kr, ^{134}Cs, ^{137}Cs, and some ^{125}Sb. The fractional release values agreed, in general, with those previously reported. The laser-Raman facility located at the Oak Ridge Gaseous Diffusion Plant was used to detect saturated vapor above CsI crystals in the temperature range 650-800°C (vapor pressure $4x10^{-4}$ to $5x10^{-3}$ atm). Good spectra were obtained at these concentrations which should typify the released cesium species in the high temperature release tests. A status report prepared on the studies to evaluate the feasibility of the laser-Raman technique for specie identification in our release tests concluded that the feasibility could not yet be determined.

By inference from spectrophotometric data on HOCl and HOBr, which have known absorption bands at 240 and 260 nm, respectively, HOI would be expected to absorb in the 280 nm region. In the Iodine and Tellurium Chemistry project, spectrophotometric examinations were made in kinetic experiments at progressively higher iodine concentrations ($5x10^{-5}$ up to 10^{-4} M I_2) over a pH range of 9 to 11. These have revealed a weak shoulder at ~270 nm. The net absorbance in this region follows second order decay kinetics in support of expected HOI behavior.

In the LWR Core-Melt studies as part of the LWR Aerosol Release and Transport project, a series of experiments was started in which simulant fission product materials are added to UO_2, sintered, and zircaloy clad for heating inductively to various temperatures up to melting. The first experiment used a sintered (1400°C) mixture of UO_2 containing barium oxide (BaO), strontium oxide (SrO), and cerium oxide (CeO_2). Preliminary results show low release fractions for barium and strontium (~4%) with a much smaller value for cerium. The apparent enhanced release of barium and strontium relative to cerium could be explained as resulting from a partial chemical reduction of the oxides of barium and strontium by the presence of metallic zirconium in the melt. Release would then be as metallic elements with subsequent reoxidation. Two additional tests were conducted in this series with mixtures containing appropriate amounts of molybdenum, ruthenium, and tellurium as metal powders blended with UO_2 and steel powder all sintered at 1200-1400°C and loaded into Zircaloy tubes. Almost none of the fission product additives were transported to the filters. Practically all of the aerosol material that was found on the filters came from the steel additive and from the Zircaloy tube.

In the aerosol tasks of the same project, a trial test section (a 10-inch diameter SS pipe, 8-feet high) was assembled with the plasma torch aerosol generator located at the bottom. Four Fe_2O_3 aerosol/steam experiments have been completed in the NSPP (Nos. 501-504) at increasing concentration levels (1 to 10 g/M^3). Although analysis of the data is incomplete, the Fe_2O_3 aerosol (at comparable concentration levels) appeared to be removed faster than U_3O_8 at early times and more slowly at later times. Two smaller scale aerosol generation tests were also conducted using powdered concrete as the feed material to the plasma torch. One concrete sample was made up of limestone aggregate and the other was basalt. The aerosols produced were composed mainly of silicon dioxide and calcium silicate in highly agglomerated crystalline forms.

The Severe Accident Sequence Analysis project has completed and issued for review the draft report "SBLOCA Outside Containment at Browns Ferry Unit One - Accident Sequence Analysis." The report "Iodine and Noble Gas Distribution and Release Following Station Blackout at Browns Ferry Unit One" was also completed. The first volume recommends changes in operational procedures, operator training, and plant design. The second volume develops methodology for fission transport studies, and concludes that the pressure suppression pool is effective in reducing fission product release, and predicts that about 0.5% of the initial core iodine inventory would be released to the atmosphere.

The Advanced Two-Phase Instrumentation project is developing an ultrasonic sensor to measure simultaneously the level, temperature, and density of the fluid in which it is immersed. The use of a high voltage pulser for driving the magnetic-coil transducer has resulted in an order-of-magnitude increase in the signal strength. A new electronic package under design will make multiple zone measurement faster and more flexible.

Development of the ORECA code capability for HTGR severe accident sequence analysis continued with the formation of equations describing heat transfer between the upper core (reflector) nodes and the upper plenum area of the PCRV and between the core side reflector block and the PCRV sidewall area. A version of the ORECA (3-D Core model) for simulating the dynamics of the 2240 MWt steam cycle/cogeneration HTGR plant design was also completed and checked out.

The final Multirod Burst Test (B-6) bundle was sectioned, polished and photographed, and strain values were determined. The bundle exhibited uniform strains in the 15-25% range with localized burst strains in the 25-50% range. As expected for the test temperature (930°C), rod-to-rod interaction was not a significant factor. A draft of a topical report, entitled "Variations in Zircaloy-4 Cladding Deformation in Replicate LOCA Simulation Tests" was prepared and is undergoing internal peer review. The report presents results of five single rod heated shroud replicate tests that were conducted to study statistical variations in cladding deformation parameters.

Division of Risk Analysis

In the Analysis of Reliability Data From Nuclear Power Plants project, an interim letter report titled "The Reliability Characteristics of Selected Pumps in Four Nuclear Plants" was submitted to NRC for comment. The report documented failure rate calculations and presented repair information.

In the project on Acceptable Level of Risk Criteria for Nuclear Power Plants, a report was completed and submitted for review entitled "Health and Safety Standards: Theoretical Rationale and Application to Safety Goals for Nuclear Power." The report is in two parts. Part 1 is "Standard Setting Standards: A General Theory of Standards." Part 2 is "Safety Goals for Nuclear Power: An Application of the General Theory of Standards."

The Evaluation of Pressurized Thermal Shock project completed a study to investigate the importance of countercurrent flow limiting behavior in the steam generator when injecting feedwater to the auxiliary header. The impact upon the cooling supplied by the auxiliary feedwater was determined to be minimal regardless of the injection point. Event trees for the more important classes of overcooling sequences were pruned (on the bases of engineering judgement and initial estimates of probability associated with certain top-line events) to yield a reduced number of possible end-states and were replotted for distribution to PTS program participants. Three specific overcooling scenarios were selected from the pruned event trees and were completely specified (initial conditions, timing of operator actions, etc.) for thermal-hydraulic calculation using the large systems codes, following approval by NRC.

Two major reports on common-cause risk analysis for floods were issued under the Flood Risk Analysis Methodology project, NUREG/CR-2677, ORNL/TM-8313, "ESP and NOAH - Computer Programs for Flood Risk Analysis of Nuclear Power Plants," and NUREG/CR-2678, ORNL/TM-8314, "Flood Risk Analysis Methodology Development Project Final Report."

The LWR Accident Sequence Precursor Study project issued a major report on precursors to potential severe core damage accidents for the period 1969-1979 (NUREG/CR-2497). An interim report was drafted on the study of precursors to pressure vessel thermal shock.

Division of Facility Operations

In the project on Continuous On-Line Reactor Surveillance System Evaluations, the in-plant demonstration system performed well except when removed from service briefly for software modifications. Data were also recorded during a loss-of-feedwater-flow test at LOFT to assess the ability of noise analysis methods to detect and diagnose abnormal operating conditions in PWRs.

The Noise Diagnostic Methods for Safety Assessments project completed all flux adjoint calculations for the beginning and end of fuel cycle core conditions to help complete the assessment of ex-core neutron detector sensitivity to fuel element vibrations. At the midyear review on April 15, the RRG advised postponement of the study of functional redundancy until a later date. The funds allocated for this study are being used to perform additional analysis and interpretation of noise data from LOFT and Sequoyah and to explore the use of expert system technology for automated anomaly diagnosis.

Three reports have been written for the Maintenance Error Model project. The report on the job analysis of the Maintenance Mechanic position (NUREG/CR-2670) has been completed, reviewed, and is now being prepared for publication. The report on the front-end analysis, literature review and overall program plan (NUREG/CR-2669) has been completed in draft, and is now ready for review. The report on the job analysis of the Maintenance and I&C Supervisor position (NUREG/CR-2668) has been completed and is now being reviewed prior to publication. At the mid-year review meeting on April 5, a modified program plan was presented concerning the development of a human reliability model for NPP maintenance personnel. The modified program plan proposed an initial model release (following debugging and sensitivity testing) 20 months after the start of development. This is a reduction of approximately 10 months in the originally proposed schedule. In addition, the modified program plan including model validation and transfer to users was reduced in total by about 14 months. The development phase of this program will be initiated as soon as funding is received.

As part of the project on Operational Aids for Nuclear Power Plant Operators, during site visits the subcontractor secured exclusive access and use of the simulator and experienced operators for a total of 24 operating hours. Still photographs and video tape recordings were made of operating sequences, including one emergency sequence (low coolant leading to a scram.) A report was issued entitled The Allocation of Functions in Man-Machine Systems: A Perspective and Literature Review (NUREG/CR-2623). This report reviews the literature relevant to allocation of functions and presents a procedure for the allocation process applicable to nuclear power plant control rooms.

In the Safety Implications of Control Systems project, work began on simulating the ICS on the analog computer, with the steam generator-feedwater control unit selected as the starting point. The model is being implemented wherever sufficient approximate information exists. The Rod Control and the Unit Load Development sections of the Oconee Integrated Control System were added to the analog simulation. The simulation provides the capability of changing the rate at which the load demand is allowed to vary. Adaptation of the WIGGLE neutronics code was completed, and preparations were made to begin coupling the code to the core thermalhydraulics subroutines. FORTRAN routines and subroutines were written and debugged for thermodynamic and transport water properties, heat transfer logic and correlations, and the computation of one- and two-phase friction pressure loss coefficients. Steam generator modeling was focused on the two-phase phenomena in a single flow channel, with particular attention to transitions between single and two-phase regimes. Test runs were made of realistic steam generator flow. Models of four pumps - hotwell, booster, mainfeedwater, and the pump between flash tank and main feedwater line - were added to ORTURB.

The Safety Related Operator Actions project completed data collection during "Week 1" of the PWR requalification program, recording 83 data runs. BWR data collection for "Week 2" of requalification training was completed for five operator teams. Selection of critical task elements (CTEs) to be used in analysis of response times and error probability is nearly complete. Demographic data on operators has been reduced for statistical analysis. Data collection for the ten events in the BWR task analysis was also completed. Two reports were issued, Specification and Verification of Nuclear Power Plant Training Simulator Response Characteristics, Part II. Conclusions and Recommendations (NUREG/CR-2353) and Nuclear Power Plant Control Room Task Analysis: Pilot Study for Pressurized Water Reactors (NUREG/CR-2598).

Division of Health, Siting, and Waste Management

Camera-ready copy is being prepared for the report, "Nuclear Power Plant Operating and Maintenance Costs and Estimating Guidelines." This is part of Task 1 of the project CONCEPT/OMCOST Code Development. As part of Task 2 of this project, a draft of a literature review on cost-size scaling for nuclear and coal power generation units has been completed. The review documents that the cost-size scaling exponent for nuclear units is 0.4-0.6 and 0.7-0.9 for coal units.

The project, Forecasting Electricity Demand by State, has documented the Integrated Forecasting System in An Integrated System for Forecasting Electric Energy and Load for States and Utility Service Areas (ORNL/TM-7947).

In the project studying Internal Dose for Specific Occupational Exposure Conditions, committed dose equivalent (H_{50}) per unit uptake and the annual limit on intake (ALI) were computed for inhalation of radioiodines in the vapor form assuming an instantaneous uptake by the transfer compartment of the total inhaled vapor activity (100%). The results show that for the shorter-lived radioiodines, the vapor form becomes increasingly more restrictive due to the prompt uptake from the lung.

The project on Pathogenic Microorganisms in Closed Cycle Cooling Systems compared air sampling devices to determine their efficacy for detecting Legionnaires' Disease Bacteria (LDB) at the point of discharge from cooling towers. No LDB could be detected in either the impinger or high-volume air samplers placed adjacent to the tower plume. Air samples with detectable LDB did not produce infection on intraperitoneal inoculation of guinea pigs, whereas obvious lung disease did occur on intranasal injection. Histologic and cultural analysis of diseased lung tissue did not indicate the presence of LDB but did show the presence of a variety of other bacteria.

The draft document prepared for the project on Uncertainties in Assessment of Long-Term Collective Dose and Health Effects from Geologic Disposal of High Level Waste entitled An Analysis of Uncertainties in Long-Term Dose and Health Effects Resulting from Geologic Disposal of High-Level Radioactive Waste, NUREG/CR-2506, ORNL-5838, has completed internal technical review. The reviews have indicated the need for extensive revisions. A letter report was transmitted to NRC giving technical responses to selected public comments on the proposed rule, 10 CFR Part 60. A set of notes on developmment of a system performance standard for high-level waste was sent to NRC to serve as a basis for discussions on June 28. The notes discussed (1) the applicability of 10 CFR 61, 10 CFR 40, and ICRP 26 to a high-level waste standard, (2) comments on Draft 20 of the EPA standard (40 CFR 191), (3) special features of high-level waste disposal that could influence performance standards, and (4) topics that must be dealt with in a standard and illustrations of alternatives. Several papers were published in technical journals.

Problem Areas

Seventy milestones were scheduled to be completed this quarter for the Office of Nuclear Regulatory Research. Of these, fifty-one were completed on schedule for a completion rate of 73%. Those that necessitated rescheduling were primarily due to decreased funding levels, delayed receipt of FY 1982 funds, or changes in work scope. Minor problem areas are delineated below.

Ten out of twelve milestones scheduled for the NRC Division of Engineering Technology were achieved on schedule for a completion rate of 83%. Two milestones in the project on Eddy-Current In-Service Inspection for Steam Generators were delayed due to shortages in personnel and personnel commitments to other programs. In Task 4 (Intermediate Vessel Test) of the HSST project, the small Balseals, used in instrumentation penetrations, continue to be a minor problem. A set survived 86 pressure cycles to 200 MPa at 150°C. A further modification of the instrumentation penetration fitting was made to reduce the likelihood of failure.

For the Division of Accident Evaluation, on April 19, NRC informed us that analysis and correlation assessment efforts were to be deleted from the Correlation and Evaluation of Bundle Heat Transfer Models project in the areas of film boiling, forced convection to steam, and void fraction distribution, and that three fourths of the program's funding for FY 1983 would be withdrawn. Sixteen of nineteen milestones were completed on schedule for a completion rate of 84% for all projects. Milestones have been delayed in two projects. In the Post-Accident Iodine and Tellurium Chemistry project, the level of work required along with unexpected technical difficulties has led to a delay in two milestones. Problems in the Aerosol Release and Transport Program such as a decreased level of funding and difficulties in obtaining a suitable power supply have caused rescheduling of several milestones. Efforts are being made to resolve these difficulties.

Seven out of fourteen milestones scheduled for the Division of Risk Analysis this quarter were completed on schedule for a completion rate of 50%. Most of the delayed milestones were because of delays in receipt of expected FY 1982 funding. In the project on Acceptable Level of Risk Criteria for Nuclear Power Plants, reports pertaining to the quantitative safety goal have been rescheduled because of late arrival of FY 1982 funds. A potential problem area in the Common Cause Failure Analysis Procedure project is the delivery of plant/PRA information necessary to initiate the required plant analyses. In the project on Utilization of Risk Analysis and Risk Criteria, Rand's sub-subcontractor, Kuljian Corp., has failed to meet contractural agreements by being at least three months overdue on delivery of a draft report. This problem is being confronted by Rand and will be resolved shortly. This project also has had to reschedule four milestones because of delays in FY 1982 funding. In the project on Definition of Scenarios and Controlling Parameters for Major Accidents Involving UF_6 at NRC-Licensed Fuel Cycle Facilities, relevant documents obtained so far do not provide sufficent accident scenario descriptions. Development of scenario descriptions may be difficult if sufficient details are not obtained through planned site visits.

Four milestones were scheduled to be completed this quarter for the NRC Division of Facility Operations and they were all completed as scheduled for a completion rate of 100%. There are several potential problem areas that may affect future milestones mainly due to a lack of utility cooperation in providing plant design and operating data. TVA has not agreed to extend the demonstration of the ORNL automated noise surveillance system at Sequoyah-1 because the space is needed for installation of the technical support center. NRC has sent a formal request to TVA requesting extension of the demonstration beyond the first fuel cycle. Limited access to detailed design data is delaying the completion and testing of models to be used in the program to study the Safety Implications of Control Systems. While continuing to pursue avenues for obtaining utility cooperation, ORNL and NRC staff are discussing alternative ways to perform this task if the desired data is not obtained. This same project also experienced subcontractor problems which slowed the failure modes portion, but the problem has been resolved. The problem of obtaining BWR operator participation in assessing Safety-Related Operator Actions has also been resolved and data collection during BWR requalification programs has resumed.

There were twenty-one milestones scheduled for the Division of Health, Siting, and Waste Management this quarter and sixteen were completed on time for a completion rate of 63%. In the CONCEPT/OMCOST Code Development project two subtasks were rescheduled by agreement with NRC to allow incorporation of the results of the January 1982 cost study being performed by United Engineers & Constructors for DOE.

New Projects, Initiatives, and Proposals

In the Division of Engineering Technology, two projects are being reported on for the first time, ASME Code Section III-Technical Support and Containment Leak Rate Testing. A proposal was submitted as an outgrowth of work in the first project on recommendations for future research on the problem of preloading of bolted connections.

Several new projects, proposals, and extensions of present tasks were begun or funded in the Division of Accident Evaluation. Reported for the first time this quarter is the project on Near-Term TRAP-MELT Verification. Several new proposals for FY 1983 were funded including Fast Reactor Aerosol Release and Transport, Clad Ballooning Evaluation, Fission Product Deposition Onto Aerosols, and Computerized Research Information.

Two new projects were started this quarter in the Division of Risk Analysis on Analysis of Proposed New IAEA Basis for Transportation Regulatory System and Definition of Scenarios and Controlling Parameters for Major Accidents Involving UF_6 at NRC-Licensed Fuel Cycle Facilities. One additional new project has been funded for FY 1983, Accident Sequence Precursor Methodology. For the project on Evaluation of Pressurized Thermal Shock, the task on Probabilistic Risk Assessment was expanded to a level of ~4.5 man-months beginning about June 1. A proposal was also submitted relative to this project on the development of a method for incorporating the uncertainties of calculated temperature-and pressure-vs-time histories into vessel failure prediction codes (Probabilistic Methodology for Pressure Vessel Failure Prediction). One other new proposal was submitted for FY 1983 for a Modal Study - Structural Testing and Technical Analysis.

New projects initiated during the third quarter in the Division of Facility Operations were: Pressure Sensor/Sensing Line System Evaluation Research and Occupational Radiological Monitoring at Uranium Mills. New proposals included Internal Dose for Specific Occupational Exposure Conditions and High Sensitivity Radionuclide Analysis for Internal Dose Assessment. As part of the Human Factors effort, new projects include Human Factors in Incident Alert Notification and Organizational Interface in Reactor Emergency Preparedness. As a partial outgrowth of the Safety Related Operator Actions Program, a proposal was submitted for FY 1983 to conduct Training Simulator Experiments.

Financial Status

The ORNL projects supported by the Office of Nuclear Regulatory Research are under satisfactory financial control as shown in the attached figures for each NRC division (ET, AE, RA, FO, and HSWM). The financial plan amounts are based on funds carried over from FY-81, the funds received in FY-82, and funds expected to be carried over to FY-83. The cumulative planned amounts include expected funds for FY-82 in addition to financial plan amounts. The funds shown in the Cost/Budget Reports reflect all authorizations through June 30, 1982. Programs which are not properly funded are discussed below.

The overall summary Cost/Budget Report shows that \$4765K was carried over from FY-81, \$17558K was received as of June 30, 1982, and \$2596K is planned carryover for FY-83. Therefore, the financial plan as of June 30, 1982 was \$19702K. With the expected funds of \$577K, the total funding allocation to ORNL in FY-82 from RES is expected to be \$20279K, which is lower than the \$20403K authorized in FY-81. This lower funding level and pressure to accelerate many tasks has caused many programs to have insufficient funds available to use as planned carryover for FY-83 to ensure program continuation if FY-83 funding authorizations are delayed. Immediate resolution of this problem is required.

Funds were received this quarter for two new projects in the Division of Engineering Technology: ASME Code Section III - Technical Support and Containment Leak Rate Testing. Remaining funds in the closed-out project on Evaluation of Performance of Greased Prestressing Tendons are being used for preparation of the final report.

The new project in the Division of Accident Evaluation on Trap-Melt Verification tests received initial funding this quarter.

FY 1982 funds were received this quarter for two new projects in the Division of Risk Analysis: Analysis of Proposed New IAEA Basis for Transportation Regulatory System and Definition of Scenarios and Evaluation of Methodologies. In addition, expected funds for FY 1982 which had been delayed were received for the projects on Common Cause Screening Failure Analysis Procedures and Mathematical and Statistical

Problems in Risk Analysis. The delayed receipt of expected FY 1982 funding is still causing problems in the project on Utilization of Risk Analysis and Risk Criteria. While the project on LWR Systems Survey on PRA is not yet complete pending issuance of a revised report, the spending target was achieved in February and no funds have been expended for the last four months.

Two new projects in the Division of Facility Operations received their FY 1982 funding this quarter: Occupational Radiological Monitoring at Uranium Mills and Pressure Sensor/Sensing Line System Evaluation Research. The project on Maintenance Error Model finally was funded and is progressing.

In the Division of Health, Siting, and Waste Management, no new funds were received this quarter for either new or existing projects. Some additional FY 1982 funding is still expected for the projects on Evaluation of Atmospheric Dispersion Models and Forecasting Electricity Demand by States. The Methods in Dosimetry for Nuclear Regulations project was completed this quarter with no additional funds expected during FY 1982.

COST/BUDGET REPORT

FIN No.:

NRC Project Manager:

Report For Period Ending: 06-31-82

ORNL Act No.

NRC Act. No.

Program Director:

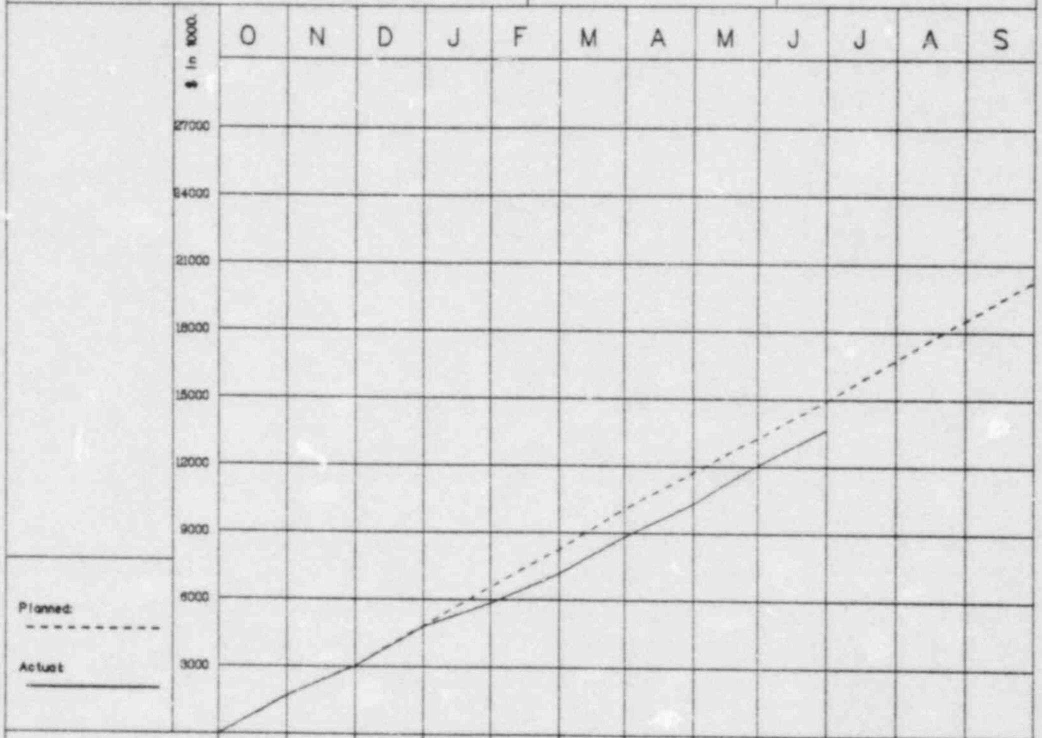
Program Title: Overall Summary Office of Nuclear Regulatory Research

NRC Div.: RES/:

ORNL Div.:

Program Manager:

Principal Investigator:



	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	1686	1365	1777	1737	1692	1819	1633	1553	1644	1821	1792	1760
Cumulative Planned	1686	3051	4828	6565	8257	10076	11709	13262	14906	16727	18519	20279
Monthly Actual	1689	1346	1748	1058	1349	1662	1461	1746	1569			
Cumulative Actual	1689	3035	4783	5841	7190	8852	10313	12059	13628			
Monthly Variance	+3	-19	-29	-679	-343	-157	-172	+193	-75			
Cumulative Variance	+3	-16	-45	-724	-1067	-1224	-1396	-1203	-1278			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	5117	1413	1451	5094	14316
2	4765	15247	2015	17964	1113
3	4765	17558	2596	19702	577
4					

Comments: Variance: -8.6%

DIVISION OF ENGINEERING TECHNOLOGY

COST/BUDGET REPORT

FIN No.:

NRC Project Manager:

Report For Period Ending: 06-31-82

ORNL Act No.

NRC Act. No.

Program Director:

Program Title: Summary

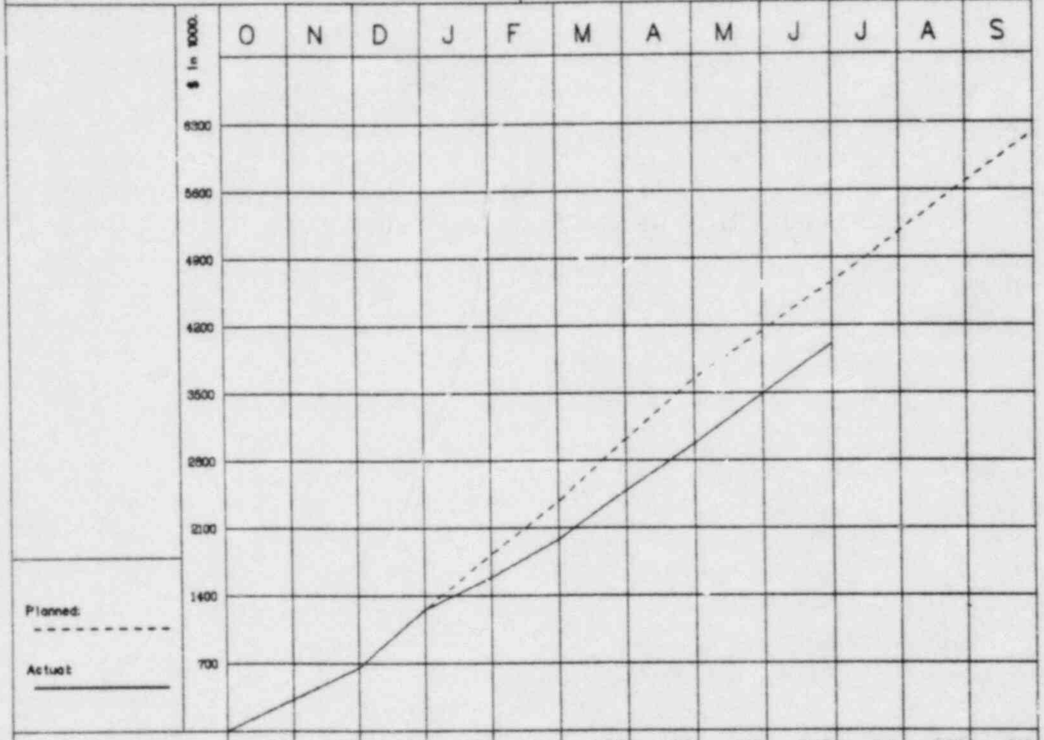
Office of Nuclear
Regulatory Research

NRC Div.: RES/: ET

ORNL Div.:

Program Manager:

Principal Investigator:



	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	328	327	599	568	544	653	625	496	505	519	520	515
Cumulative Planned	328	655	1254	1822	2366	3019	3644	4140	4645	5164	5684	6199
Monthly Actual	328	328	599	327	393	514	475	532	50			
Cumulative Actual	328	656	1255	1582	1975	2489	2964	3496	4000			
Monthly Variance	0	+1	0	−241	−151	−139	−150	+36	−1			
Cumulative Variance	0	+1	+1	−240	−391	−530	−680	−644	−645			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	1266	135	657	744	5589
2	846	5572	588	5830	199
3	846	5977	768	6055	144
4					

Comments: Variance: −13.9%

COST/BUDGET REPORT

FIN No.: B0103

NRC Project Manager: A. Taboada

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 54 30 3

NRC Act. No. 10 19 02 01 2

Program Director: Lotts/Homan

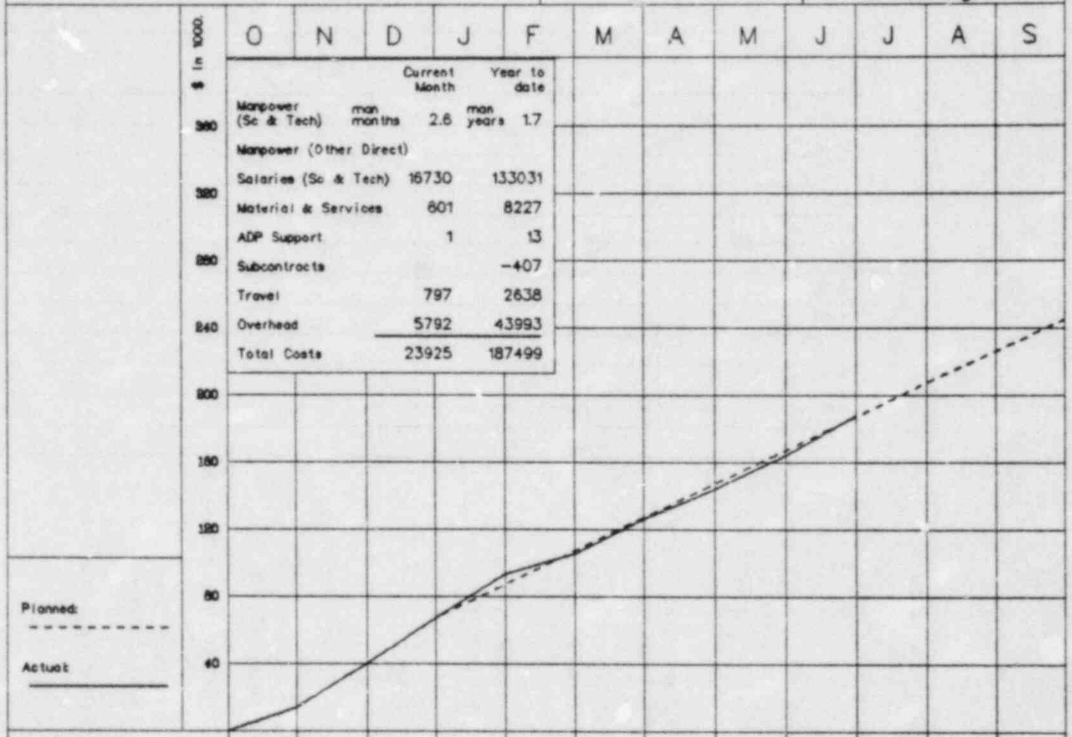
Program Title: Additioral Requirements For Materials

NRC Div.: RES/: ET

ORNL Div.: M&C

Program Manager: R. K. Nanstad

Principal Investigator: R. W. McClung



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.6	man years	1.7
Manpower (Other Direct)				
Salaries (Sc & Tech)		16730		133031
Material & Services		601		8227
ADP Support		1		13
Subcontracts				−407
Travel		797		2638
Overhead		5792		43993
Total Costs		23925		187499

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	14	26	27	20	20	20	20	20	20	20	19	19
Cumulative Planned	14	40	67	87	107	127	147	167	187	207	226	245
Monthly Actual	14	26	27	26	12	21	18	20	24			
Cumulative Actual	14	40	67	93	105	126	144	164	188			
Monthly Variance	0	0	0	+6	−8	+1	−2	0	+4			
Cumulative Variance	0	0	0	+6	−2	−	−3	−3	+1			

Quarter	carry over 10/01/81	FY 82 Funding	carry cver 9/30/82	Financial Plan	Expected Changes
1	113	28	38	103	142
2	113	198	66	245	0
3	113	198	66	245	0
4					

Comments: Variance: +0.5%

MILESTONE BAR CHART

TITLE: ADDITIONAL REQUIREMENTS FOR MATERIALS
FIN No.: B0103
PROJECT MANAGER: R. K. NANSTAD

1. Submit final report on ferrite content in austenitic weld metal

6. Radiography, ultrasonics, materials, and welder qualification review (as required)

7. Complete report on the effect of poor practice during half-bead weld repair

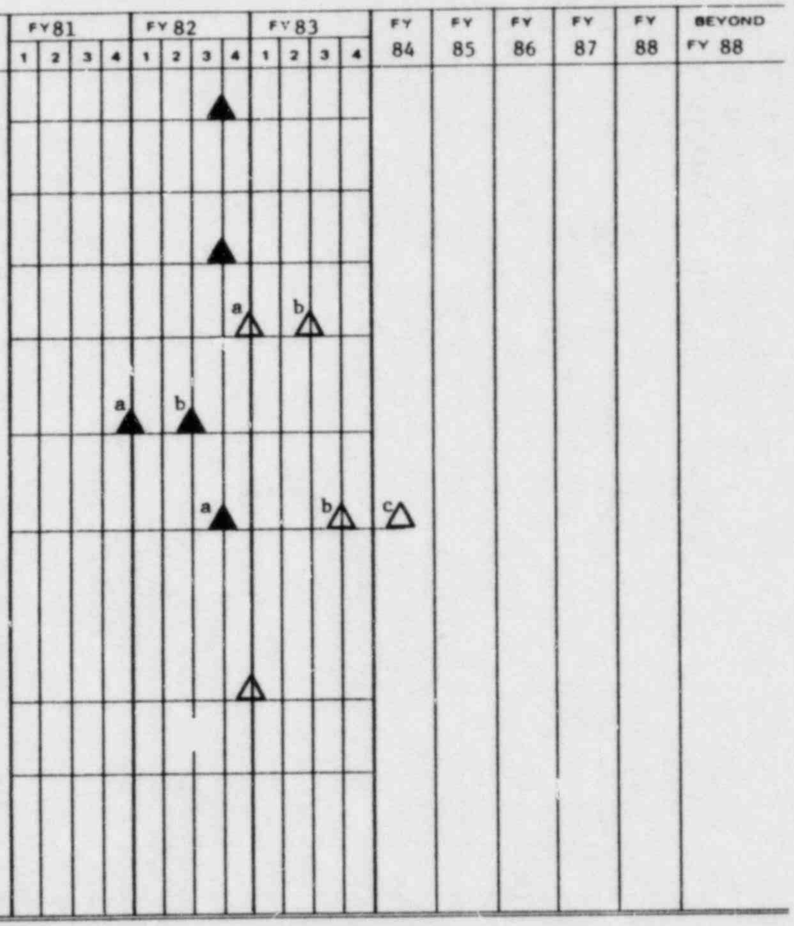
8. Underclad cracking
   a. Complete literature survey report
   b. Submit final report on test results

9. HAZ transformations
   a. Completion of draft report
   b. Submit final report

11. Effect of aging at 500–600°F on toughness of stainless steel weld metal
   a. Complete literature search
   b. Complete long-term aging (10,000 h) of materials
   c. Complete testing and submit final report

12. Effect of irradiation on Charpy V-notch upper-shelf energy – literature review

13. Review of materials for Code applications (as required)



UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0474

NRC Project Manager: E. T. Baker

Report For Period Ending: 06-31-82

ORNL Act No.: 41 88 55 05 1

NRC Act. No.: 60 19 21 00

Program Director: Lotts/Homan

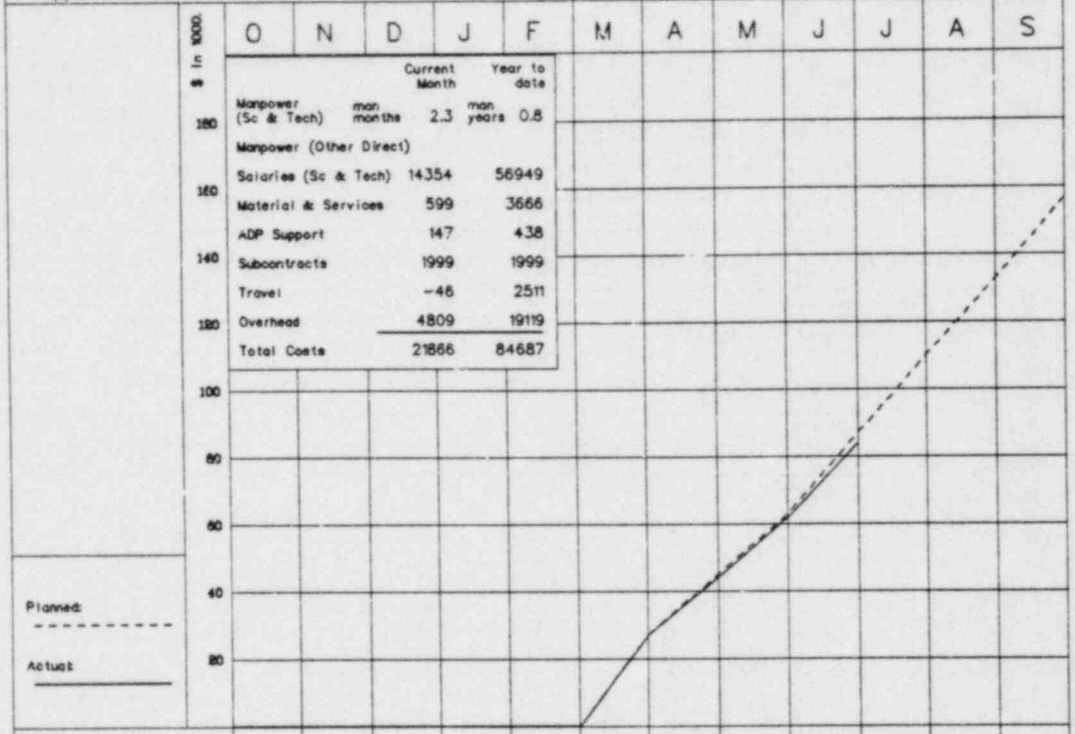
Program Title: ASME Code Section III-Technical Support

NRC Div.: RES/: ET

ORNL Div.: ETD

Program Manager: G. T. Yahr

Principal Investigator: S. E. Moore



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.3	man years	0.8
Manpower (Other Direct)				
Salaries (Sc & Tech)		14354		56949
Material & Services		599		3666
ADP Support		147		438
Subcontracts		1999		1999
Travel		-48		2511
Overhead		4809		19119
Total Costs		21866		84687

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	27	18	18	24	23	23	24
Cumulative Planned	0	0	0	0	0	27	45	63	87	110	133	157
Monthly Actual	0	0	0	0	0	27	17	18	22			
Cumulative Actual	0	0	0	0	0	27	44	62	84			
Monthly Variance	0	0	0	0	0	0	-1	0	-2			
Cumulative Variance	0	0	0	0	0	0	-1	-1	-3			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	200	43	157	0
4					

Comments: Variance: -3.4%

MILESTONE BAR CHART

ASME CODE SECTION III — TECHNICAL SUPPORT
(B0474)

TASK 1: DYNAMIC ALLOWABLE STRESSES

a. Issue report on combined experimental/analytical investigation of allowable stress criteria for dynamic loads (Univ. of Akron/PVRC)

TASK 2: PIPING SUPPORT REACTIONS

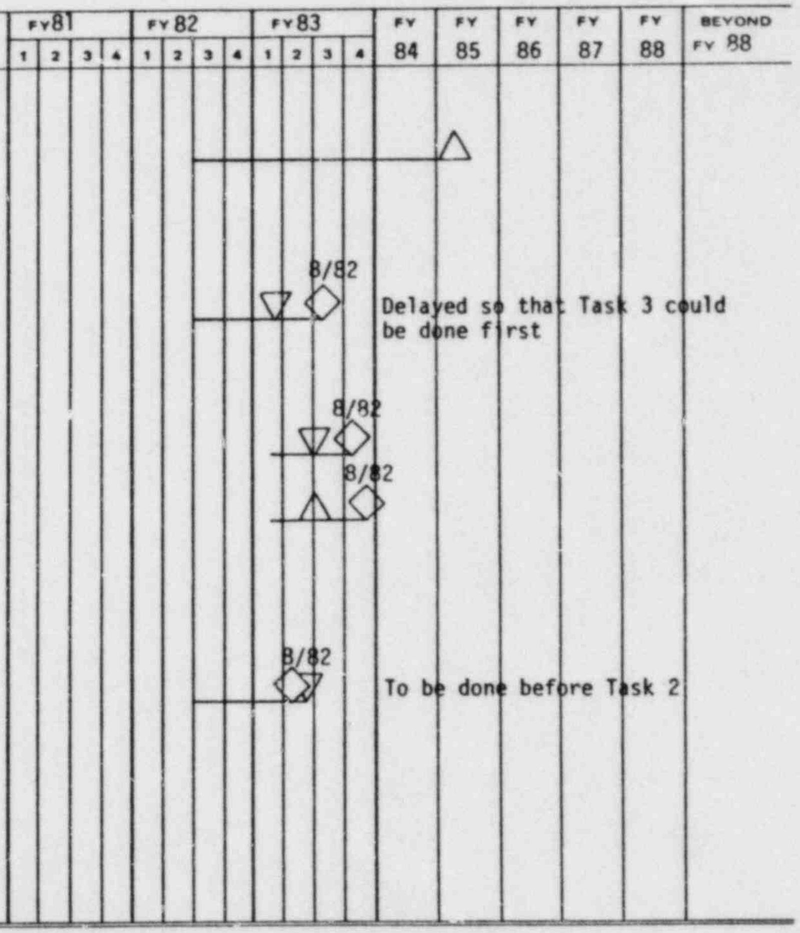
a. Complete draft report that identifies the sources of uncertainties associated with piping support restraint loads and quantifies them to the extent feasible (E. C. Rodabaugh Associates, Inc.)

b. Provide recommendations for future research to NRC with cost and time schedule

c. Publish report that identifies the sources of uncertainties associated with piping support restraint loads and quantifies them to the extent feasible

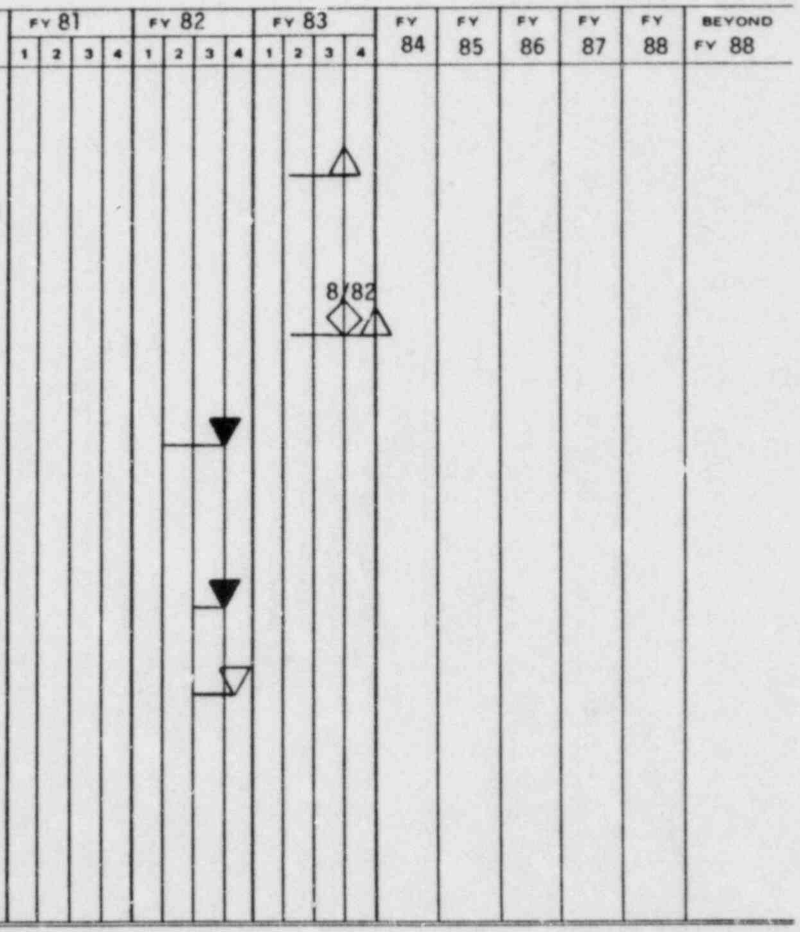
TASK 3: FATIGUE EVALUATION FOR CLASS 2 AND 3 PIPING COMPONENTS

a. Complete draft report that describes the basis for the Code Class 2 and 3 fatigue evaluation method, shows how it correlates with Class 1 method, and recommends Code changes that will bring the two methods into better agreement (E. C. Rodabaugh Associates, Inc.)



MILESTONE BAR CHART

ASME CODE SECTION III — TECHNICAL SUPPORT
(B0474)



TASK 3: FATIGUE EVALUATION FOR CLASS 2 AND 3 PIPING COMPONENTS (cont'd)

b. Publish report that describes the basis for the Code Class 2 and 3 fatigue evaluation method, shows how it correlates with Class 1 method, and recommends Code changes that will bring the two methods into better agreement

c. Present recommendations to appropriate Code committee

TASK 5: PRELOADING OF BOLTED CONNECTIONS

a. Provide recommendations for future research and cost/time schedule

TASK 7: EVALUATION OF SECTION III ACCEPTANCE STANDARDS AND FATIGUE CURVES USING A FRACTURE MECHANICS APPROACH

a. Review Section III fatigue rules, fatigue crack growth literature, and component loading histograms

b. Submit proposal to NRC to evaluate the conservatism of Section III fatigue criteria

COST/BUDGET REPORT

FIN No.: B0489

NRC Project Manager: E. G. Arndt

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 13 9

NRC Act. No.: 40 10 01 06

Program Director: Lotts/Homan

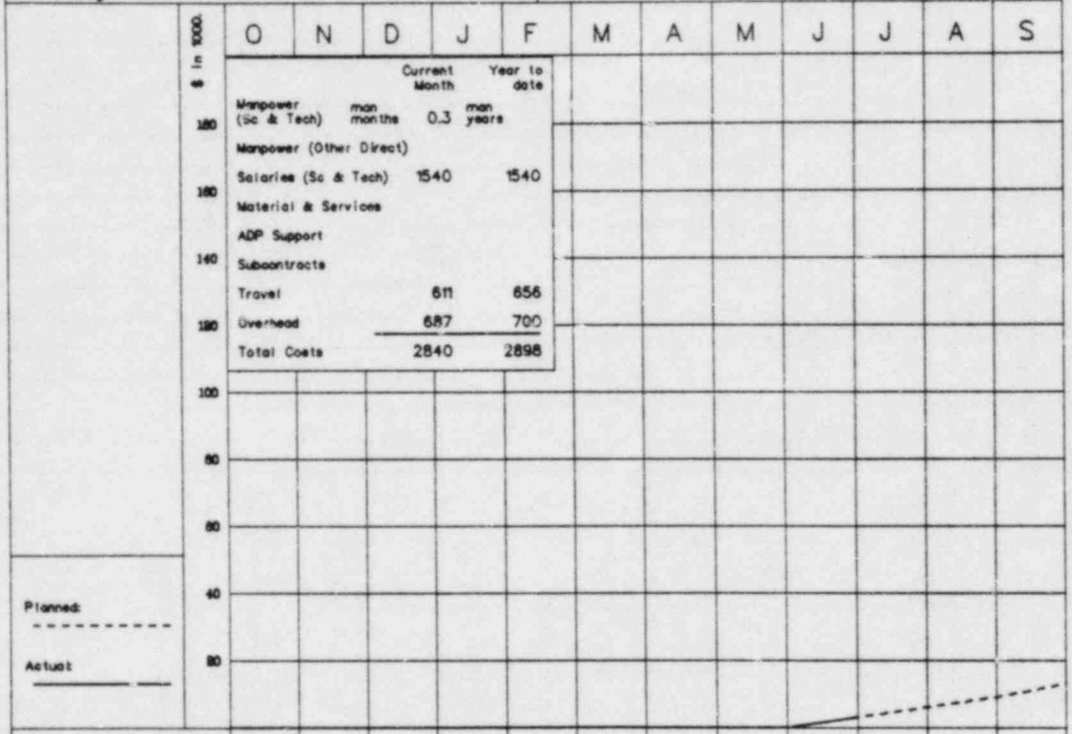
Program Title: Containment Leak Rate Testing

NRC Div.: RES/: ET

ORNL Div.: ET

Program Manager: D. J. Naus

Principal Investigator: J. R. Dougan



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.3	man years	
Manpower (Other Direct)				
Salaries (Sc & Tech)		1540		1540
Material & Services				
ADP Support				
Subcontracts				
Travel		611		656
Overhead		687		700
Total Costs		2840		2898

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	0	0	0	3	3	3	4
Cumulative Planned	0	0	0	0	0	0	0	0	3	6	9	13
Monthly Actual	0	0	0	0	0	0	0	0	3			
Cumulative Actual	0	0	0	0	0	0	0	0	3			
Monthly Variance	0	0	0	0	0	0	0	0	0			
Cumulative Variance	0	0	0	0	0	0	0	0	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	150	137	13	0
4					

Comments: Variance: 0.0%

MILESTONE BAR CHART

ITLE: Containment Leak Rate Testing
ACTIVITY NO.: 41 89 55 13

	FY 82				FY 83				FY				FY	FY	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
1. Task A: Review Existing Containment Leak Rate Testing Requirements.																		
a. Complete review of relevant reports.				▽														
b. Complete witnessing of typical tests.					▽													
c. Complete interviews with interested parties.					▽													
2. Task B: Review Proposed Appendix J Revisions.																		
a. Complete review of proposed revision to Appendix J.						▽												
b. Complete commentary on proposed revision to Appendix J.						▽												
c. Complete recommendations on specific aspects of the proposed revision to Appendix J.						▽												
3. Task C: Review ANSI/ANS 56.8-1981 for compatability with Appendix J.																		
a. Complete review with respect to potential conflicts with Appendix J.						▽												
b. Complete determination of items in Appendix J which should be included.						▽												

MILESTONE BAR CHART

TITLE: Containment Leak Rate Testing
ACTIVITY NO.: 41 89 55 13

	FY 82				FY 83				FY				FY	FY	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
4. Task D: Provide Value-Impact Analysis for Appendix J proposed revision.																		
a. Complete development of an initial value-impact statement.							▽											
b. Complete revision of value-impact statement.								▽										
5. Task E: Provide Final Report.																		
a. Complete development of draft final report.								▽										

COST/BUDGET REPORT

FIN No.: A9044

NRC Project Manager: E. G. Arndt

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 54 32 3

NRC Act. No. 10 19 01 01 2

Program Director: Lotts/Homan

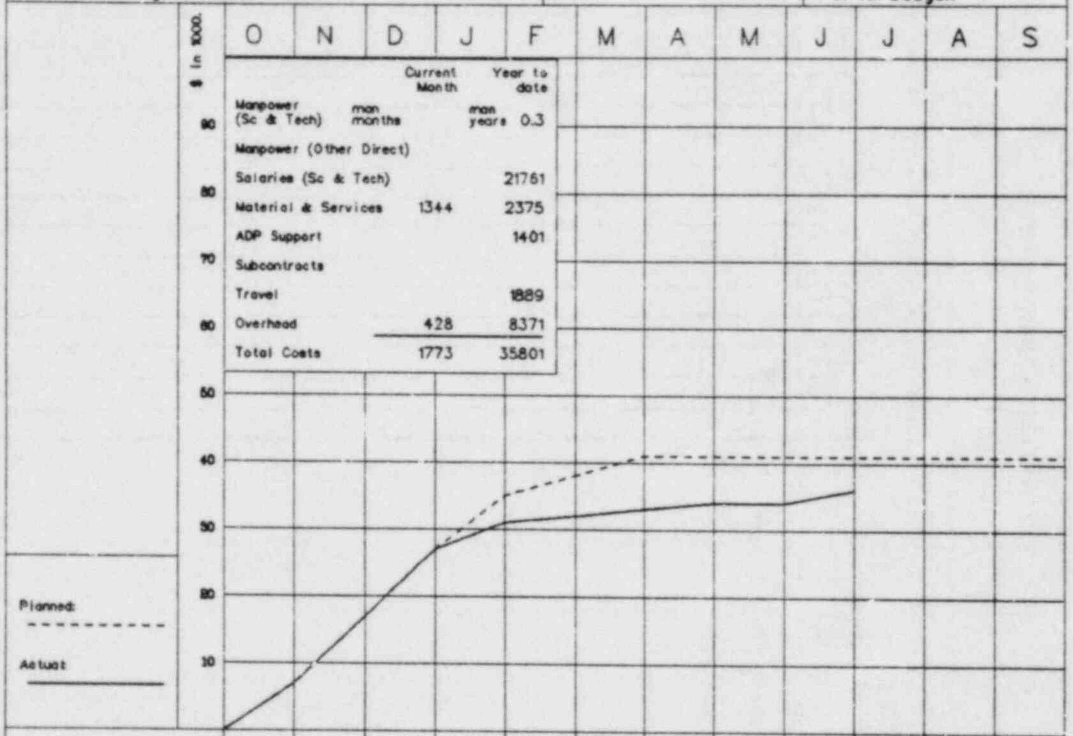
Program Title: Evaluation of Performance of Greased Prestressing Tendons

NRC Div.: RES/: ET

ORNL Div.: ETD

Program Manager: D. J. Naus

Principal Investigator: J. R. Dougan



		Current Month	Year to date
Manpower (Sc & Tech)	man months		man years 0.3
Manpower (Other Direct)			
Salaries (Sc & Tech)			21761
Material & Services		1344	2375
ADP Support			1401
Subcontracts			
Travel			1889
Overhead		428	8371
Total Costs		1773	35801

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	7	10	10	8	3	3	0	0	0	0	0	0
Cumulative Planned	7	17	27	35	38	41	41	41	41	41	41	41
Monthly Actual	7	10	10	4	1	1	1	0	2			
Cumulative Actual	7	17	27	31	32	33	34	34	36			
Monthly Variance	0	0	0	−4	−2	−2	+1	0	+2			
Cumulative Variance	0	0	0	−4	−6	−8	−7	−7	−5			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	41	0	0	41	0
2	41	0	0	41	0
3	41	0	0	41	0
4					

Comments: Variance: −12.2%

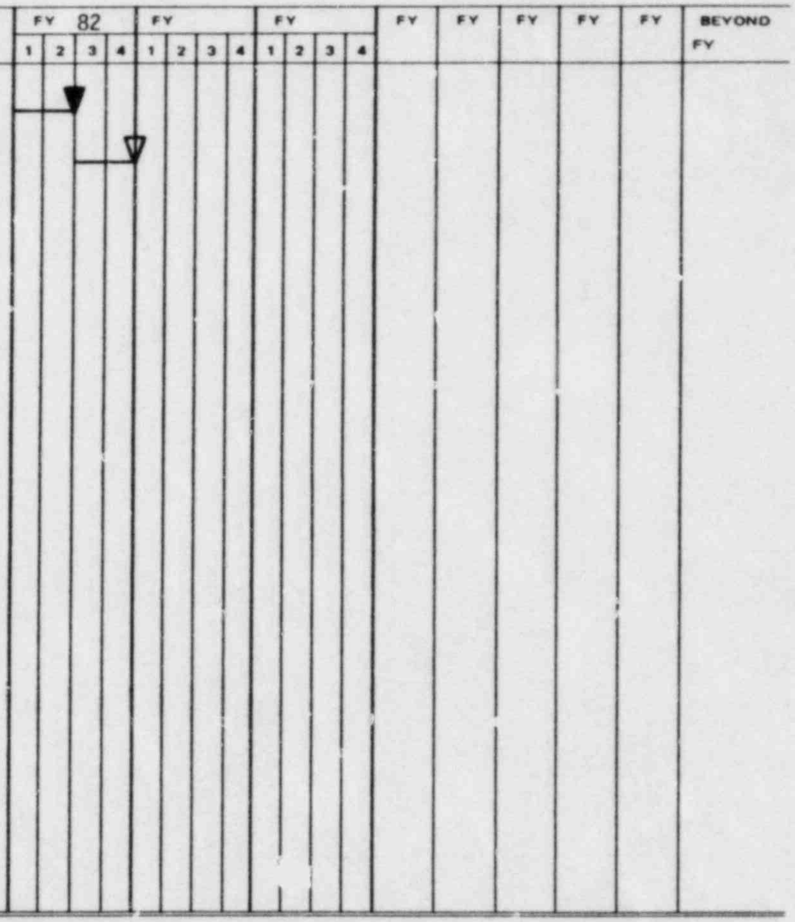
Remaining funds are being used for publication of final report. Variance is the result of delays in publishing.

MILESTONE BAR CHART

TITLE: Evaluation of Performance of Greased Prestressing Tendons in Nuclear Power Plant Structures
ACTIVITY NO. 41 88 54 32 3

1. Subtask C: Complete draft final report.

   Publish final report.



COST/BUDGET REPORT

File No.: B0119

NRC Project Manager: M. Vagins

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 10 1

NRC Act. No.: 60 19 01 30

Program Director: Lotts/Homan

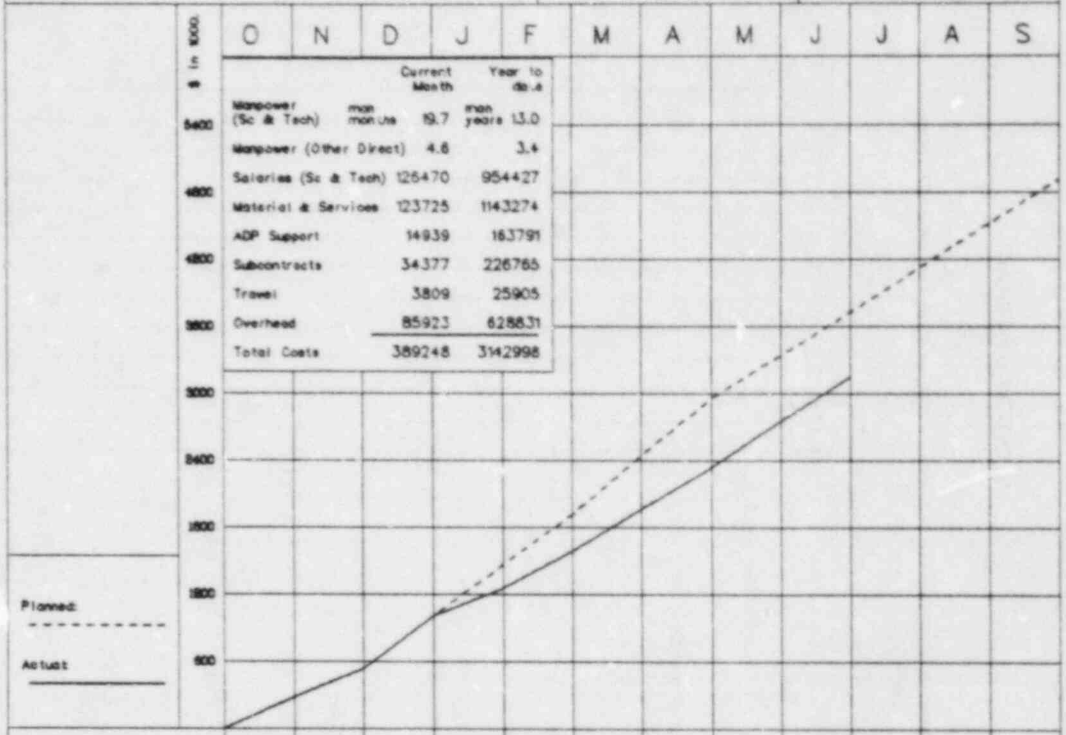
Program Title: Heavy-Section Steel Technology

NRC Div.: RES/: ET

ORNL Div.: ETD

Program Manager: G. D. Whitman

Principal Investigator: G. D. Whitman



		Current Month		Year to date
Manpower (Sc & Tech)	man months	19.7	man years	13.0
Manpower (Other Direct)		4.6		3.4
Salaries (Sc & Tech)		126470		954427
Material & Services		123725		1143274
ADP Support		14939		163791
Subcontracts		34377		226765
Travel		3809		25905
Overhead		85923		628831
Total Costs		389248		3142998

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	282	250	472	463	443	533	512	383	383	398	400	394
Cumulative Planned	282	532	1004	1467	1910	2443	2955	3338	3721	4119	4519	4913
Monthly Actual	282	250	472	247	333	376	377	417	389			
Cumulative Actual	282	532	1004	1251	1584	1960	2337	2754	3143			
Monthly Variance	0	0	0	−216	−110	−157	−135	+34	+6			
Cumulative Variance	0	0	0	−216	−326	−483	−618	−584	−578			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	1039	0	619	420	4794
2	619	4595	500	4714	199
3	619	4650	500	4769	144
4					

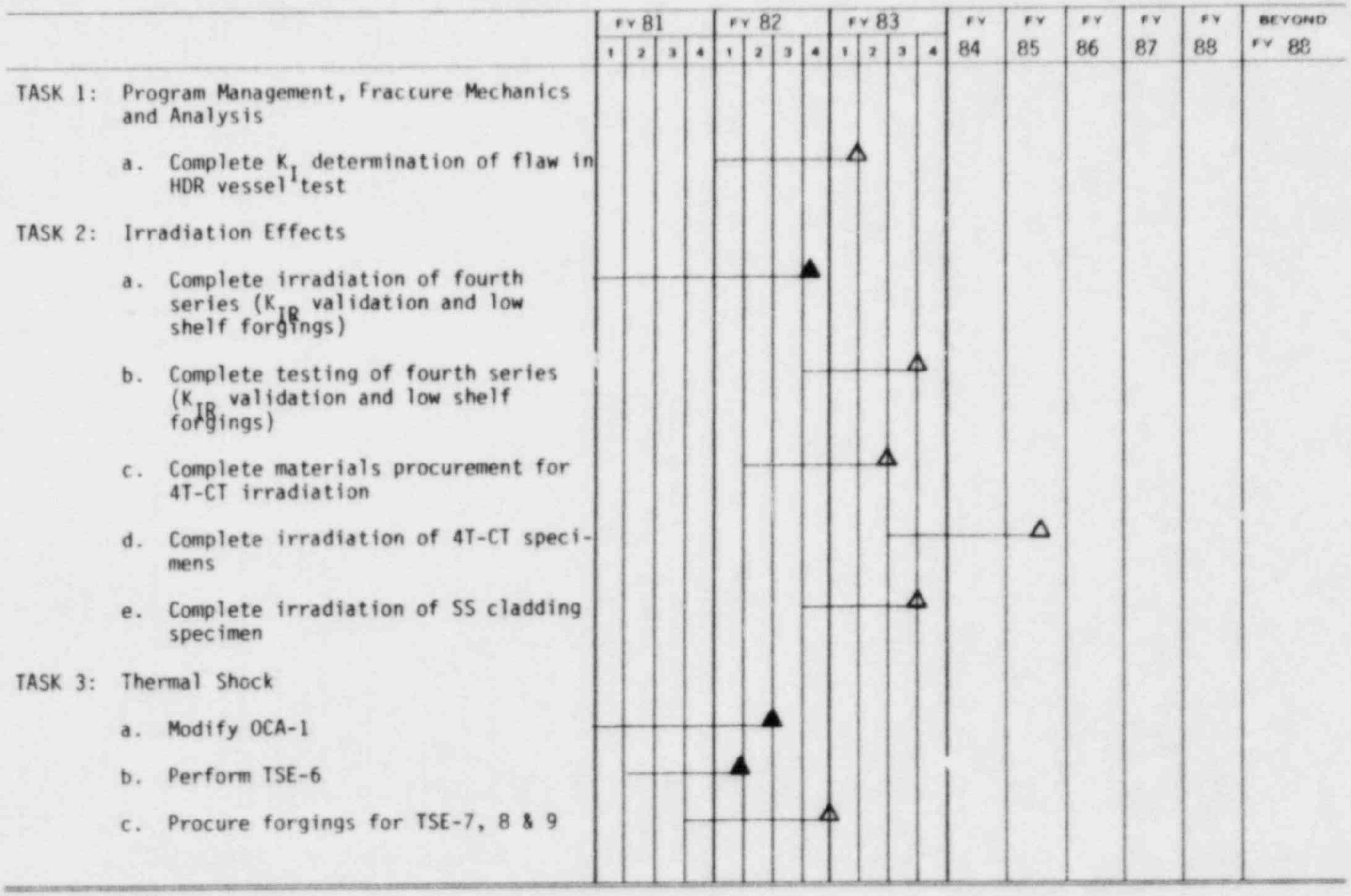
Comments: Variance: −15.5%

Variance due to delay in ordering of forgings for TS program and delay in purchase of components and materials for 4T-K_{1c} irradiation program.

MILESTONE BAR CHART

TITLE: Heavy-Section Steel Technology Program

ACTIVITY NO.: ORNL #41 89 55 10 1; NRC #60 19 01 30



TASK 1: Program Management, Fraccure Mechanics and Analysis

- a. Complete K_I determination of flaw in HDR vessel test

TASK 2: Irradiation Effects

- a. Complete irradiation of fourth series (K_{IR} validation and low shelf forgings)
- b. Complete testing of fourth series (K_{IR} validation and low shelf forgings)
- c. Complete materials procurement for 4T-CT irradiation
- d. Complete irradiation of 4T-CT specimens
- e. Complete irradiation of SS cladding specimen

TASK 3: Thermal Shock

- a. Modify OCA-1
- b. Perform TSE-6
- c. Procure forgings for TSE-7, 8 & 9

MILESTONE BAR CHART

TITLE: Heavy-Section Steel Technology Program

ACTIVITY NO.: ORNL #41 89 55 10 1; NRC #60 19 01 30

TASK 4: Intermediate Vessel Testing

- a. Complete fabrication of ITV-8A
- b. Complete ITV-8A

TASK 5: Pressurized Thermal Shock

- a. Complete feasibility study and system design
- b. Complete facility construction
- c. Complete PTS-1
- d. Complete PTS-2

TASK 6: Fracture Methodology

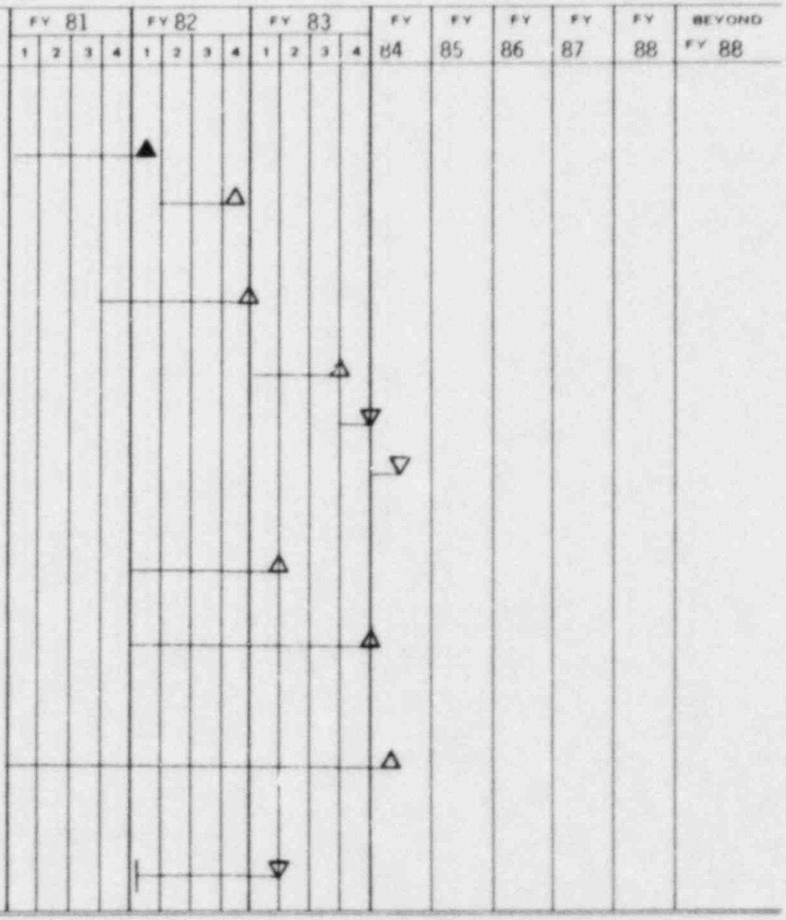
- a. Issue draft report on small specimen fracture testing in cleavage regime
- b. Complete testing and report on PCC_v Round Robin

TASK 7: Crack Arrest

- a. Complete Round Robin Testing

TASK 8: Cladding Evaluations

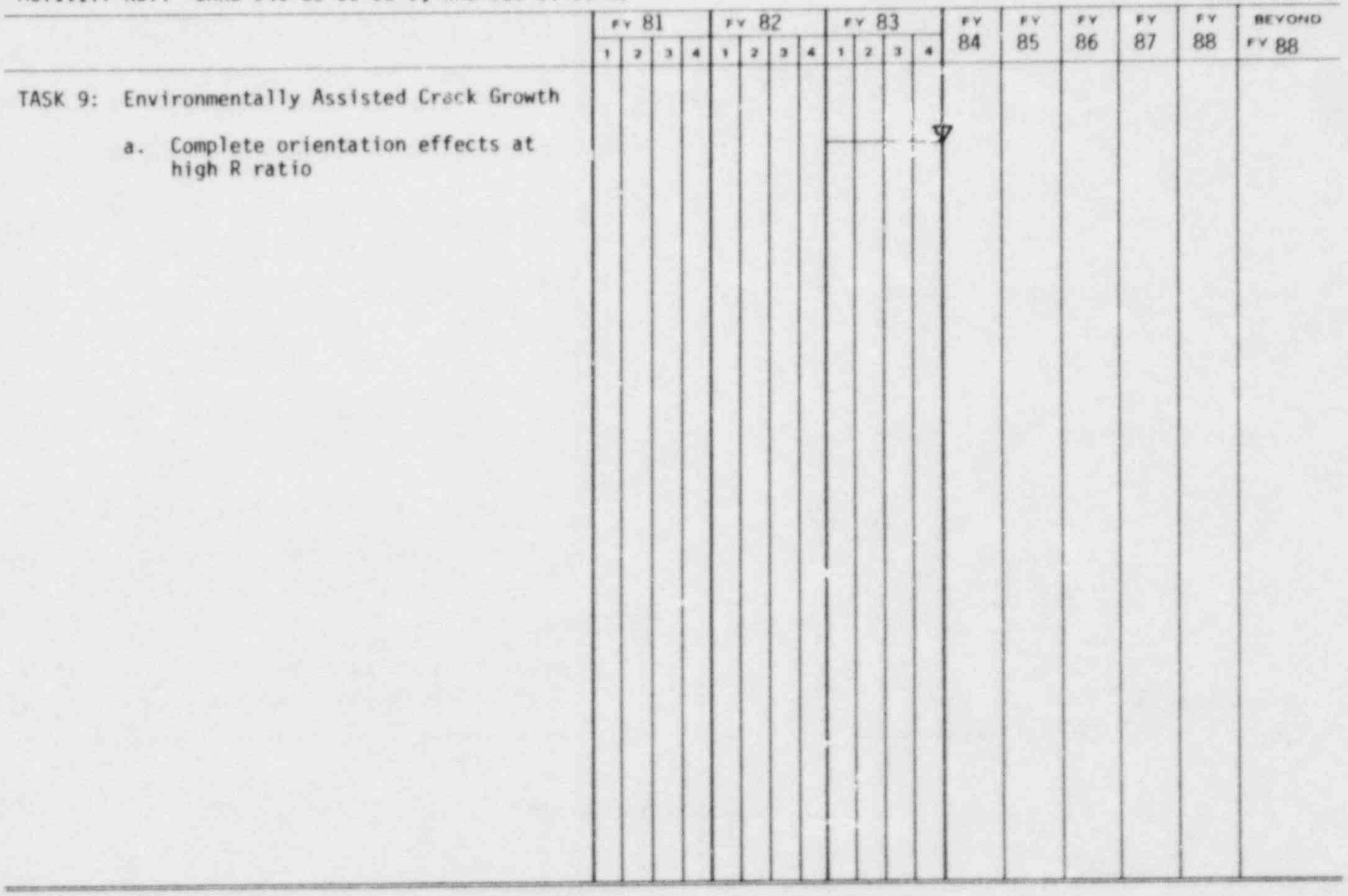
- a. Complete first test series



MILESTONE BAR CHART

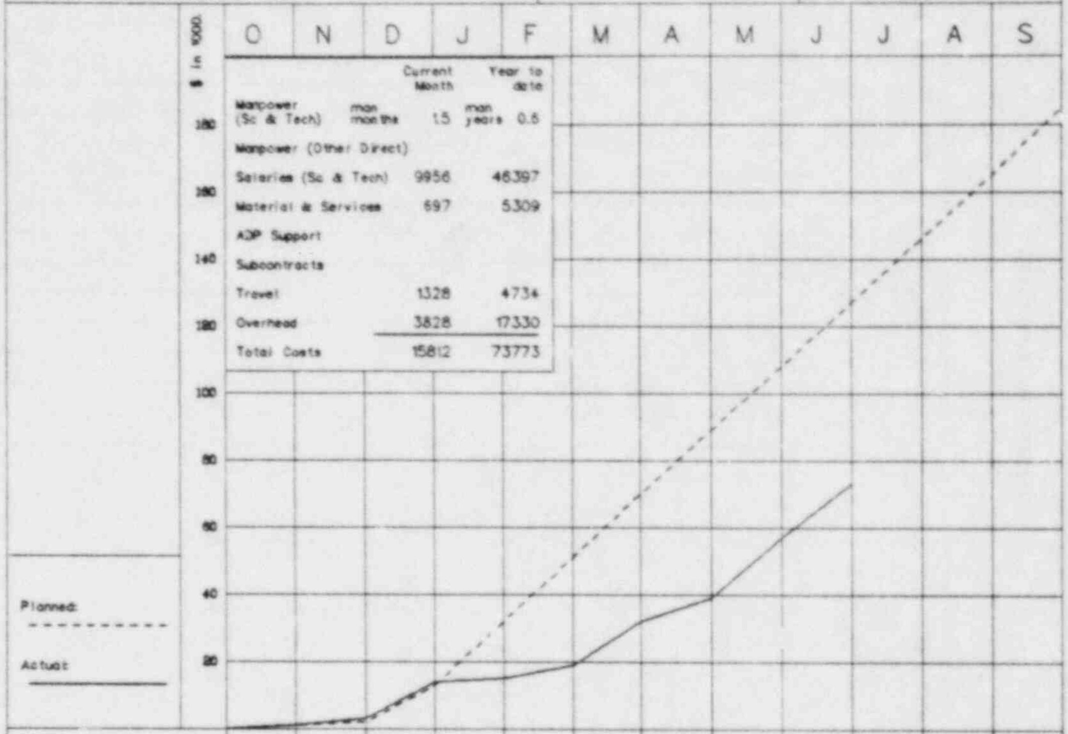
TITLE: Heavy-Section Steel Technology Program

ACTIVITY NO.: ORNL #41 89 55 10 1; NRC #60 19 01 30



COST/BUDGET REPORT

FIN No.: B0417			NRC Project Manager: J. Muscara
Report For Period Ending: 06-31-82	ORNL Act No. 41 89 55 12 1	NRC Act. No. 60 19 11 05	Program Director: Lotts/Homan
Program Title: Improved Eddy-Current In-Service Inspection FOR Steam Generators		NRC Div.: RES/: ET	Program Manager: R. W. McClung
		ORNL Div.: M&C	Principal Investigator: C. V. Dodd



	Current Month		Year to date
Manpower (Sc & Tech)	man months 1.5	man years	0.6
Manpower (Other Direct)			
Salaries (Sc & Tech)	9956		46397
Material & Services	697		5309
ADP Support			
Subcontracts			
Travel	1328		4734
Overhead	3828		17330
Total Costs	15812		73773

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	1	1	11	19	19	19	19	19	19	19	19	20
Cumulative Planned	1	2	13	32	51	70	89	108	127	146	165	185
Monthly Actual	1	2	11	1	4	13	7	18	16			
Cumulative Actual	1	3	14	15	19	32	39	57	73			
Monthly Variance	0	+1	0	−18	−15	−6	−12	−1	−3			
Cumulative Variance	0	+1	+1	−17	−32	−38	−50	−51	−54			

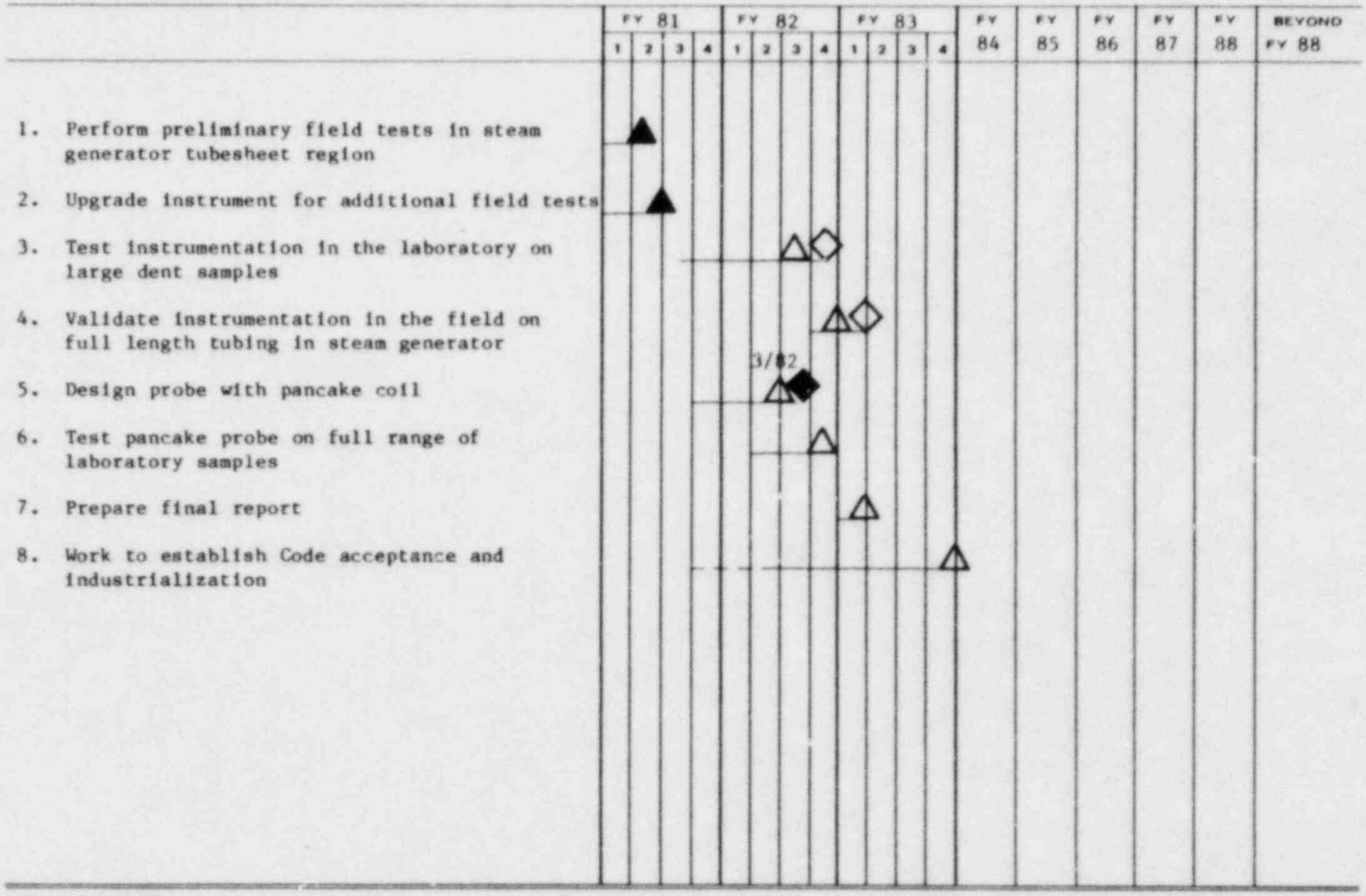
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	35	21	0	56	129
2	35	150	0	185	0
3	35	150	0	185	0
4					

Comments: Variance: −42.5%

Licensing and DOE commitments prevented meeting spending on schedule in 2nd quarter. Variance was decreased by 11.8 in 3rd quarter.

MILESTONE BAR CHART

TITLE: EDDY-CURRENT IN-SERVICE INSPECTION FOR STEAM GENERATORS
FIN No.: B0417
PROJECT MANAGER: R. W. McCLUNG

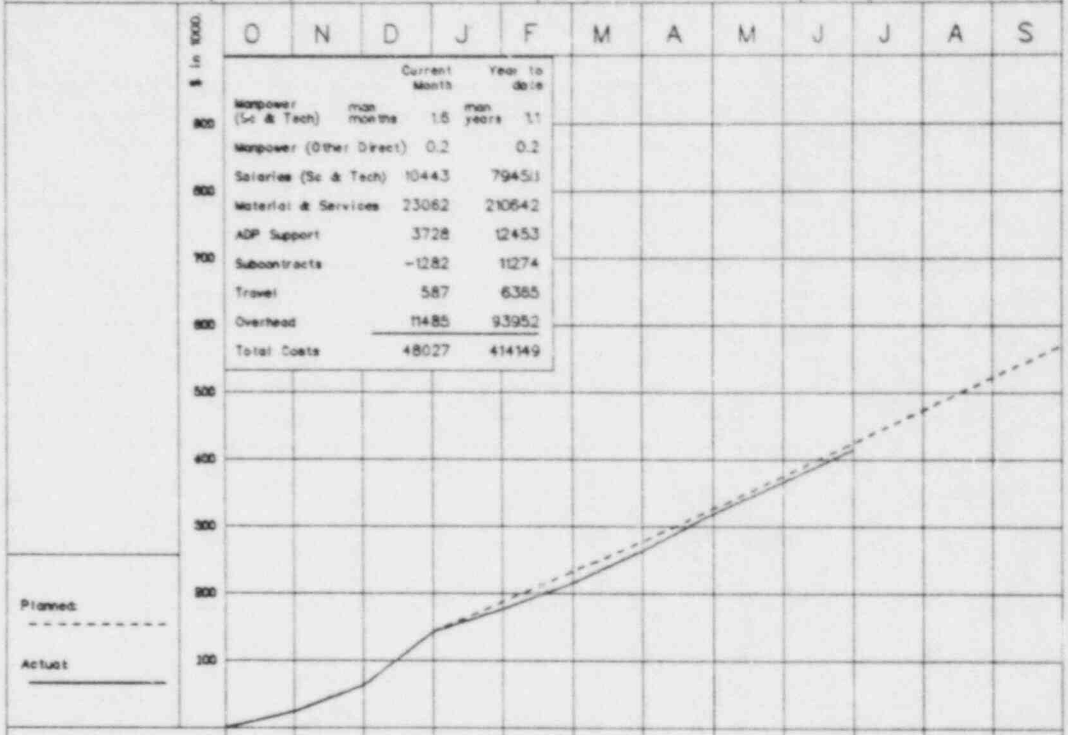


1. Perform preliminary field tests in steam generator tubesheet region
2. Upgrade instrument for additional field tests
3. Test instrumentation in the laboratory on large dent samples
4. Validate instrumentation in the field on full length tubing in steam generator
5. Design probe with pancake coil
6. Test pancake probe on full range of laboratory samples
7. Prepare final report
8. Work to establish Code acceptance and industrialization

UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0415			**NRC Project Manager:** C. Z. Serpan
Report For Period Ending: 06-31-82	**ORNL Act No.** 41 89 55 12 0	**NRC Act. No.** 60 19 21	**Program Director:** Lotts/ Homan
Program Title: Light Water Reactor Pressure Vessel (LWR-PV) Irradiation		**NRC Div.: RES/:** ET **ORNL Div.:** OP	**Program Manager:** F. B. K. Kam **Principal Investigator:** Kam/Maerker



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.6	man years	1.1
Manpower (Other Direct)		0.2		0.2
Salaries (Sc & Tech)		10443		79451
Material & Services		23062		210642
ADP Support		3728		12453
Subcontracts		−1282		11274
Travel		587		6365
Overhead		11485		93952
Total Costs		48027		414149

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	24	39	79	45	45	45	49	49	49	49	49	47
Cumulative Planned	24	63	142	187	232	277	326	375	424	473	522	569
Monthly Actual	24	39	79	34	39	48	55	48	48			
Cumulative Actual	24	63	142	176	215	263	318	366	414			
Monthly Variance	0	0	0	−11	−6	+3	+6	−1	−1			
Cumulative Variance	0	0	0	−11	−17	−14	−8	−9	−10			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	22	77	0	99	473
2	22	569	22	569	0
3	22	569	22	569	0
4					

Comments: Variance: −2.4%

MILESTONE BAR CHART

Title: Light Water Reactor Pressure Vessel (LWR-PV) Irradiation Program
(B0415)

	FY 81				FY 82				FY 83				FY 84	FY 85	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
SUBTASK A. LWR-PV BENCHMARK FACILITIES																		
A-1. Dosimetry Benchmark Facility (PCA)																		
a. Final neutron flux characterization experiments for "Blind Test" completed.	▲																	
A-2. Metallurgical Benchmark Facility (PSF)																		
a. Complete fabrication and check out of Second Simulated Surveillance Capsule (SSC-2).			▼															
b. Start irradiation of SSC-2.			▼															
c. Complete irradiation of SSC-2, simulated pressure vessel capsule (SPVC), and void box capsule (VBC).							▼											
d. Remove, decapsulate, and ship dosimetry capsules and metallurical specimens from SSC-2, SPVC, and VBC.								△										
A-3. Surveillance Dosimetry Measurement Facility																		
a. Characterization								▽										
b. B&W surveillance capsule mockup experiment and four vendors and two service laboratories certification tests at ORR*								▽										

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*Supplemental work statement for FY 1982

MILESTONE BAR CHART

	FY 81				FY 82				FY 83				FY 84	FY 85	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
SUBTASK B. INSTRUMENTED IRRADIATION CAPSULES (IIC) AND PROCESS CONTROL SYSTEM (PCS)																		
a. Operation and maintenance of PCS until end of irradiation.							▼											
SUBTASK C. TRANSPORT THEORY, DOSIMETRY, ASTM STANDARDS, AND DAMAGE CORRELATION																		
C-1. Transport Theory																		
a. Complete neutron transport calculations of PSF perturbation experiment for Westinghouse/HEDL surveillance capsule.				▼														
b. Complete neutron transport theory calculations for PSF capsules.				▼														
c. Documentation of calculational and experimental results for neutron exposure parameters in PSF.							▼											
d. Coupled neutron-gamma calculations for PCA.								▽										
e. Calculate source distribution for VENUS "core source benchmark."											▼							
f. Calculate source distribution and neutron fluxes for two-year metallurgical experiment and "Blind Test," and B&W surveillance capsule mockup experiment and four vendors and two service laboratories certification test.												▽						

MILESTONE BAR CHART

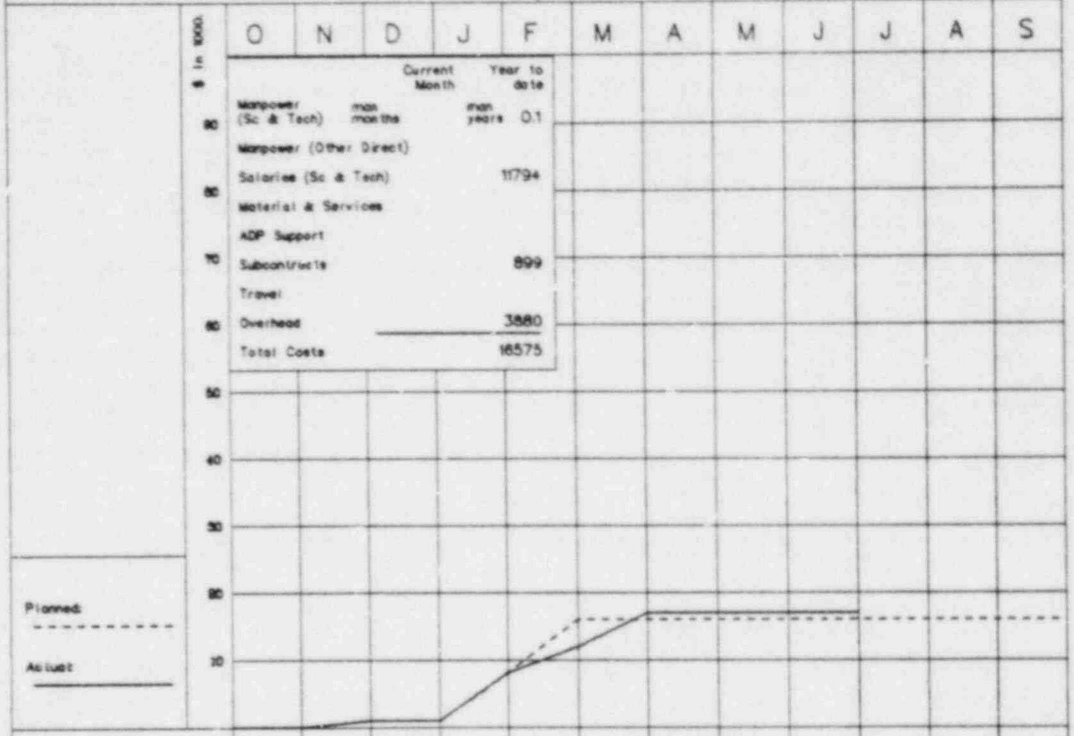
	FY 81				FY 82				FY 83				FY 84	FY 85	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
g. Calculate neutron fluxes outside VENUS core to determine azimuthal lead factors coupled neutron-gamma calculations for VENUS.													∇					
C-2. Dosimetry Analysis																		
a. Analysis and documentation of PCA "Blind Test" results.	▼																	
b. Analysis and documentation of PSF experiments and "Blind Test" - SSC-1 and SSC-2.												∇						
c. Analysis and documentation of PSF experiments and "Blind Test" - PV capsule and void box capsule.													∇					
C-3. ASTM Standards																		
a. Complete draft of Neutron Transport Methods Guide to E10.05.		▼																
b. Complete draft of Neutron Spectrum Adjustment Methods Guide to ASTM E10.05.			▼															
c. Complete draft of document for assessment and propagation of uncertainties for 17 LWR-PV Surveillance Standards to ASTM E10.05.			▼															
d. Review above drafts as necessary to obtain acceptance as Standards.									Δ									
e. Input to other ASTM LWR-FV Standards to obtain acceptance as Standards.														Δ				

MILESTONE BAR CHART

	FY 81				FY 82				FY 83				FY 84	FY 85	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
C-4. Damage Correlation																		
a. Statistical analysis of PSF metallurgical test data. Method estimates dependency of ΔRT_{NDT} and shift of upper-shelf energy on fluence, irradiation temperature, chemical composition, and other parameters.												Δ						

COST/BUDGET REPORT

FIN No.: B0724			**NRC Project Manager:** E. O. Woolridge
Report For Period Ending: 06-31-82	**ORNL Act No.** 41 88 54 30 5	**NRC Act. No.** 10 19 02 01 3	**Program Director:** Lotts/Homan
Program Title: Review of Materials for Code Applications		**NRC Div.: RES/:** ET	**Program Manager:** R. K. Nanstad
		ORNL Div.: M&C	**Principal Investigator:** R. K. Nanstad



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years 0.1
Manpower (Other Direct)		
Salaries (Sc & Tech)		11794
Material & Services		
ADP Support		
Subcontracts		899
Travel		
Overhead		3880
Total Costs		16575

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	1	0	7	8	0	0	0	0	0	0	0
Cumulative Planned	0	1	1	8	16	16	16	16	16	16	16	16
Monthly Actual	0	1	0	7	4	5	0	0	0			
Cumulative Actual	0	1	1	8	12	17	17	17	17			
Monthly Variance	0	0	0	0	−4	+5	0	0	0			
Cumulative Variance	0	0	0	0	−4	+1	+1	+1	+1			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	16	0	0	16	0
2	16	0	0	16	0
3	16	0	0	16	0
4					

Comments: Variance: +6.3%

COST/BUDGET REPORT

FIN No: A9042

NRC Project Manager: C. Feldman

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 54 32 1

NRC Act. No. 10 19 02 05 3

Program Director: Lotts/Homan

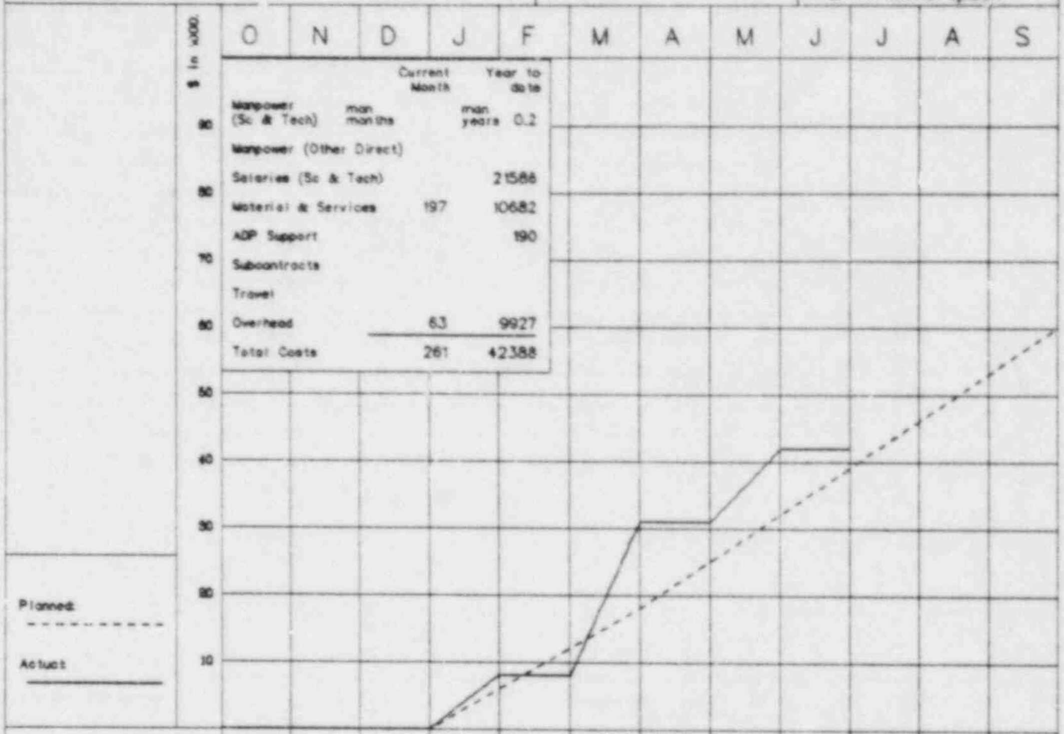
Program Title: Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities

NRC Div.: RES/: ET

ORNL Div.: HASR

Program Manager: P. S. Rohwer

Principal Investigator: J. P. Witherspoon



		Current Month	Year to date
Manpower (Sc & Tech)	man months		man years 0.2
Manpower (Other Direct)			
Salaries (Sc & Tech)			21588
Material & Services		197	10682
ADP Support			190
Subcontracts			
Travel			
Overhead		63	9927
Total Costs		261	42388

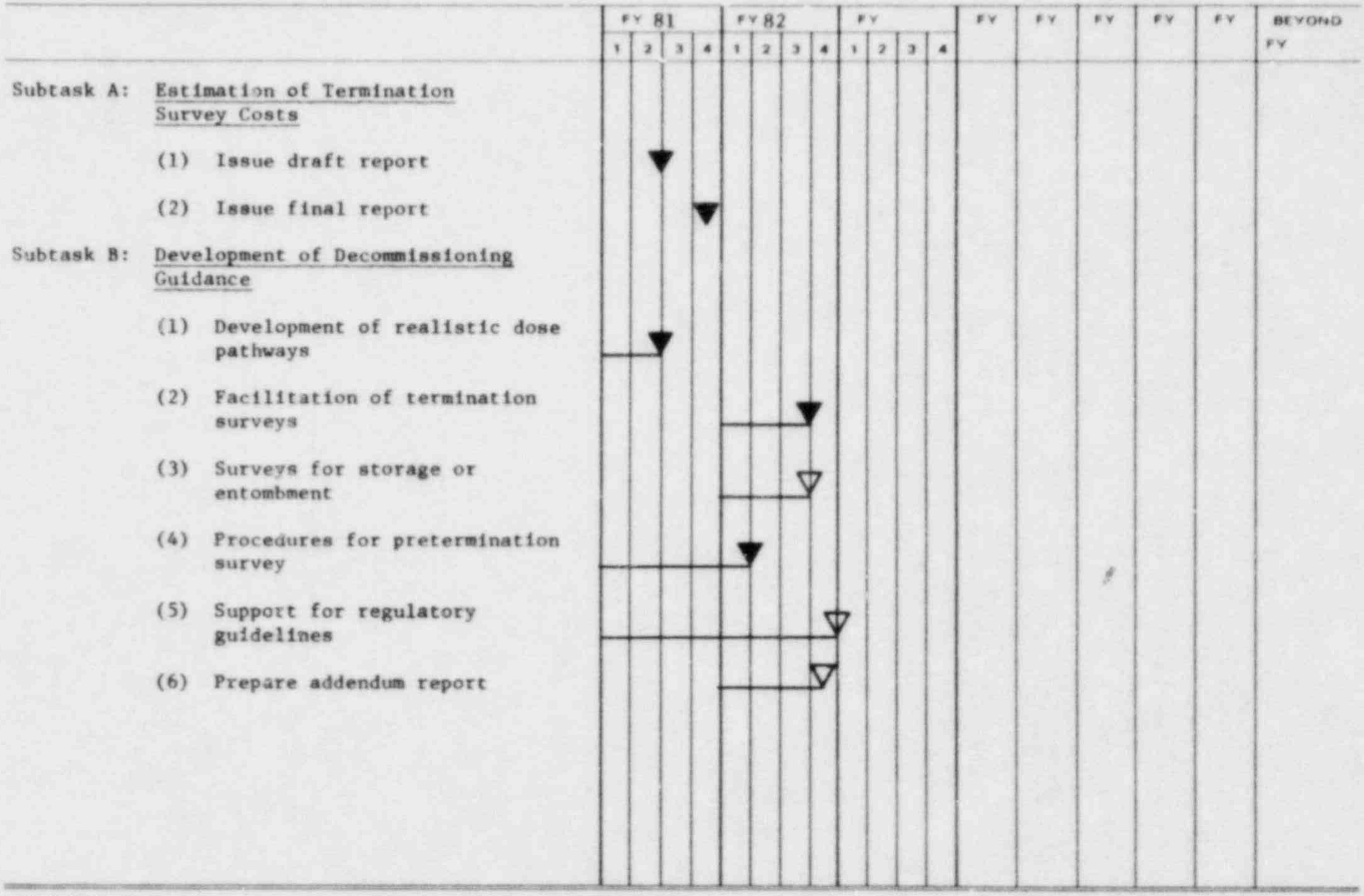
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	6	6	6	7	7	7	7	7	7
Cumulative Planned	0	0	0	6	12	18	25	32	39	46	53	60
Monthly Actual	0	0	0	8	0	23	0	11	0			
Cumulative Actual	0	0	0	8	8	31	31	42	42			
Monthly Variance	0	0	0	+2	-6	+17	-7	+4	-7			
Cumulative Variance	0	0	0	+2	-4	+13	+6	+10	+3			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	9	0	9	51
2	0	60	0	60	0
3	0	60	0	60	0
4					

Comments: Variance: +7.7%

MILESTONE BAR CHART

TITLE: Technology and Costs of Termination Surveys Associated with Decommissioning of Nuclear Facilities (A9042)



UCN-14127 (3 9-80)

DIVISION OF ACCIDENT EVALUATION

COST/BUDGET REPORT

FIN No.:

NRC Project Manager:

Report For Period Ending: 06-31-82

ORNL Act No.

NRC Act. No.

Program Director:

Program Title: Summary

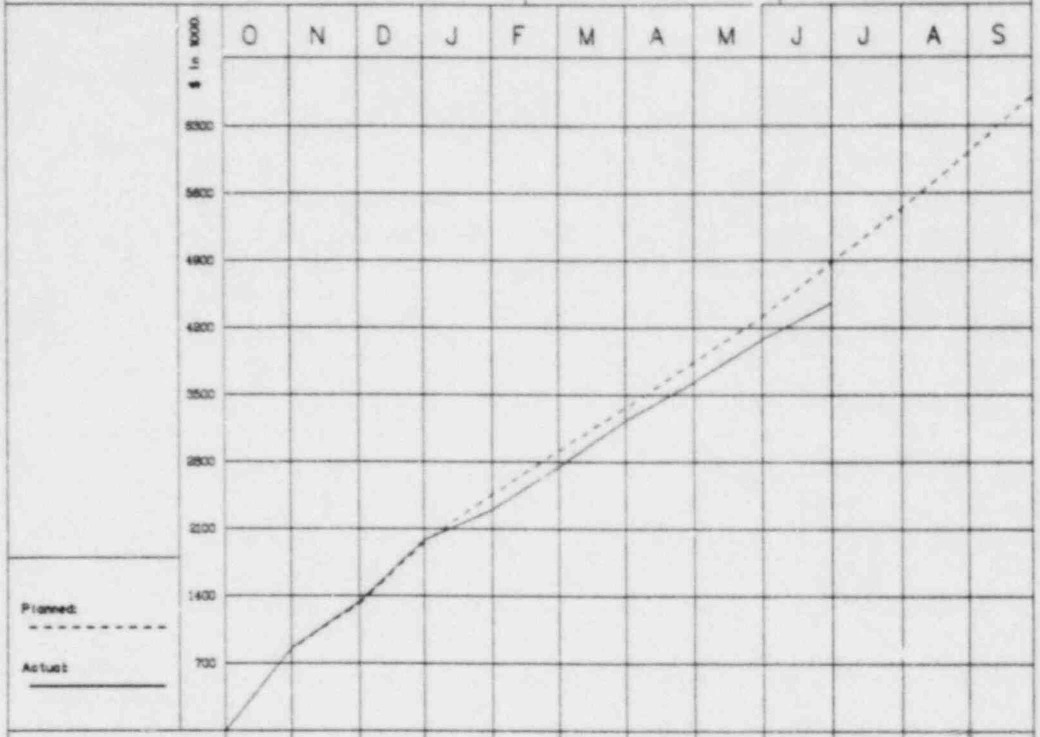
Office of Nuclear
Regulatory Research

NRC Div.: RES/: AE

ORNL Div.:

Program Manager:

Principal Investigator:



	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	851	464	644	498	459	450	473	476	559	569	577	589
Cumulative Planned	851	1315	1959	2457	2916	3366	3839	4315	4874	5443	6020	6609
Monthly Actual	852	484	644	316	453	481	403	445	379			
Cumulative Actual	852	[illegible]	380	2296	2749	3230	3633	4078	4457			
Monthly Variance	+1	+20	0	-182	-6	+31	-70	-31	-180			
Cumulative Variance	+1	+21	+21	-161	-167	-136	-206	-237	-417			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	1863	613	269	2222	3855
2	1920	4366	348	5938	99
3	1920	5049	348	6576	33
4					

Comments: Variance: -8.6%

COST/BUDGET REPORT

FIN No.: B0413

NRC Project Manager: Y. Y. Hsu

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 11 8

NRC Act. No.: 60 19 10 01

Program Director: Lotts/Kress

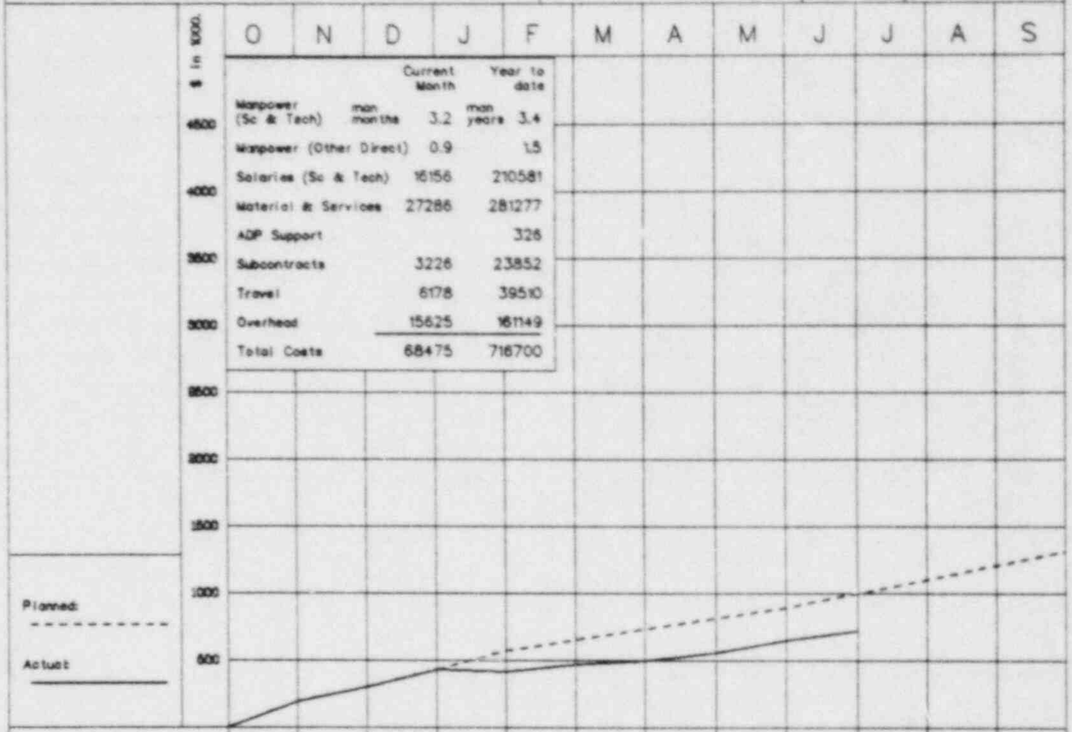
Program Title: Advanced Instrumentation for Reflood Studies

NRC Div.: RES/: AE

ORNL Div.: I&C

Program Manager: M. B. Herskovitz

Principal Investigator: J. O. Hylton



		Current Month		Year to date
Manpower (Sc & Tech)	man months	3.2	man years	3.4
Manpower (Other Direct)		0.9		1.5
Salaries (Sc & Tech)		16156		210581
Material & Services		27286		281277
ADP Support				326
Subcontracts		3226		23852
Travel		6178		39510
Overhead		15625		161149
Total Costs		68475		716700

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	191	110	127	142	80	80	80	80	105	105	105	105
Cumulative Planned	191	301	428	570	650	730	810	890	995	1100	1205	1310
Monthly Actual	191	110	127	−17	54	29	63	91	68			
Cumulative Actual	191	301	428	411	465	494	557	648	716			
Monthly Variance	0	0	0	−159	−26	−51	−17	+11	−37			
Cumulative Variance	0	0	0	−159	−185	−236	−253	−242	−279			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	310	0	0	310	900
2	310	900	0	1210	0
3	310	1000	0	1310	0
4					

Comments: Variance: −28.0%

Variance due to delay in procurement of instrumentation.

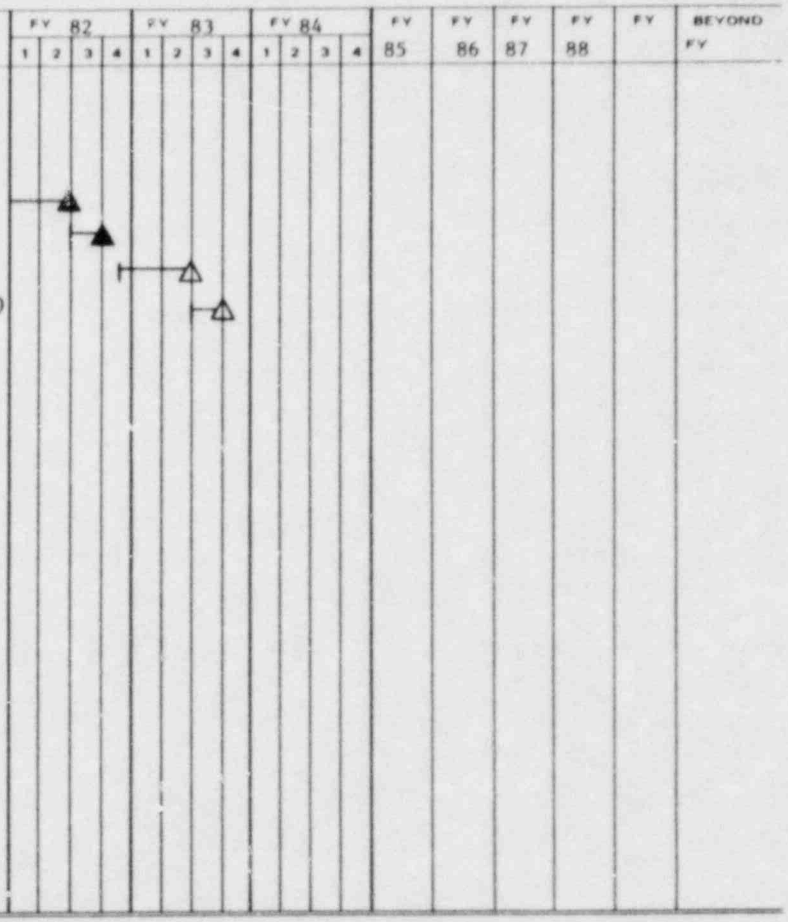
MILESTONE BAR CHART

ADVANCED INSTRUMENTATION FOR PWR REFLOOD STUDIES
ACTIVITY NO.: 60 19 10 01 B0413

I. Task 1 PKL-II Instrumentation

Subtask 1.1 Support

(a) Complete Software
(b) Participate in Shakedown Test
(c) Analyze Data of Shakedown Test
(d) Provide Field Support (as required)



MILESTONE BAR CHART

ADVANCED INSTRUMENTATION FOR PWR REFLOOD STUDIES
ACTIVITY NO.: 60 19 10 01 B0413

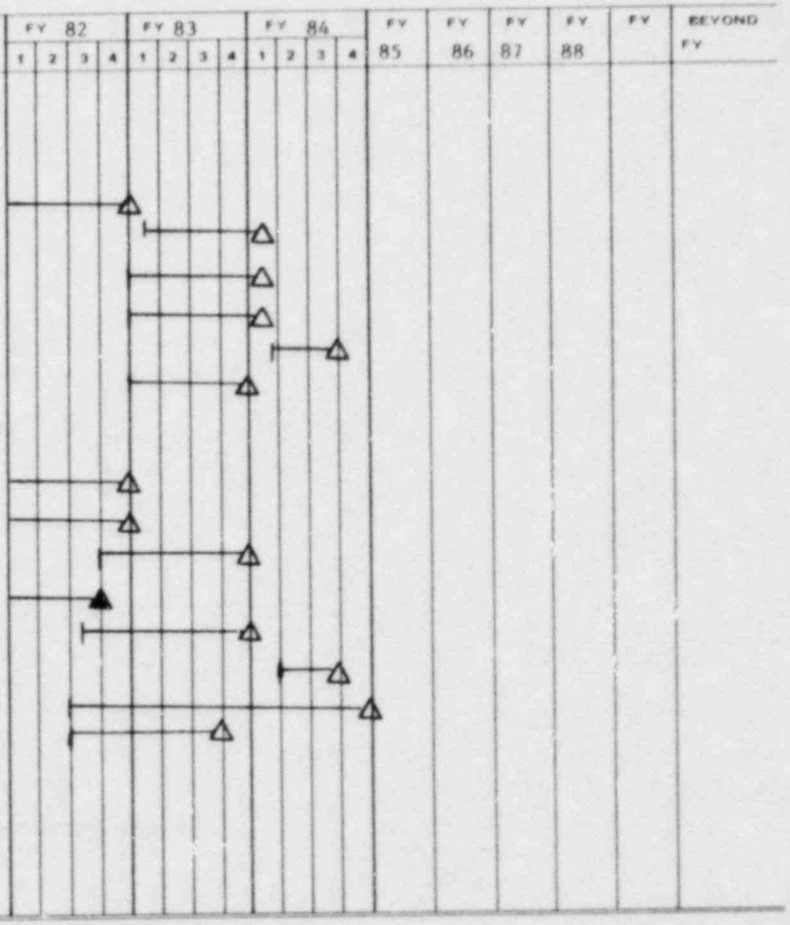
II. Task 2 UPTF Instrumentation

Subtask 2.1 DP Measurement

(a) Complete Design DP Measurement Block
(b) Fabrication
(c) DP Electronics Fabrication
(d) Purge System Fabrication
(e) System Installed in FRG
(f) Documentation

Subtask 2.2 Tie Plate Drag Body Measurement

(a) Design (Type 1 & 2)
(b) End Box at ORNL
(c) Fabrication of Sensors
(d) Design of Electronics
(e) Electronics Fabrication
(f) System Installed in FRG
(g) Mass Flow Software
(h) Documentation



MILESTONE BAR CHART

ADVANCED INSTRUMENTATION FOR PWR REFLOOD STUDIES
ACTIVITY NO.: 60 19 10 01 B0413

Subtask 2.3 Breakthrough Detectors

(a) Design

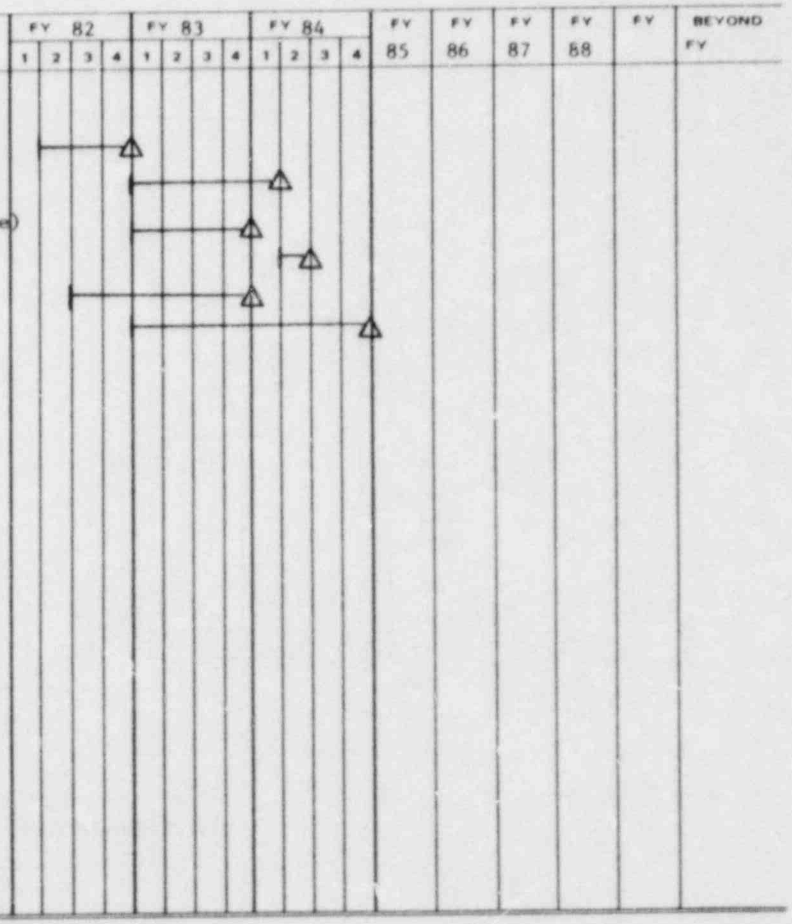
(b) Fabrication

(c) Electronics Fab (Design to 2.2(d) Above)

(d) System Installed in FRG

(e) Documentation

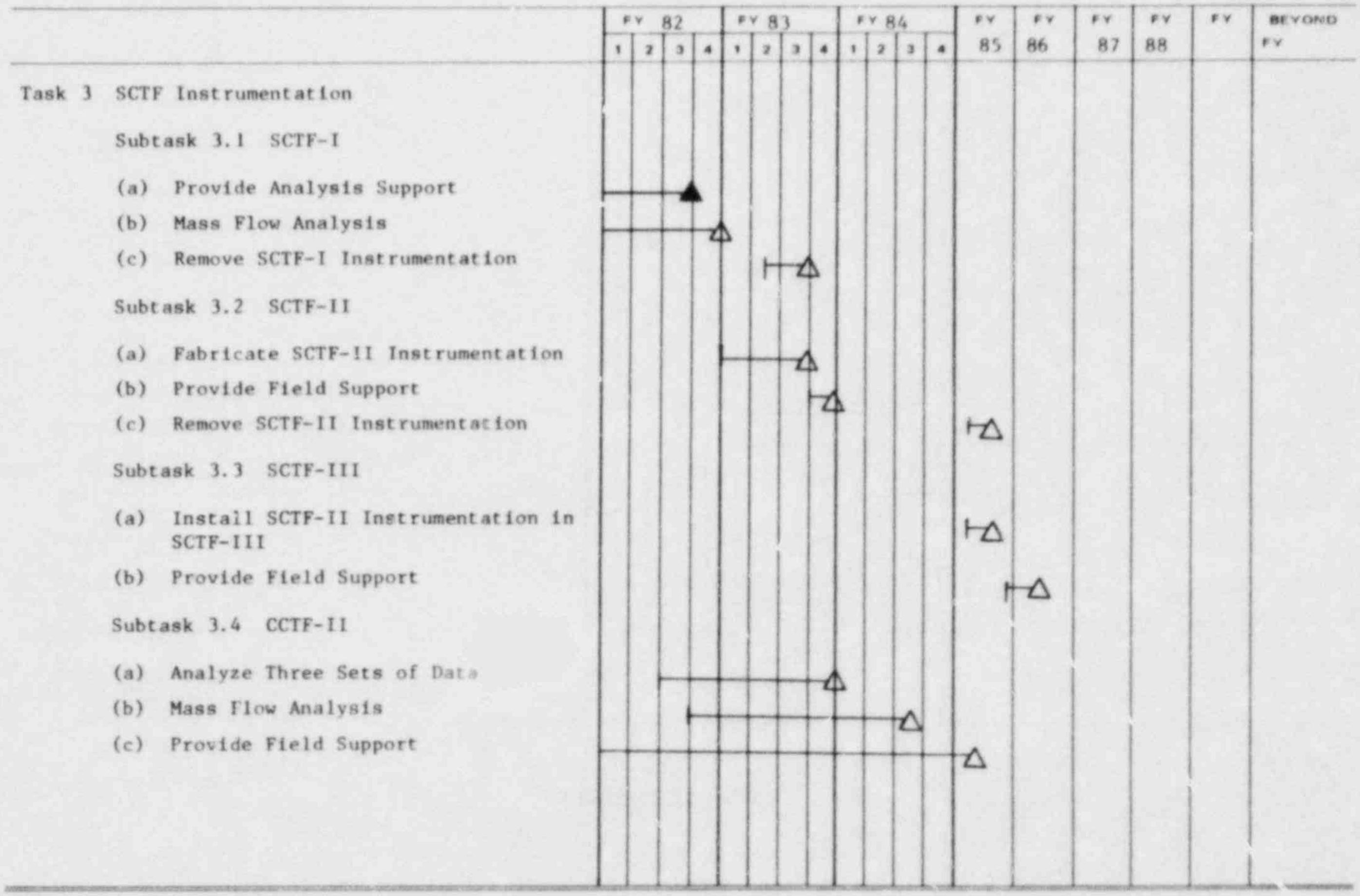
(f) Mass Flow Software



UCN-14127 (3 9-80)

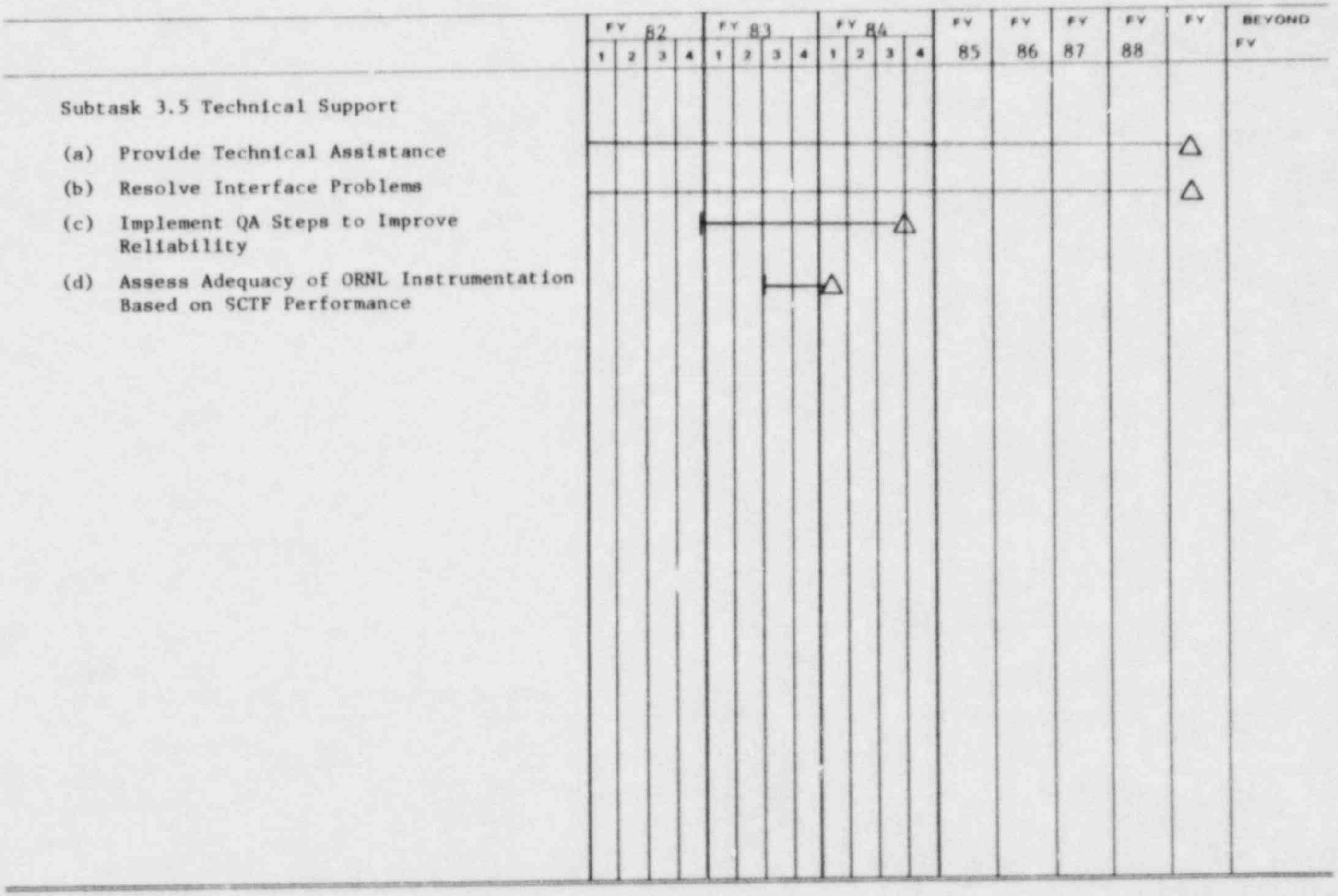
:MILESTONE BAR CHART

ADVANCED INSTRUMENTATION FOR PWR REFLOOD STUDIES
ACTIVITY NO.: 60 19 10 01 B0413



MILESTONE BAR CHART

ADVANCED INSTRUMENTATION FOR PWR REFLOOD STUDIES
ACTIVITY NO.: 60 19 10 01 B0413



COST/BUDGET REPORT

FIN No.: B0401

NRC Project Manager: A. L. M. Hon

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 11 5

NRC Act. No. 60 19 01 30

Program Director: Kress/Lotts

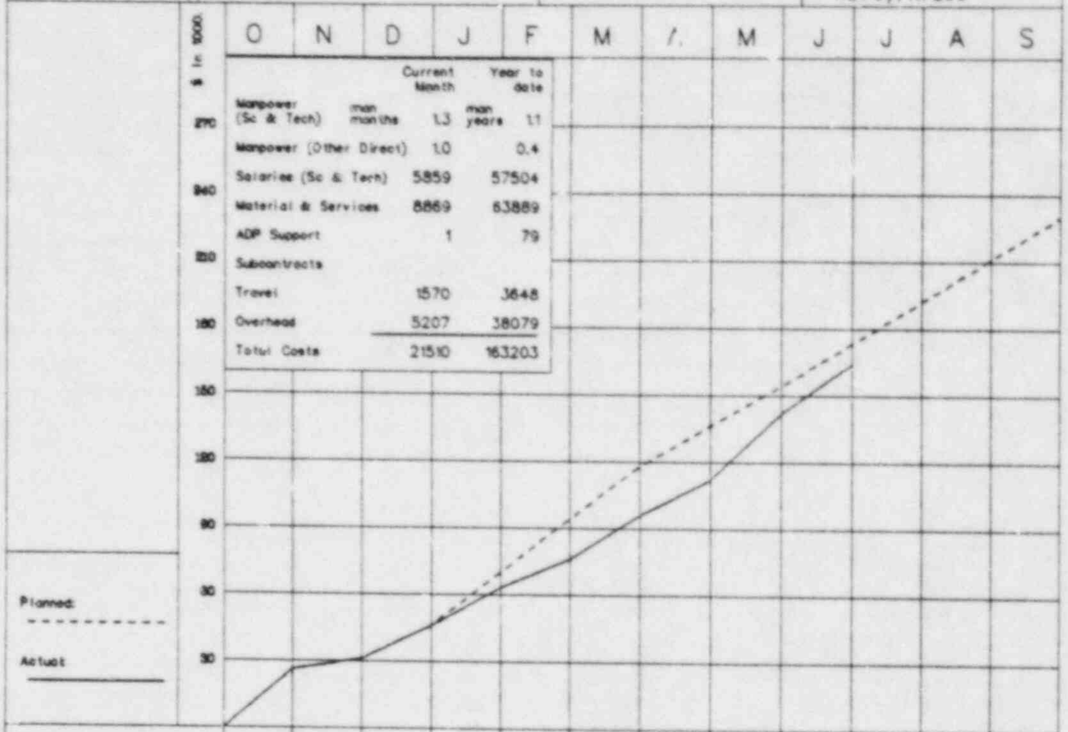
Program Title: Advanced Two-Phase Flow instrumentation for Power Plant Application

NRC Div.: RES/: AE

ORNL Div.: ETD

Program Manager: D. G. Thomas

Principal Investigator: Hardy/Kress



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.3	man years	1.1
Manpower (Other Direct)		1.0		0.4
Salaries (Sc & Tech)		5859		57504
Material & Services		8869		63889
ADP Support		1		79
Subcontracts				
Travel		1570		3648
Overhead		5207		38079
Total Costs		21510		163203

	O	N	D	J	F	M	/.	M	J	J	A	S
Monthly Planned	26	5	15	24	24	24	18	18	19	19	19	19
Cumulative Planned	26	31	46	70	94	118	136	154	173	192	211	230
Monthly Actual	26	5	15	17	13	20	16	30	22			
Cumulative Actual	26	31	46	63	76	96	112	142	164			
Monthly Variance	0	0	0	-7	-11	-4	-2	+12	+3			
Cumulative Variance	0	0	0	-7	-18	-22	-24	-12	-9			

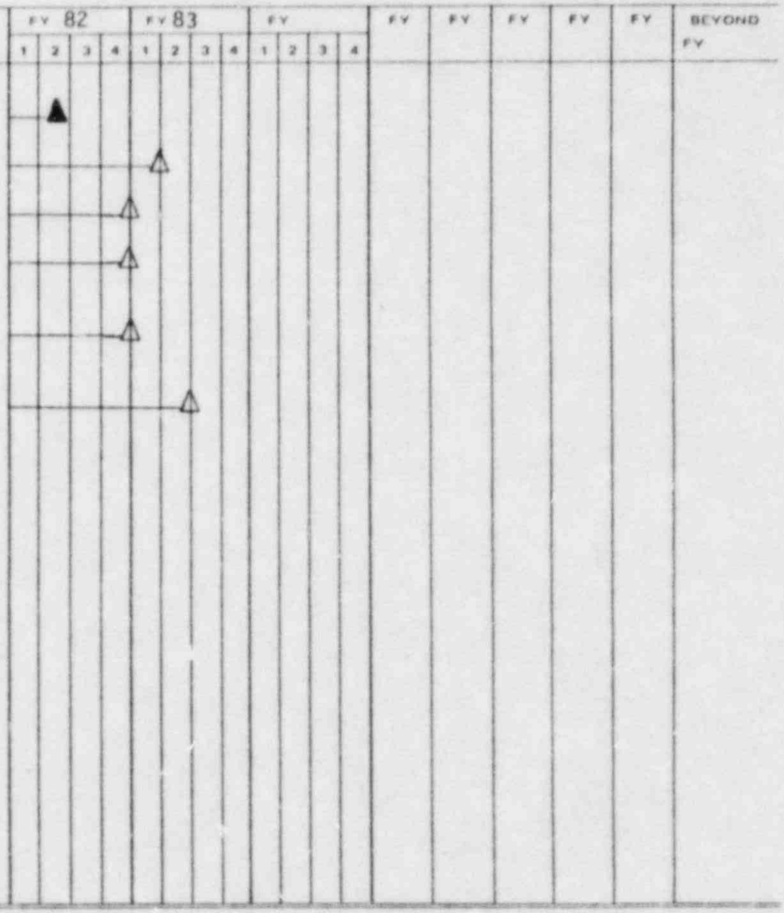
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	113	0	0	113	142
2	113	142	35	220	10
3	113	142	35	220	10
4					

Comments: Variance: -5.2%

MILES:ONE BAR CHART

Title: Advanced Two Phase Flow Instrumentation for Power Plant Applications
Act:vity No.: 40 89 55 11 5
BO 401

1. Complete report on INEL Tests of Westinghouse DP system.
2. Turbine Meter Calibration.
3. Final report on HJTC studies.
4. Optimum specification for ultrasonic probe.
5. Ultrasonic probe fabricated, tested, calibrated.
6. Final report on ultrasonic probe development.



COST/BUDGET REPORT

FIN No.: B0463

NRC Project Manager: J. N. Reyers,Jr

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 13 6

NRC Act. No. 60 19 01 10

Program Director: Lotts/Kress

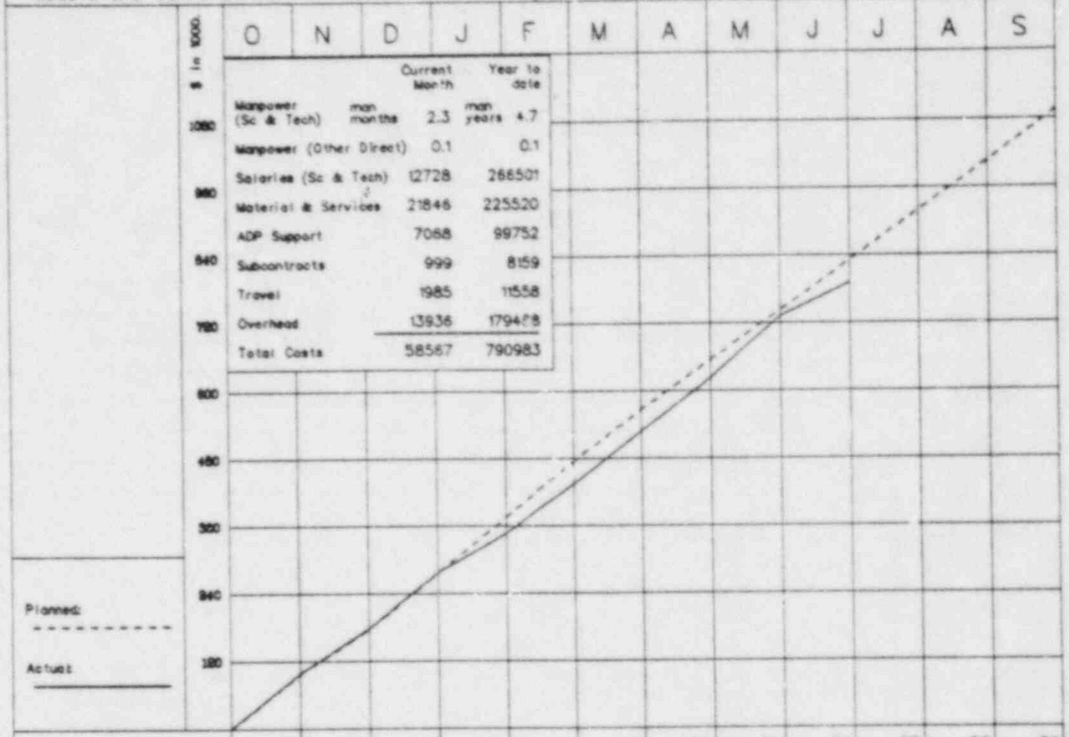
Program Title: Evalution of Bundie Heat Transfer Models and Correlations

NRC Div.: RES/: AE

ORNL Div.: ETD

Program Manager: C. B. Mullins

Principal Investigator: Anklam/Mullins



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.3	man years	4.7
Manpower (Other Direct)		0.1		0.1
Salaries (Sc & Tech)		12728		266501
Material & Services		21846		225520
ADP Support		7068		99752
Subcontracts		999		8159
Travel		1985		11558
Overhead		13936		179478
Total Costs		58567		790983

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	97	79	99	99	101	91	88	88	88	88	88	89
Cumulative Planned	97	176	275	374	475	566	654	742	830	918	1006	1095
Monthly Actual	98	79	99	70	88	94	93	111	59			
Cumulative Actual	98	177	276	346	434	528	621	732	791			
Monthly Variance	+1	0	0	−29	−13	+3	+5	+23	−29			
Cumulative Variance	+1	+1	+1	−28	−41	−38	−33	−10	−39			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	699	0	34	665	430
2	756	403	64	1095	0
3	756	403	64	1095	0
4					

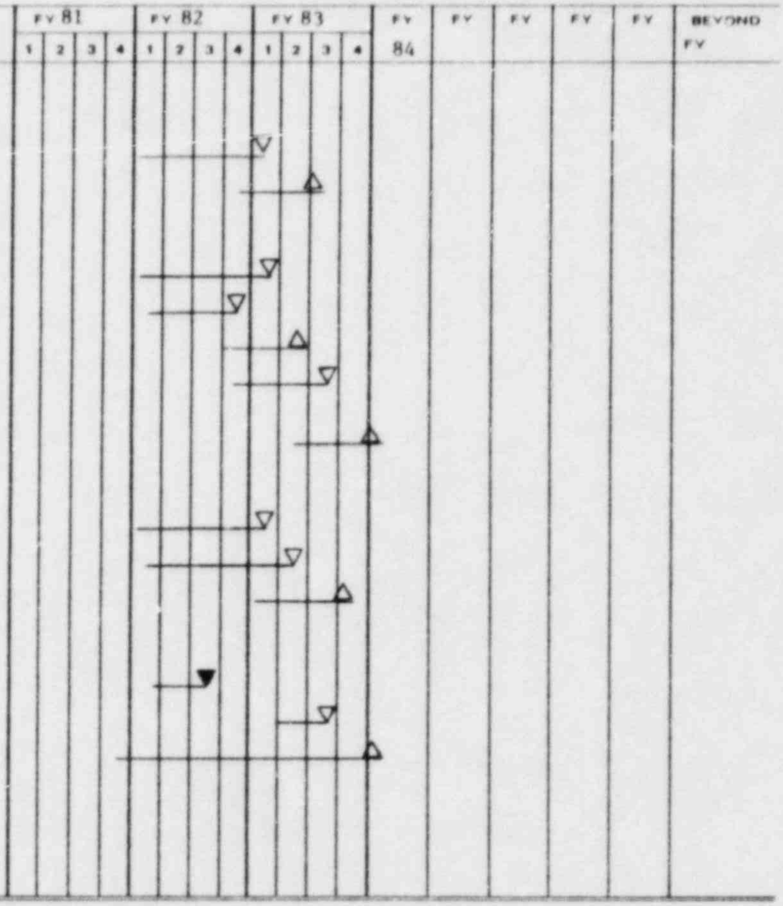
Comments: Variance: −4.7%

MILESTONE BAR CHART

TITLE: Evaluation of Bundle Heat Transfer Models and Correlations

ACTIVITY NO.: 41 89 55 13 6/NRC 60 19 01 10 (B0463)

1. Subtask 1: <u>Intermediate Flow Post-DNB Heat Transfer</u>
   a. Analyze THTF Test Data
   b. Document Analysis
2. Subtask 2: <u>Low Flow Heat Transfer</u>
   a. Acquire Heat Transfer Data
   b. Evaluate Void Fraction Models
   c. Document Evaluation
   d. Evaluate Forced Convection to Steam Correlations
   e. Document Evaluation
3. Subtask 3: <u>Film Boiling Heat Transfer</u>
   a. Acquire Heat Transfer Data
   b. Evaluate Film Boiling Correlations
   c. Document Evaluation
4. Subtask 4: <u>Management</u>
   a. Conduct Mid-Year Review 1982
   b. Conduct Mid-Year Review 1983
   c. Coordinate Analysis and Reporting



COST/BUDGET REPORT

FIN No.: B0127

NRC Project Manager: R. R. Sherry

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 10 8

NRC Act. No. 60 19 13 03

Program Director: Kress/Lotts

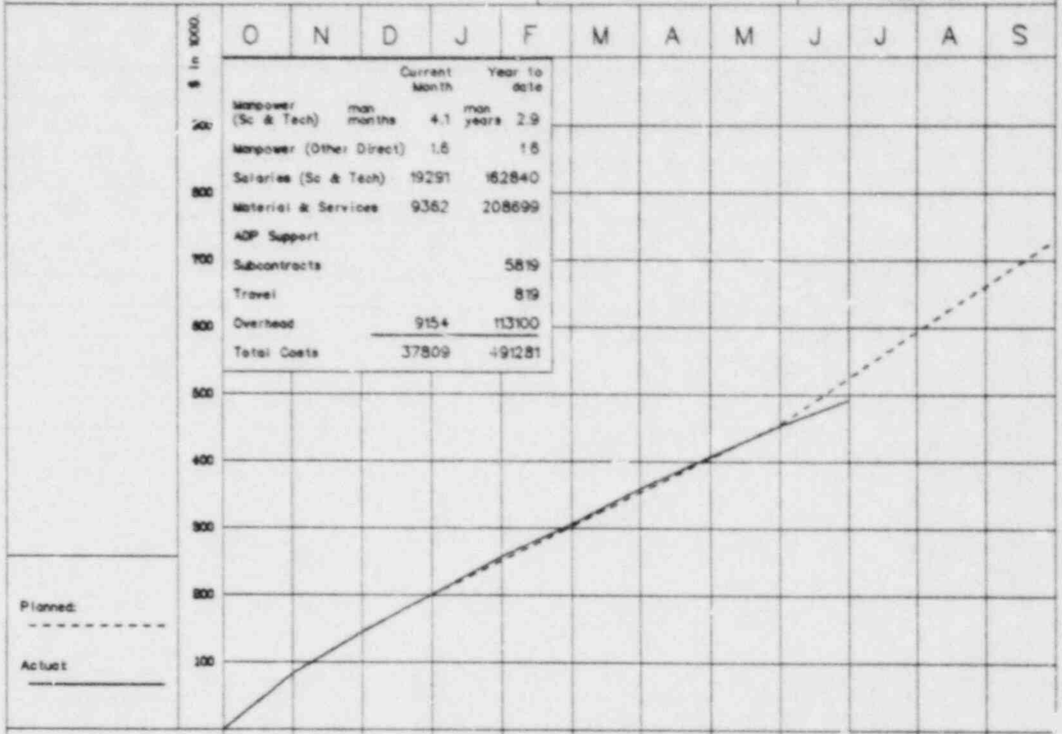
Program Title: Fission Product Release from LWR Fuel

NRC Div.: RES/: AE

ORNL Div.: CTD

Program Manager: R. P. Wichner

Principal Investigator: M. F. Osborne



		Current Month		Year to date
Manpower (Sc & Tech)	man months	4.1	man years	2.9
Manpower (Other Direct)		1.6		1.6
Salaries (Sc & Tech)		19291		162840
Material & Services		9362		208699
ADP Support				
Subcontracts				5819
Travel				819
Overhead		9154		113100
Total Costs		37809		491281

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	83	62	55	51	51	51	51	51	69	69	68	68
Cumulative Planned	83	145	200	251	302	353	404	455	524	593	661	729
Monthly Actual	83	62	55	56	49	54	47	47	38			
Cumulative Actual	83	145	200	256	305	359	406	453	491			
Monthly Variance	0	0	0	+5	−2	+3	−4	−4	−31			
Cumulative Variance	0	0	0	+5	+3	+6	+2	−2	−33			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	29	143	0	172	487
2	29	599	0	628	31
3	29	700	0	729	0
4					

Comments: Variance: −6.3%

MILESTONE BAR CHART

TITLE: Fission Product Release from LWR Fuel

ACTIVITY NO.: 60 19 01 40 (B0127)

A. Concept Testing

B. Preparation of Fuel Specimens

1. Prepare specimens for tests 1 through 7
2. Complete arrangements for acquiring LWR fuel and simulants

C. Fabrication

1. Fabricate, install system for 2100°C, and complete shakedown tests
2. Design, fabricate system for species identification, a ' analysis, and multiple analytical train

D. Chemical Species Analyzer

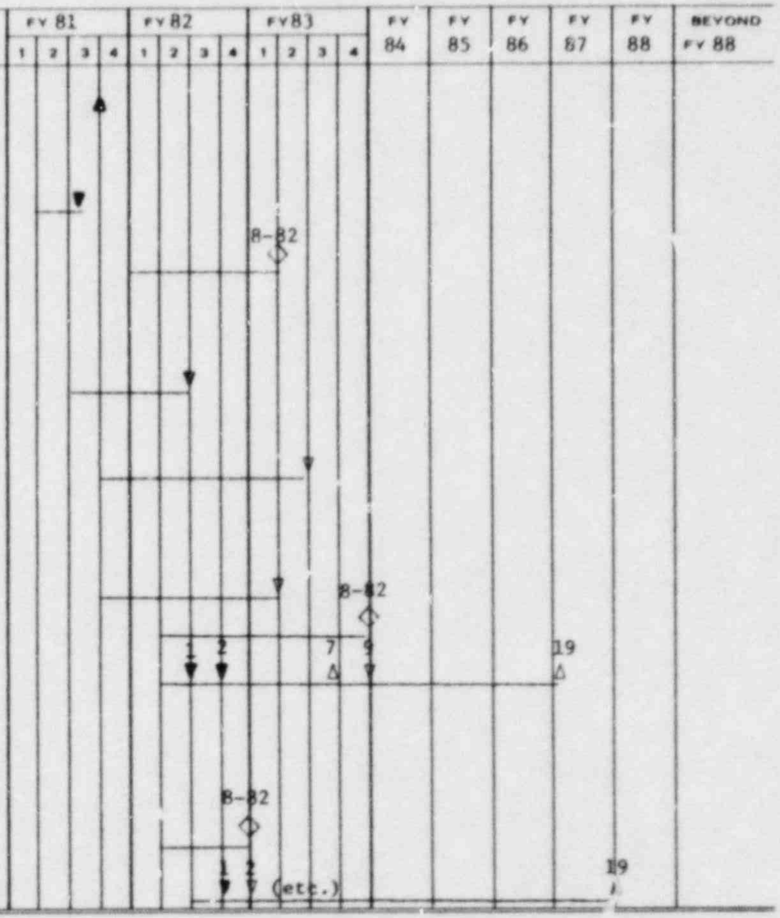
1. Feasibility evaluation of laser-Raman and alternate method
2. Fabricate, install sys ·, if applicable

E. Fission Product Release Tests

F. Posttest Examination/Waste Disposal

G. Data Analysis and Reporting

1. Test apparatus description and results of concept tests
2. Data summary reports (3 months after each test)



COST/BUDGET REPORT

FIN No.: B0122

NRC Project Manager: R. B. Foulds

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 11 2

NRC Act. No. 60 19 13 02

Program Director: Lotts/Kress

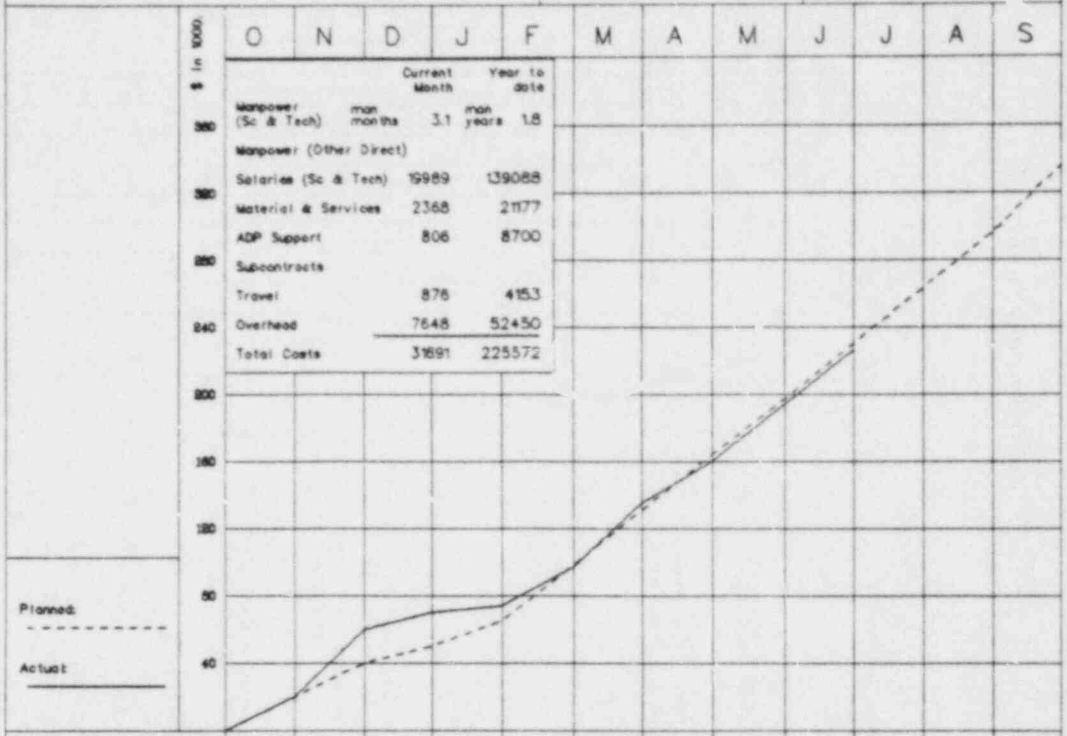
Program Title: HTGR Safety Analysis and Research

NRC Div.: RES/. AE

ORNL Div.: I&C

Program Manager: S. J. Ball

Principal Investigator: S. J. Ball



		Current Month		Year to date
Manpower (Sc & Tech)	man months	3.1	man years	1.8
Manpower (Other Direct)				
Salaries (Sc & Tech)		19989		139088
Material & Services		2368		21177
ADP Support		806		8700
Subcontracts				
Travel		876		4153
Overhead		7648		52450
Total Costs		31891		225572

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	20	20	10	15	33	33	33	33	33	33	33	40
Cumulative Planned	20	40	50	65	98	131	164	197	230	263	296	336
Monthly Actual	20	40	10	4	23	38	25	34	32			
Cumulative Actual	20	60	70	74	97	135	160	194	226			
Monthly Variance	0	+20	0	−11	−10	+5	−8	+1	−1			
Cumulative Variance	0	+20	+20	+9	−1	+4	−4	−3	−4			

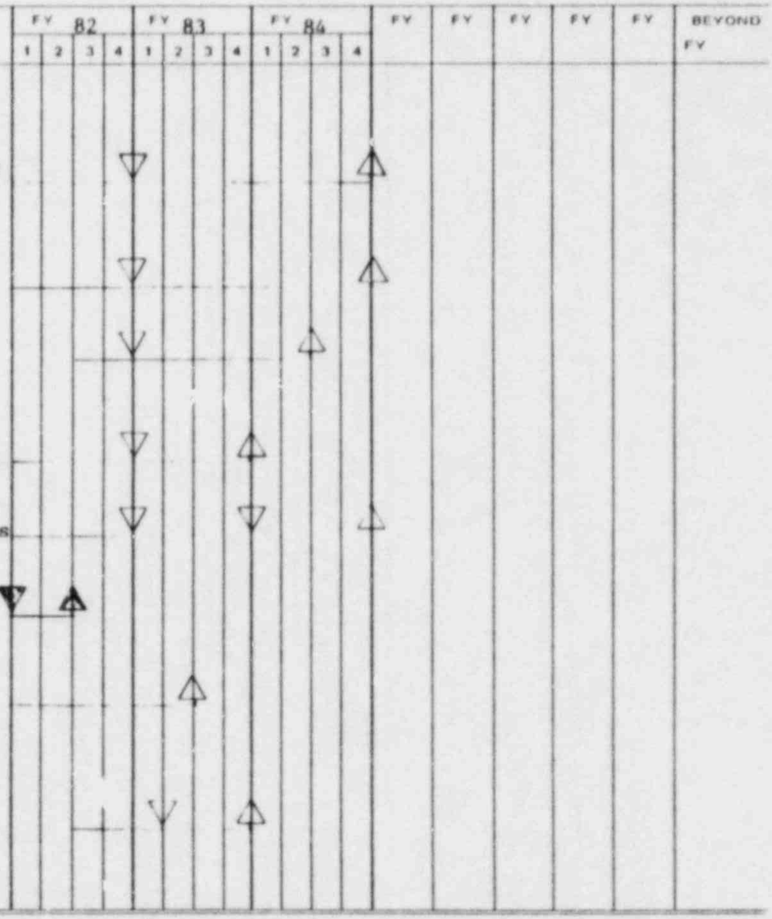
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	290	0	220	70	266
2	290	280	234	336	0
3	290	280	234	336	0
4					

Comments: Variance: −1.7%

MILESTONE BAR CHART

HTGR Safety Analysis and Research FIN: B0122

1. Task 1. Systems and Safety Analysis Methods
    - a. Refine HTGR component and system dynamics models for FSV
    - b. Complete Code Documentation
    - c. Modify Codes for 2240 MW(t) HTGR
2, Task 2. Systems and Safety Analysis
    - a. Run and analyze FSV tests
    - b. Provide technical support for FSV licensing problems
    - c. Complete report of NRC-Sponsored HTGR Safety Research
    - d. Complete initial FSV severe accident sequence analyses (SASA)
    - e. Complete SASA work on 2240 MW(t) HTGR in support of PRA and siting criteria development



COST/BUDGET REPORT

FIN No.: B0453

NRC Project Manager: D. Hoatson

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 13 5

NRC Act. No.: 60 19 01 10

Program Director: Lotts/Kress

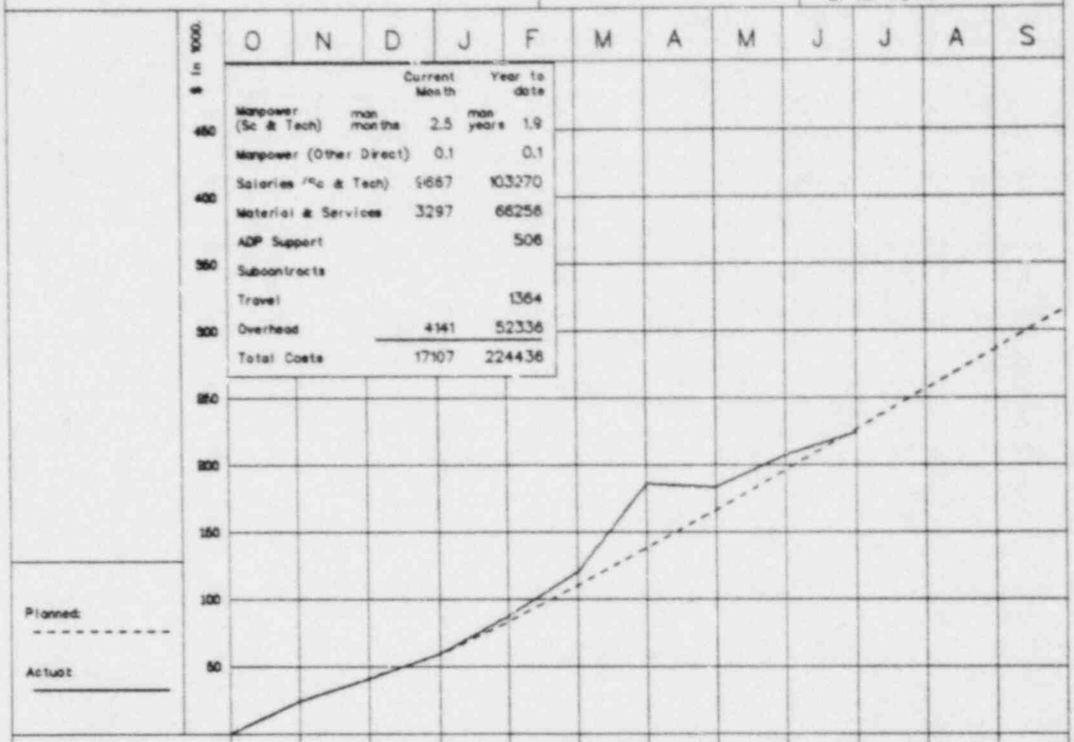
Program Title: Post-Accident Iodine and Tellurium Chemistry

NRC Div.: RES/: AE

ORNL Div.: CTD

Program Manager: R. P. Wichner

Principal Investigator: L. M. Toth



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.5	man years	1.9
Manpower (Other Direct)		0.1		0.1
Salaries (Sc & Tech)		9667		103270
Material & Services		3297		66256
ADP Support				506
Subcontracts				
Travel				1364
Overhead		4141		52336
Total Costs		17107		224436

Monthly Planned	24	17	18	24	27	28	28	30	30	30	30	30
Cumulative Planned	24	41	59	83	110	138	166	196	226	256	286	316
Monthly Actual	24	17	18	28	33	66	−3	24	17			
Cumulative Actual	24	41	59	87	120	186	183	207	224			
Monthly Variance	0	0	0	+4	+6	+38	−31	−6	−13			
Cumulative Variance	0	0	0	+4	+10	+48	+17	+11	−2			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	131	0	15	131	200
2	131	190	15	306	10
3	131	200	15	316	0
4					

Comments: Variance: −0.9%

MILESTONE BAR CHART

TITLE: Post-Accident Iodine and Tellurium Chemistry

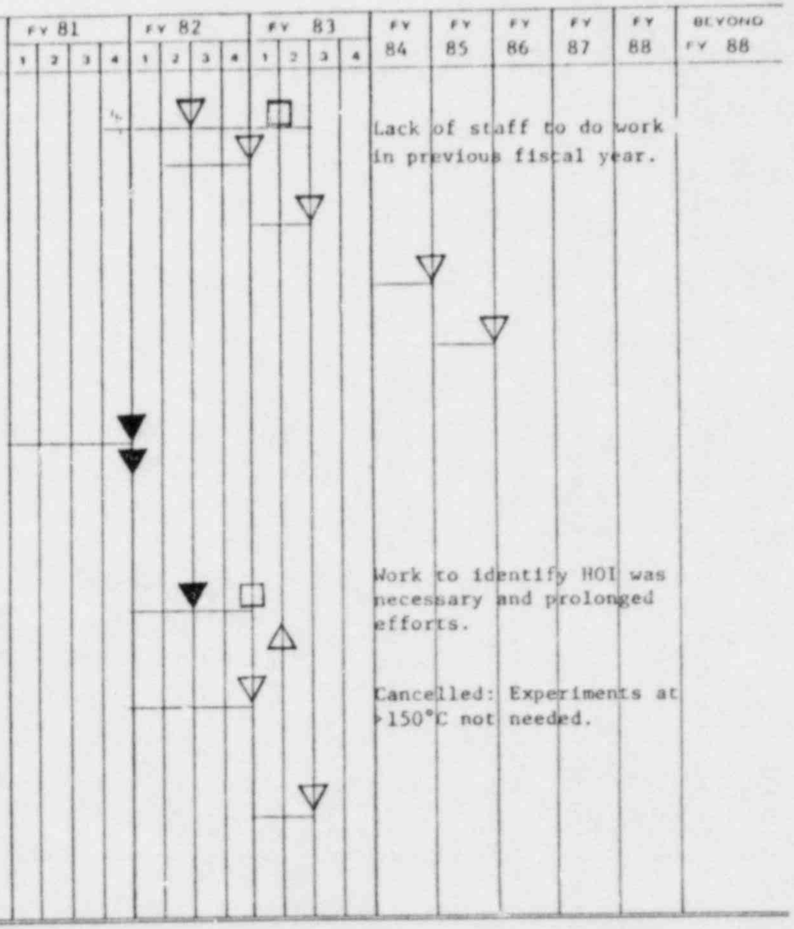
ACTIVITY NO.: 60 19 01 10 (B0453)

A. Chemistry Evaluations and Transport Rates

1. Iodine chemistry evaluatior
2. Tellurium chemistry evaluation
3. Organic iodide-summary of planned experimental approach
4. Evaluation of transport rates of Ru, Sr, Cs, plus other fission products
5. Summary report on organic iodide formation rates

B. Iodine Chemistry Tests

1. Complete low temperature (65°C) sump fluid tests
2. Draft report for tests in B.1
3. Complete tests for sump liquid conditions; pH range 6 to 10; concentration range 0.01, 0.1, 1.0, and 10 times nominal; temperatures 65°C, 150°C; boron concentration 0 to 2500 ppm
4. Draft report on sump fluid tests
5. High temperature (300°C) cell design and calibration
6. Primary liquid conditions test — PWR. Temperature 150°C; reducing and oxidizing conditions; iodine concentration 0.5, 1, 2 times nominal; range of boron levels



Lack of staff to do work in previous fiscal year.

Work to identify HOI was necessary and prolonged efforts.

Cancelled: Experiments at >150°C not needed.

UCN-14127 (3 9-80)

MILESTONE BAR CHART

TITLE: Post-Accident Iodine and Tellurium Chemistry

ACTIVITY NO.: 60 19 01 10

B. Iodine Chemistry Tests (Cont'd)

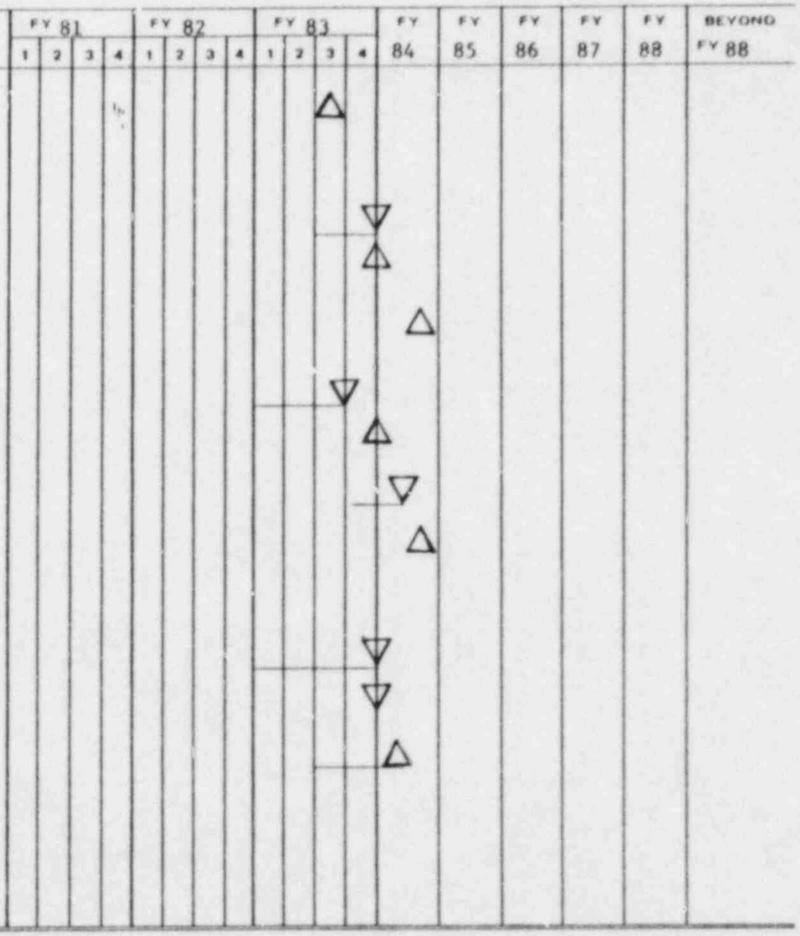
7. Draft report for tests B.6
8. Primary liquid conditions test — BWR. Temperature 286°C; iodine concentration 0.01, 0.1, 1, 10 times nominal; range of oxidizing conditions
9. Draft report for tests B.9
10. Draft final report covering all tests in Subtask B

C. Tellurium Chemistry Tests

1. Tests for sump fluid conditions (see B.3)
2. Draft report; tellurium tests C.1
3. High temperature (300°C) tellurium tests (a portion of test matrix B.7 and B.9)
4. Draft final report; tests C.1, C.3

D. Organic Iodine Tests

1. Tests on formation by gas phase reaction with methane and CO_2; using I_2 and gaseous iodide
2. Draft summary report, tests D.1
3. Tests on formation by gas phase reaction (I_2 and iodide) with condensed organic



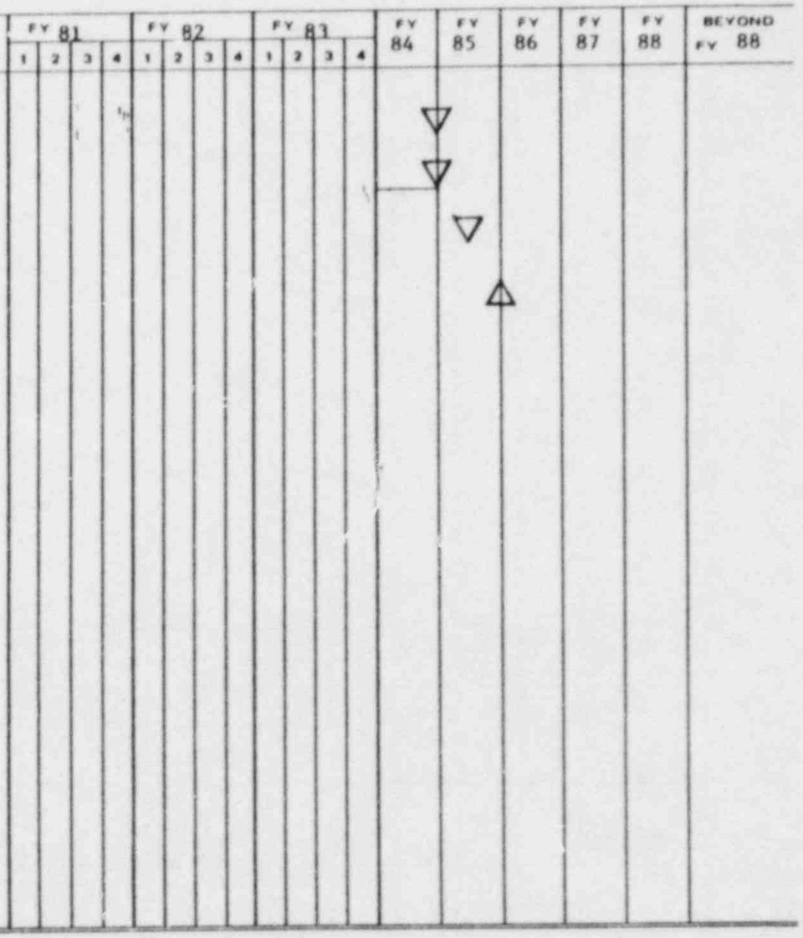
MILESTONE BAR CHART

TITLE: Post-Accident Iodine and Tellurium Chemistry

ACTIVITY NO.: 60 19 01 10

D. Organic Iodine Tests (Cont'd)

4. Draft summary report, tests D.3
5. Tests on formation in liquid with subsequent vaporization
6. Draft summary report, tests D.5
7. Draft final report; organic iodide formation mechanism



UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0121

NRC Project Manager: M. Silberberg

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 11 1

NRC Act. No.: 60 19 13

Program Director: Kress/Lotts

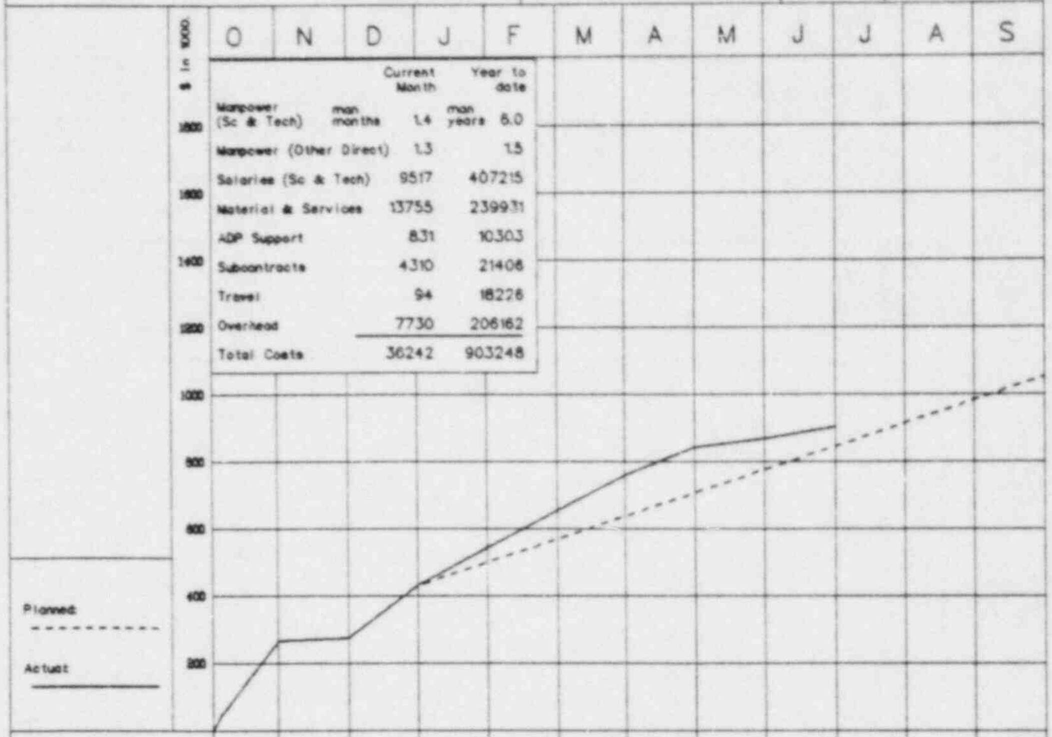
Program Title: LWR Aerosol Release and Transport

NRC Div.: RES/: AE

ORNL Div.: ETD

Program Manager: R. E. Adams

Principal Investigator: Adams/Parker



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.4	man years	6.0
Manpower (Other Direct)		1.3		1.5
Salaries (Sc & Tech)		9517		407215
Material & Services		13755		239931
ADP Support		831		10303
Subcontracts		4310		21408
Travel		94		18226
Overhead		7730		206162
Total Costs		36242		903248

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	265	9	156	69	69	69	69	69	69	69	69	70
Cumulative Planned	265	274	430	499	568	637	706	775	844	913	982	1052
Monthly Actual	265	9	156	112	113	104	82	26	36			
Cumulative Actual	265	274	430	542	655	759	841	867	903			
Monthly Variance	0	0	0	+43	+44	+35	+13	-43	-33			
Cumulative Variance	0	0	0	+43	+87	+122	+135	+92	+59			

Quarter	carry over 10/01/81	FY 82 Fundin.	carry over 9/30/82	Financial Plan	Expected Changes
1	102	250	0	352	700
2	102	950	0	1052	0
3	102	995	0	1052	0
4					

Comments: Variance: +7.0%

MILESTONE BAR CHART

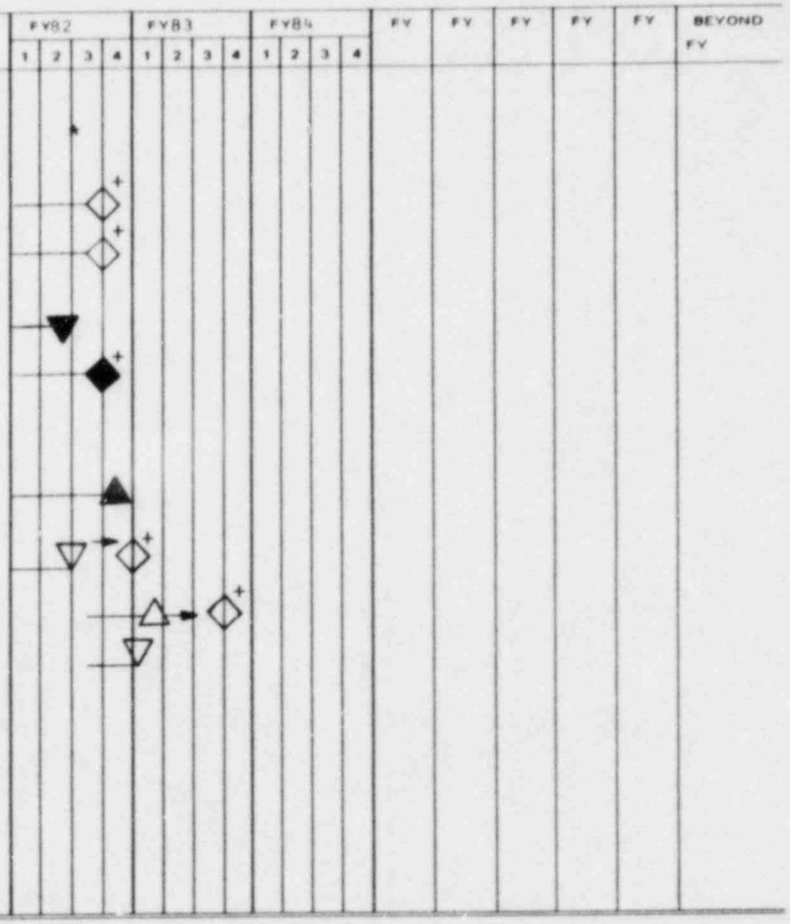
AEROSOL RELEASE AND TRANSPORT PROGRAM (B0121)

A. MANAGEMENT AND ANALYSES

1. LMFBR - FAST task
2. Test plan for LWR experiments in NSPP (containment aerosols)
3. Test plan for core-melt release task
4. Preliminary proposal for TRAP-MELT validation experiments
5. Report on NSPP LMFBR mixed aerosols

B. NSPP: LWR CONTAINMENT AEROSOL STUDIES

1. Initial LWR aerosol tests in steam environment
2. Development of "core-melt & concrete" aerosol generator
3. Core-melt aerosols in steam environment
4. NSPP follow-on plans



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[*] All previous milestones associated with the LMFBR portion of B0121 are deleted due to NRC direction to delay LMFBR portion until FY83 and to develop a separate 189.

[+] Milestones rescheduled due to impact of decreased level of funding.

UCN-14127 (3 9-80)

MILESTONE BAR CHART

AEROSOL RELEASE AND TRANSPORT PROGRAM (B0121)

C. CORE-MELT RELEASE AND TRANSPORT

1. Design of 5 kg furnace based on results of 0.5 kg tests

2. Fabrication and installation of 5 kg furnace

3. Tests with 0.5 kg furnace

   3a. Testing technique of measuring vaporization rates via added tracers

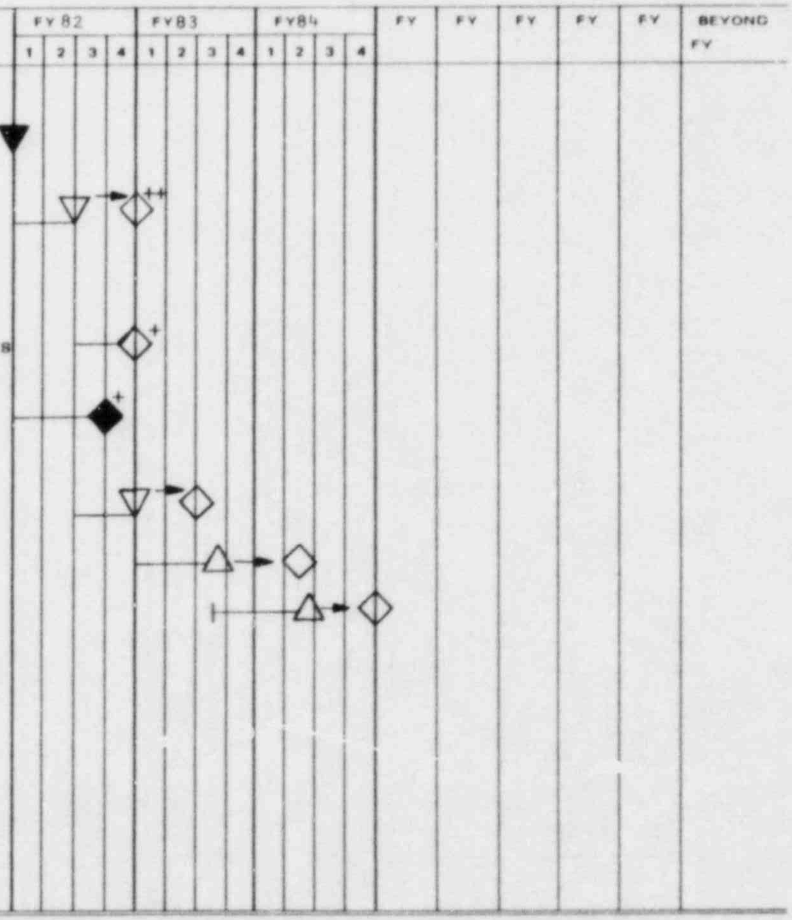
   3b. Initial characterization of core-melt aerosols

4. Tests with 5 kg furnace

   4a. Furnace development testing

   4b. Molten Corium-1 tests

   4c. Molten Corium-2 tests



[++] Milestone rescheduled due to difficulty in purchasing power supply

COST/BUDGET REPORT

FIN No.: B0120

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 10 6

NRC Act. No.: 60 19 13 01

NRC Project Manager: M. L. Picklesimer

Program Director: Lotts/Kress

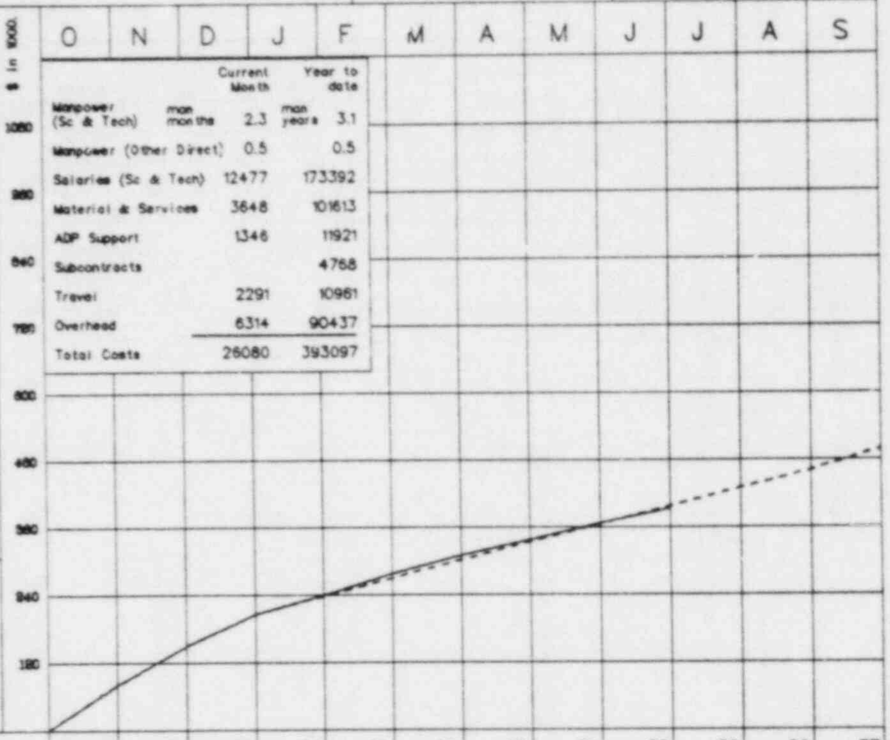
Program Title: Multirod Burst Tests

NRC Div.: RES/: AE

ORNL Div.: ETD

Program Manager: R. H. Chapman

Principal Investigator: R. H. Chapman



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.3	man years	3.1
Manpower (Other Direct)		0.5		0.5
Salaries (Sc & Tech)		12477		173392
Material & Services		3648		101613
ADP Support		1346		11921
Subcontracts				4768
Travel		2291		10961
Overhead		6314		90437
Total Costs		26080		393097

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	79	70	56	32	32	32	32	32	32	32	32	37
Cumulative Planned	79	149	205	237	269	301	333	365	397	429	461	498
Monthly Actual	79	70	56	34	37	33	27	31	26			
Cumulative Actual	79	149	205	239	276	309	336	367	393			
Monthly Variance	0	0	0	+2	+5	+1	−5	−1	−6			
Cumulative Variance	0	0	0	+2	+7	+8	+3	+2	−4			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	48	150	0	198	300
2	48	427	0	475	23
3	48	427	0	475	23
4					

Comments: Variance: −1.0%

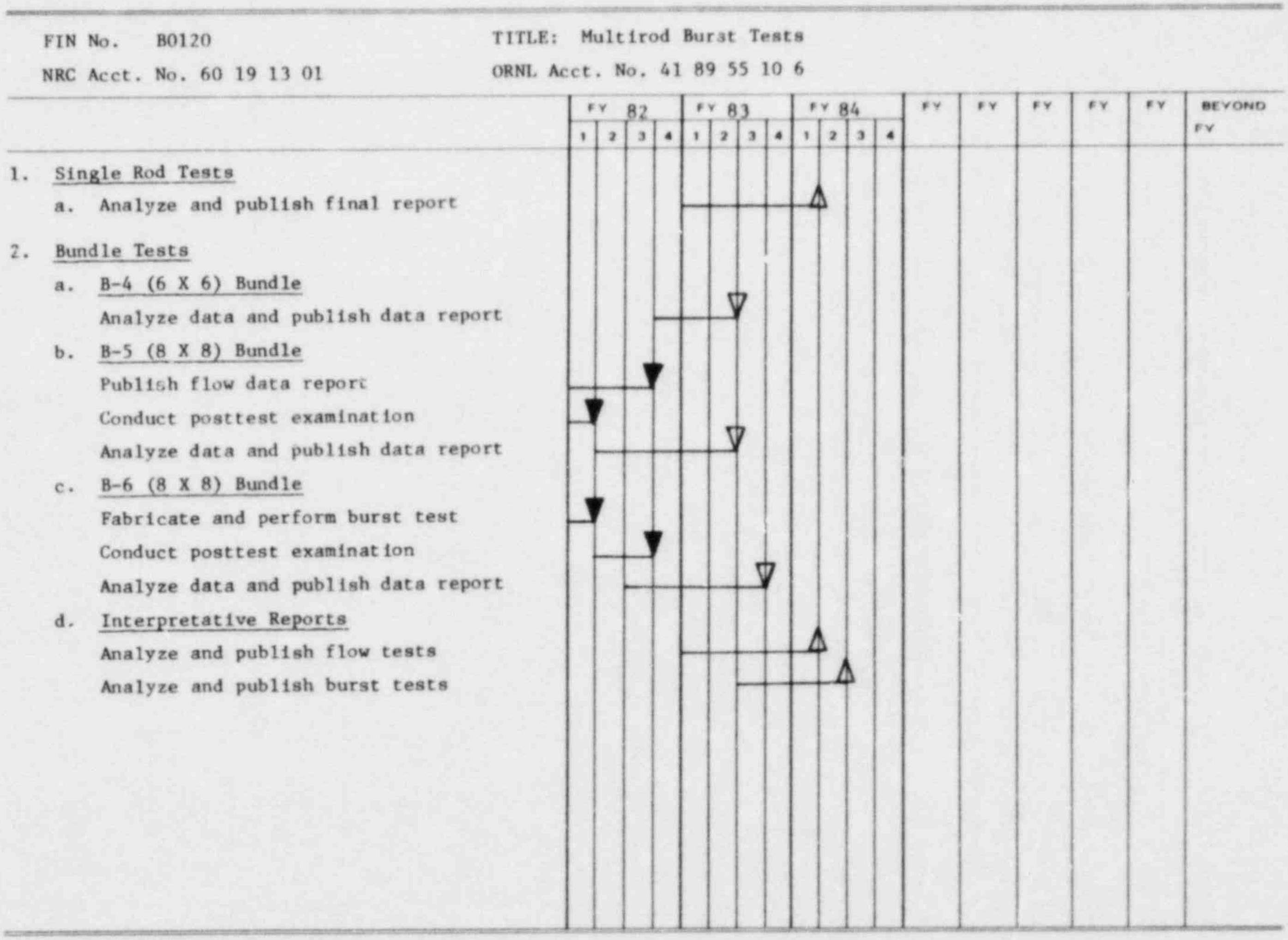
MILESTONE BAR CHART

FIN No. B0120

TITLE: Multirod Burst Tests

NRC Acct. No. 60 19 13 01

ORNL Acct. No. 41 89 55 10 6



1. Single Rod Tests
   a. Analyze and publish final report
2. Bundle Tests
   a. B-4 (6 X 6) Bundle
      Analyze data and publish data report
   b. B-5 (8 X 8) Bundle
      Publish flow data report
      Conduct posttest examination
      Analyze data and publish data report
   c. B-6 (8 X 8) Bundle
      Fabricate and perform burst test
      Conduct posttest examination
      Analyze data and publish data report
   d. Interpretative Reports
      Analyze and publish flow tests
      Analyze and publish burst tests

UCN 14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0488

NRC Project Manager: R. Sherry

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 13 8

NRC Act. No. 60 19 13

Program Director: A. L. Lotts

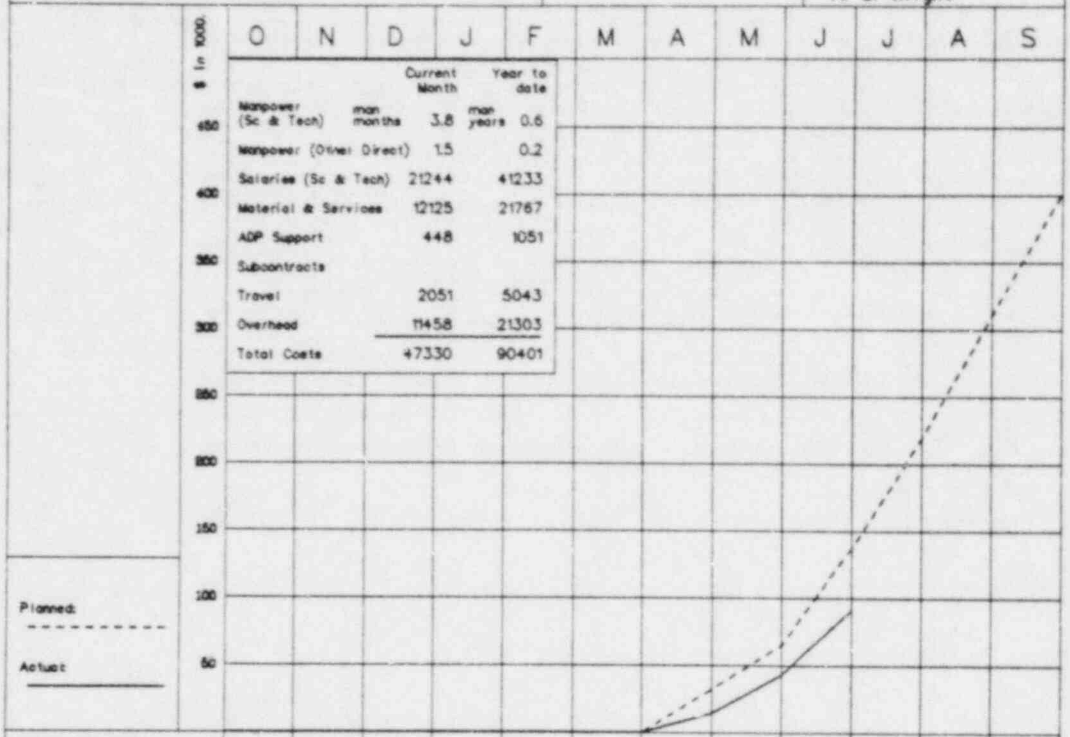
Program Title: Trap-Melt Verification Tests

NRC Div.: RES/: AE

ORNL Div.: CTD/ETD

Program Manager: Wichner/Kress

Principal Investigator: A. L. Wright



	Current Month		Year to date
Manpower (Sc & Tech)	man months 3.8	man years	0.6
Manpower (Other Direct)	1.5		0.2
Salaries (Sc & Tech)	21244		41233
Material & Services	12125		21767
ADP Support	448		1051
Subcontracts			
Travel	2051		5043
Overhead	11458		21303
Total Costs	47330		90401

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	0	32	33	72	82	92	91
Cumulative Planned	0	0	0	0	0	0	32	65	137	219	311	402
Monthly Actual	0	0	0	0	0	0	14	29	47			
Cumulative Actual	0	0	0	0	0	0	14	43	90			
Monthly Variance	0	0	0	0	0	0	−18	−4	−25			
Cumulative Variance	0	0	0	0	0	0	−18	−22	−47			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	402	0	402	0
4					

Comments: Variance: −34.3%

Variance due to delay in approval of subcontracts.

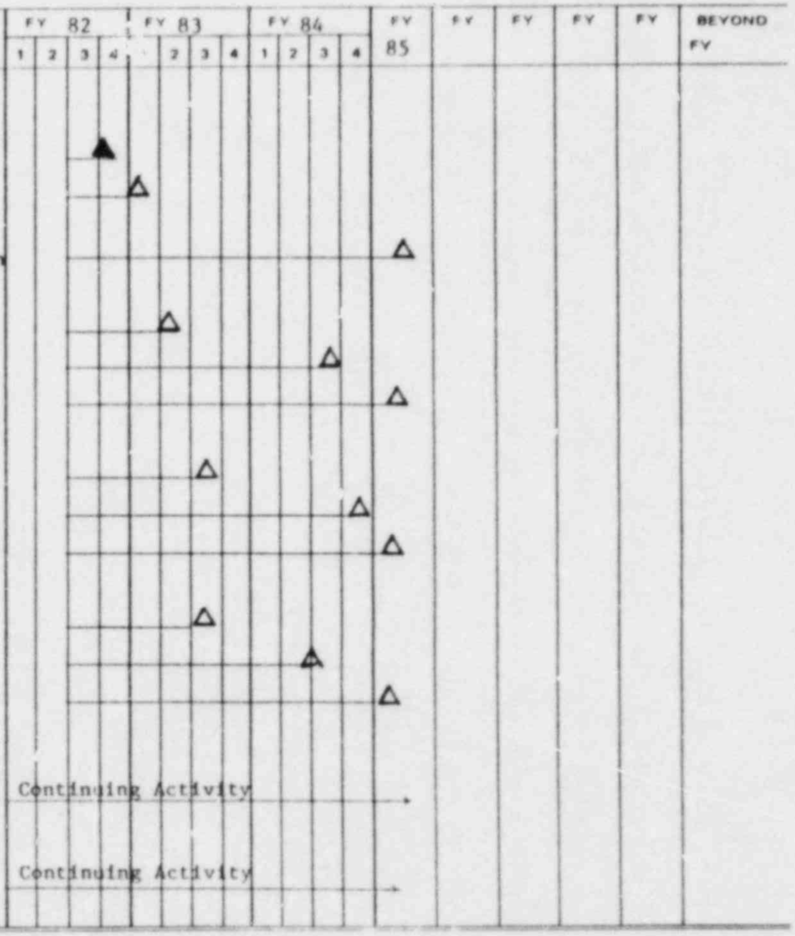
MILESTONE BAR CHART

TITLE: TRAP-MELT Verification Tests

ACTIVITY NO.: 60 19 13 189 No: B0488

SUBTASK/MILESTONE

1. Task 1: Management and Analysis
   a. Complete preliminary work plan (draft report)
   b. Complete overall test plan (draft report)
   c. Complete report on assessment of test results relevant to TRAP-MELT verification
2. Task 2: Aerosol Transport Tests
   a. Start experiments
   b. Complete experiments
   c. Complete data record report
3. Task 3: Fission Product Transport Tests
   a. Start experiments
   b. Complete experiments
   c. Complete data record report
4. Task 4: Aerosol Resuspension Tests
   a. Start experiments
   b. Complete experiments
   c. Complete data record report
5. Task 5: MARVIKEN Test Support
   a. Conduct tests/provide analysis in support of MARVIKEN experiments
   b. Coordinate/support participation of other laboratories in MARVIKEN test program



UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0452

NRC Project Manager: R. Curtis

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 13 4

NRC Act. No. 60 19 01 30

Program Director: Lotts/Kress

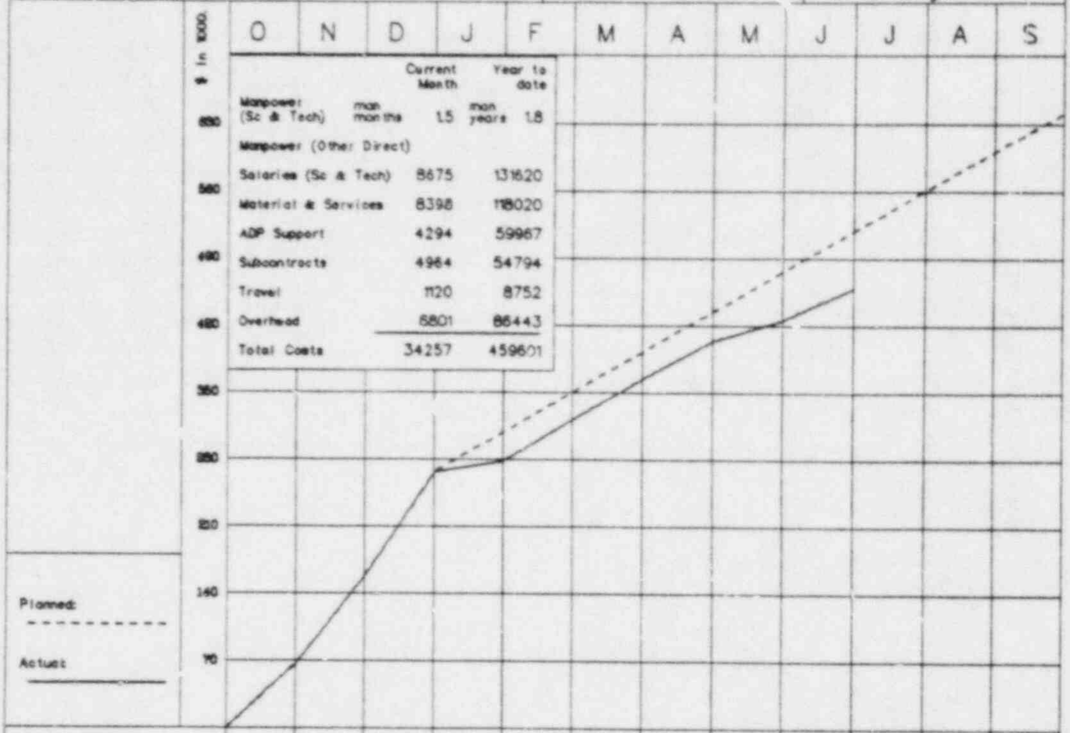
Program Title: LWR Severe Accident Sequence Analysis (SASA)

NRC Div.: RES/: AE

ORNL Div.: ETD

Program Manager: S. A. Hodge

Principal Investigator: S. A. Hodge



		Current Month		Year to date
Manpower: (Sc & Tech)	man months	1.5	man years	1.8
Manpower (Other Direct)				
Salaries (Sc & Tech)		8675		131620
Material & Services		8398		118020
ADP Support		4294		59967
Subcontracts		4964		54794
Travel		1120		8752
Overhead		6801		86443
Total Costs		34257		459601

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	66	92	108	42	42	42	42	42	42	42	41	40
Cumulative Planned	66	158	266	308	350	392	434	476	518	560	601	641
Monthly Actual	66	92	108	12	43	43	39	22	34			
Cumulative Actual	66	158	266	278	321	364	403	425	459			
Monthly Variance	0	0	0	-30	+1	+1	-3	-20	-8			
Cumulative Variance	0	0	0	-30	-29	-28	-31	-51	-59			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	141	70	0	211	430
2	141	475	0	616	25
3	141	500	0	641	0
4					

Comments:

Variance: -11.4%

Program has not yet been charged for two reports in process of publication. Surplus will be used up with these charges.

MILESTONE BAR CHART

TITLE: Severe Accident Sequence Analysis (SASA)

NRC Activity No: 60 19 01 30 (Fin B0452)

Subtask/Milestone	FY 82				FY 83				FY 84				FY	FY	FY	FY	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4	85	86	87			
Task 1: Analysis of Browns Ferry Station Blackout																		
a) Issue accident sequence analysis report	▲																	
b) Submit draft fission product transport report for peer review	▼																	
c) Issue fission product transport report			▲															
Task 2: Analysis of Browns Ferry SBLOCA Outside Containment																		
a) Submit draft accident sequence analysis report for peer review		▼																
b) Issue accident sequence analysis report				△														
c) Submit draft fission product transport report for peer review				▽														
d) Issue fission product transport report					△													

MILESTONE BAR CHART

TITLE: Severe Accident Sequence Analysis (SASA)

NRC Activity No: 60 19 01 30 (Fin B0452)

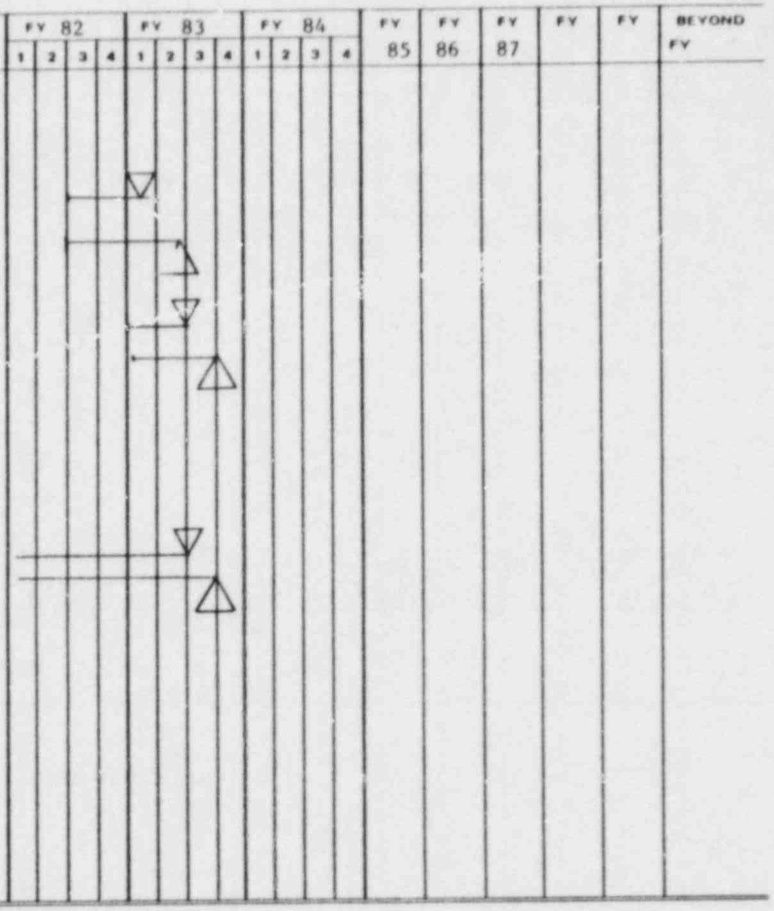
Subtask/Milestone

Task 3: Analysis of Browns Ferry Loss of DHR Sequences

- a) Submit draft accident sequence analysis report for peer review
- b) Issue accident sequence analysis report
- c) Submit draft fission product transport report for peer review
- d) Issue fission product transport report

Task 4: Develop Methodology for Analysis of Pressure Suppression Pool Response During Severe Accidents

- a) Issue draft report
- b) Issue final report



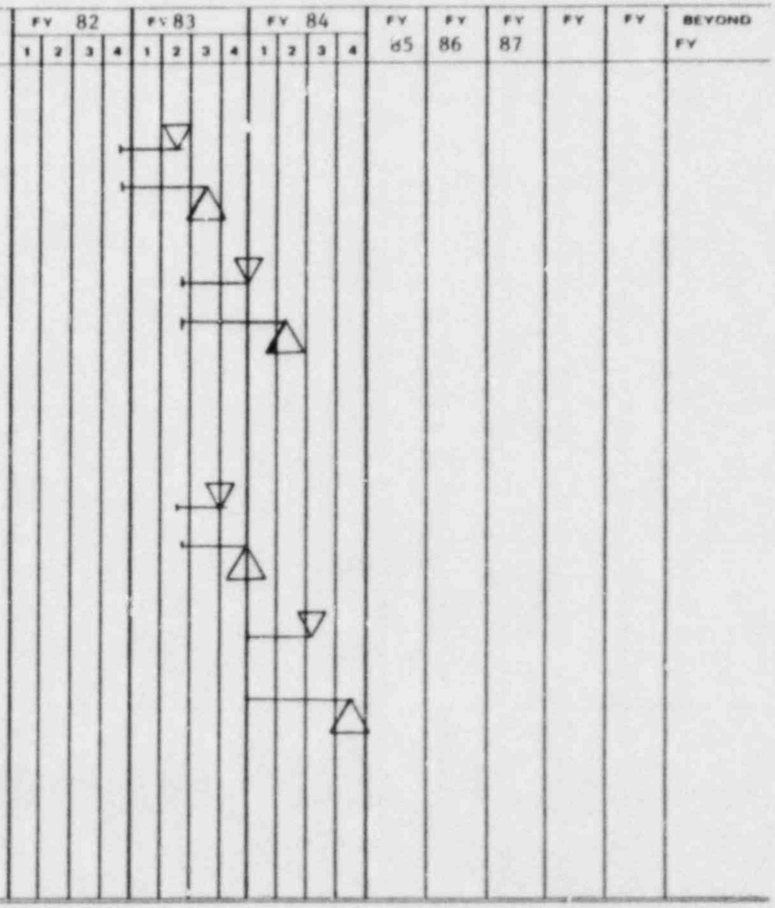
UCN 14127 (3 9-80)

MILESTONE BAR CHART

TITLE: Severe Accident Sequence Analysis (SASA)

NRC Activity No: 60 19 01 30 (Fin B0452)

Subtask/Milestone



Task 5: <u>Analysis of Limerick Station Blackout</u>

a) Submit draft accident sequence analysis report for peer review

b) Issue accident sequence analysis report

c) Submit draft fission product transport analysis report for peer review

d) Issue fission product transport report

Task 6: <u>Analysis of Limerick Scram Discharge Volume Break</u>

a) Submit draft accident sequence analysis report for peer review

b) Issue accident sequence analysis report

c) Submit draft fission product transport analysis report for peer review.

d) Issue fission product transport report

MILESTONE BAR CHART

TITLE: Severe Accident Sequence Analysis (SASA)

NRC Activity No: 60 19 01 30 (Fin B0452)

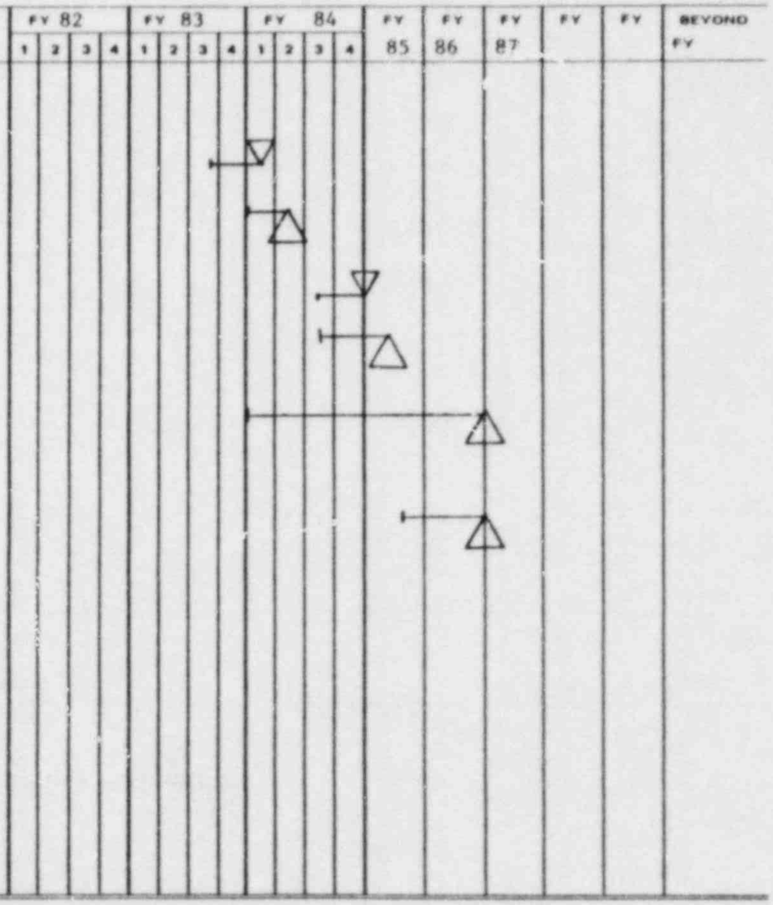
Subtask/Milestone

Task 7: Analysis of Limerick Loss of DHR Sequences

- a) Submit draft accident sequence analysis report for peer review
- b) Issue accident sequence analysis report
- c) Submit draft fission product transport report for peer review
- d) Issue fission product transport report

Task 8: Accident Sequence Analysis for Additional Browns Ferry Sequences and Reports

Task 9: Analysis of Additional Limerick Accident Sequences and Reports



DIVISION OF RISK ANALYSIS

COST/BUDGET REPORT

FIN No.:

NRC Project Manager:

Report For Period Ending: 06-31-82

ORNL Act No.

NRC Act. No.

Program Director:

Program Title: Summary

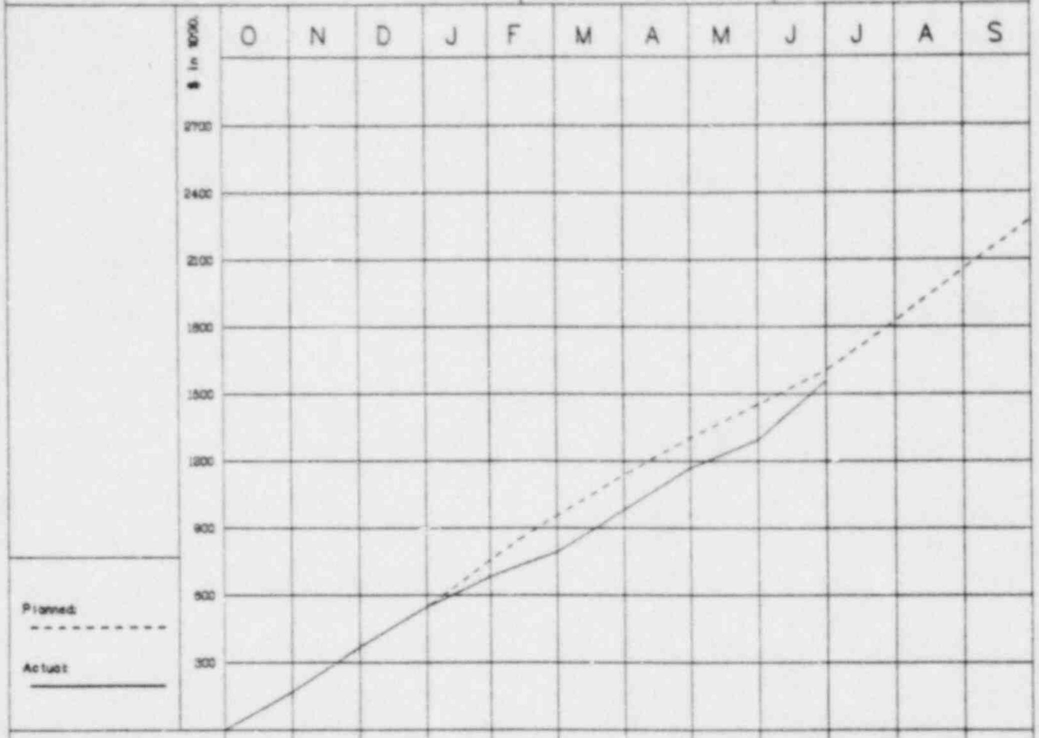
Office of Nuclear Regulatory Research

NRC Div.: RES/: RA

ORNL Div.:

Program Manager:

Principal Investigator:



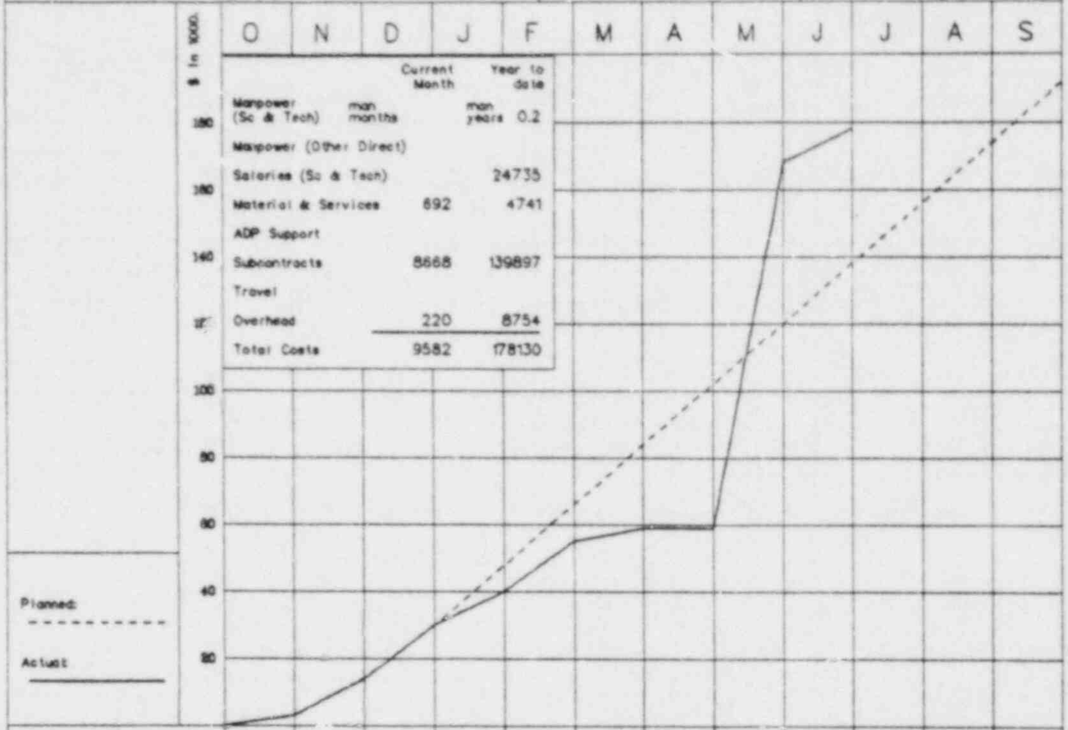
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	169	201	177	209	201	181	165	150	151	218	235	220
Cumulative Planned	169	370	547	756	957	1138	1303	1453	1604	1822	2057	2277
Monthly Actual	169	201	177	134	112	188	185	129	259			
Cumulative Actual	169	370	547	681	793	981	1166	1295	1554			
Monthly Variance	0	0	0	−75	−89	+7	+20	−21	+108			
Cumulative Variance	0	0	0	−75	−164	−157	−137	−158	−50			

Quarte:	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	592	70	155	507	1637
2	603	1289	237	1655	470
3	603	1824	440	2007	270
4					

Comments: Variance: −3.1%

COST/BUDGET REPORT

FIN No.: B0424			NRC Project Manager: P. Rathbun
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 02 2	NRC Act. No. 60 81 20 09	Program Director: Lotts/Flanagan
Program Title: Acceptable Levels of Risk Criteria		NRC Div.: RES/: RA ORNL Div.: EPD	Program Manager: G. F. Flanagan Principal Investigator: G. F. Flanagan



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years 0.2
Manpower (Other Direct)		
Salaries (Sc & Tech)		24735
Material & Services	692	4741
ADP Support		
Subcontracts	8668	139897
Travel		
Overhead	220	8754
Total Costs	9582	178130

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	3	11	16	18	18	18	18	18	18	18	18	18
Cumulative Planned	3	14	30	48	66	84	102	120	138	156	174	192
Monthly Actual	3	11	16	10	15	4	0	109	10			
Cumulative Actual	3	14	30	40	55	59	59	168	178			
Monthly Variance	0	0	0	−8	−3	−14	−18	+91	- 3			
Cumulative Variance	0	0	0	−8	−11	−25	−43	+48	+40			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	32	0	40	−8	200
2	32	200	40	192	0
3	32	200	40	192	0
4					

Comments: Variance: +29.0%

By NRC request, a rush was placed on several reports causing excessive expenditures for one month. Expenses will be as projected by end of FY 1982.

MILESTONE BAR CHART

TITLE: Acceptable Level of Risk Criteria for Nuclear Power Plants

ACTIVITY NO: 41 88 55 02 2

B0424

A. NRC Workshops on Risk Criteria

1. Review and prepare assessments of workshop results and recommendations

B. Evaluation of the NRC Safety Goal Proposal

1. Evaluate and respond to comments on proposed NRC goals.

C. Complete reports on issues pertaining to quantitative safety goals

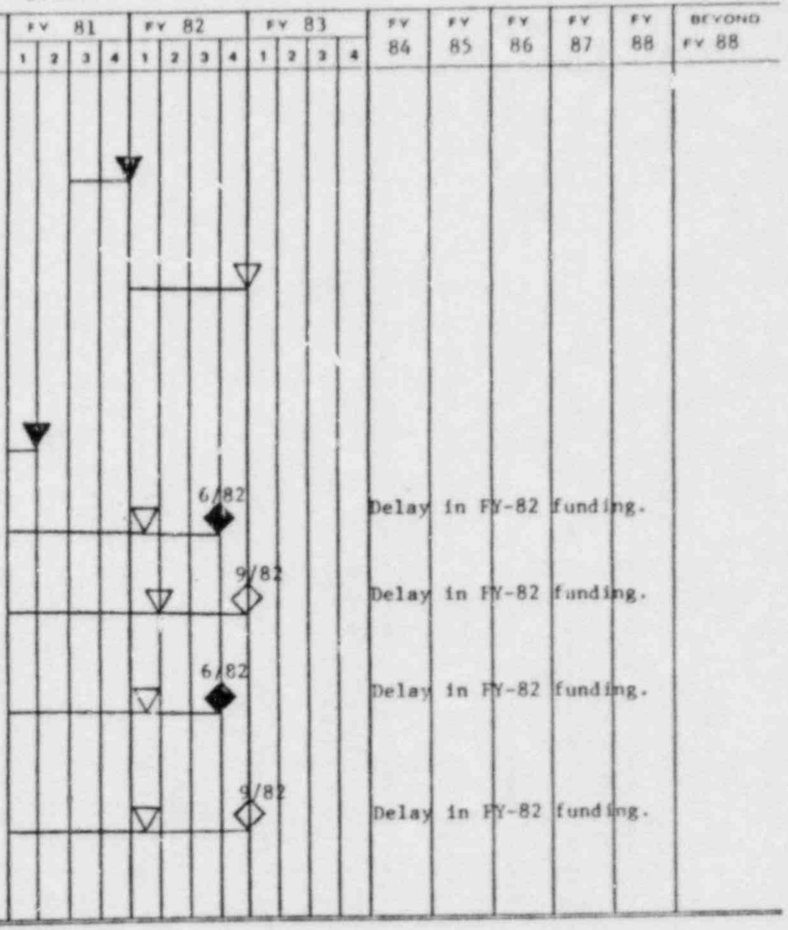
1. Issue final draft of "Approaches to Acceptable Risk: A Critical Guide" NUREG/CR-1614

2. Issue report on "Standard Setting Standards"

3. Issue report on "Perceived Risk and Quantitative Safety Goals for Nuclear Power"

4. Issue report on "The Public vs. the Experts: Perceived vs. Actual Disagreements about the risks of Nuclear Power"

5. Issue report on "Evaluation of Mortality Risks from an Organizational Perspective"



Delay in FY-82 funding.

Delay in FY-82 funding.

Delay in FY-82 funding.

Delay in FY-82 funding.

UCN-14127 (3 9-80)

MILESTONE BAR CHART

TITLE: Acceptable Level of Risk Criteria for Nuclear Power Plants

ACTIVITY NO: 41 88 55 02 2

B0424

6. Issue report on "Issues in Evaluating Alternative Standards"

7. Issue report on "Understanding How Safe is Safe Enough"

8. Issue report on "Risk Aversion and Safety Goals for Nuclear Power"

9. Issue report on "Judgmental Issues in Probabilistic Risk Analysis"

10. Issue report on "Incorporating Social Values into Nuclear Safety Goals"

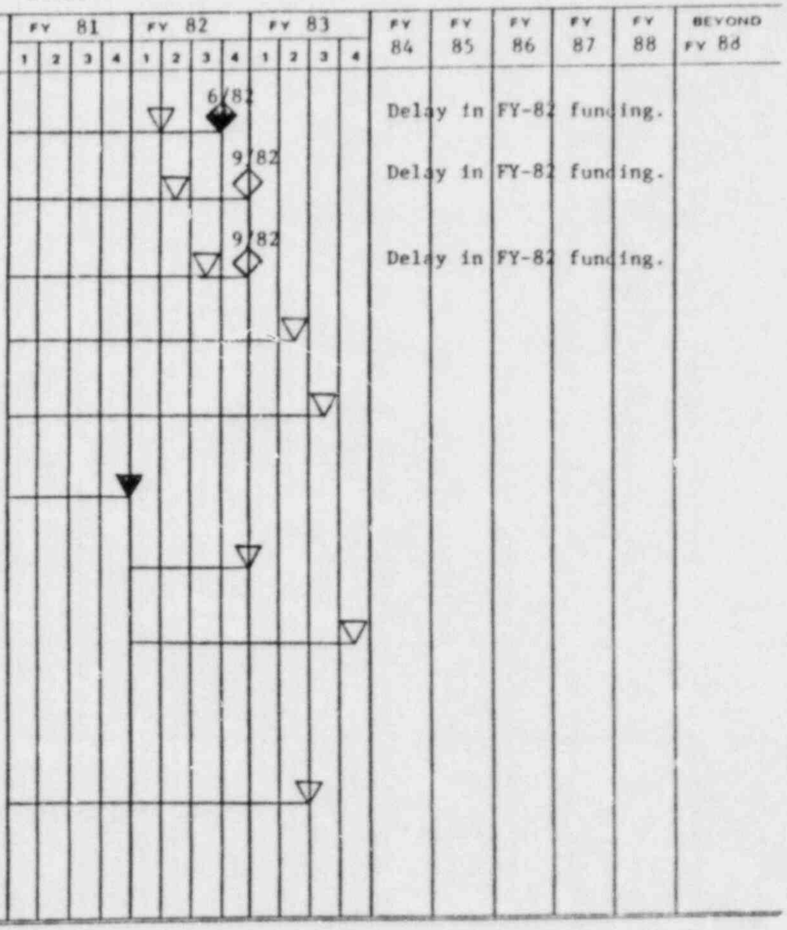
11. Review and prepare assessments of workshop results and recommendations

12. Evaluate and respond to comments on proposed NRC safety goals

D. Examine the relevance of research on probabilistic judgment for improving probabilistic risk assessment.

E. Consideration of public attitudes in formulating quantitative safety goals

1. Examine issues and ramifications associated with incorporating public attitudes



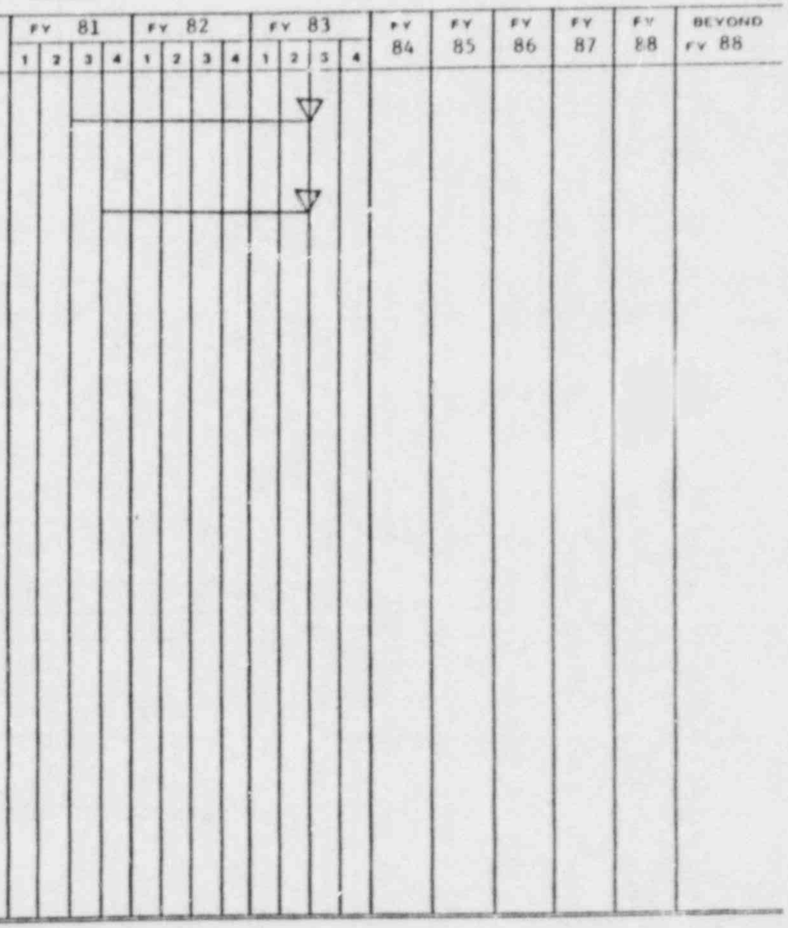
MILESTONE BAR CHART

TITLE: Acceptable Level of Risk Criteria for Nuclear Power Plants

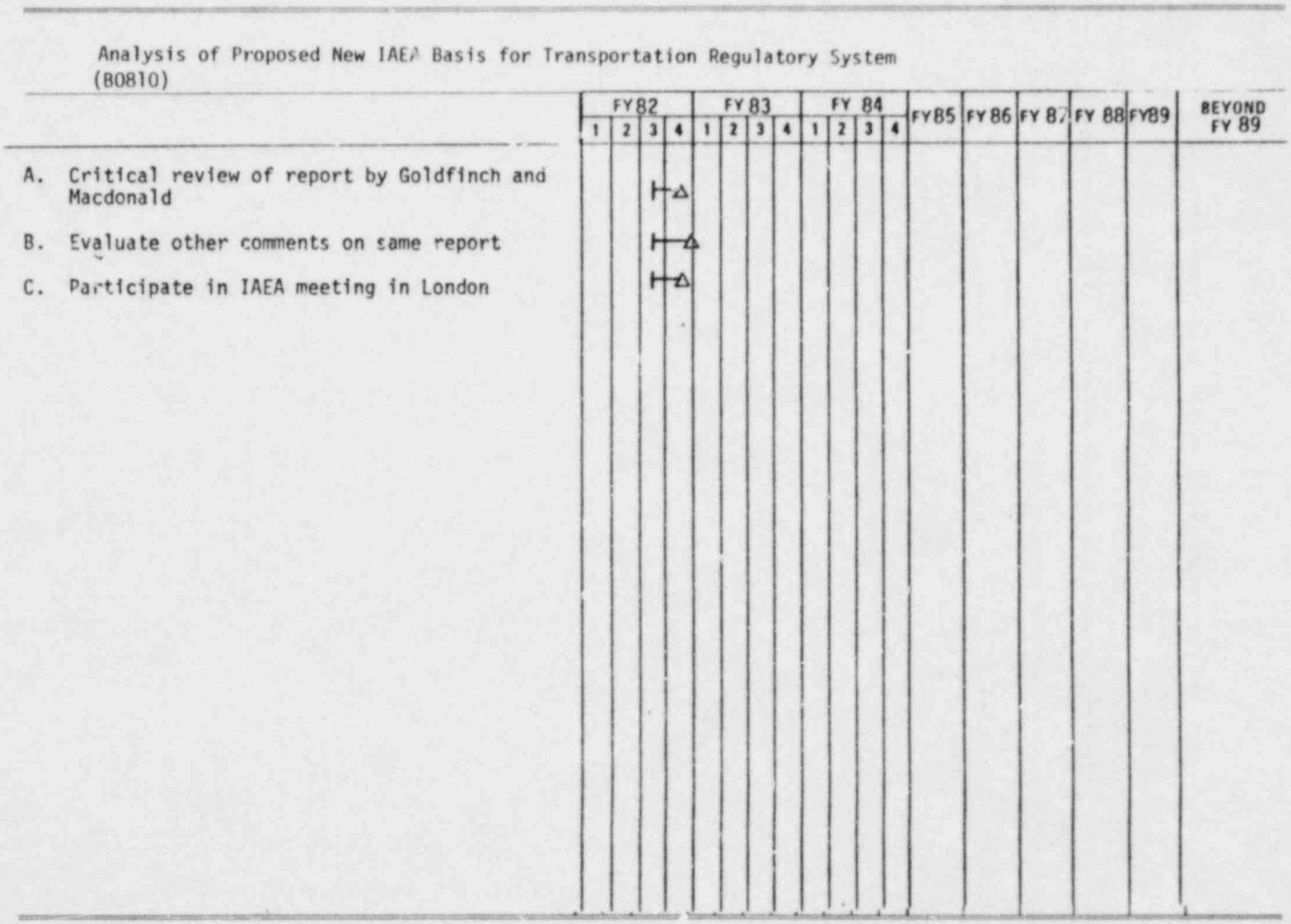
ACTIVITY NO: 41 88 55 02 2 B0424

2. Evaluate specific models for incorporating public attitudes in risk criteria

3. Conduct pilot survey to sample public views on issues associated with risk



MILESTONE BAR CHART



Analysis of Proposed New IAEA Basis for Transportation Regulatory System (B0810)

A. Critical review of report by Goldfinch and Macdonald

B. Evaluate other comments on same report

C. Participate in IAEA meeting in London

COST/BUDGET REPORT

FIN No.: B0445

NRC Project Manager: J. W. Johnson

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 1

NRC Act. No. 60 19 03 10

Program Director: Lotts/Flanagan

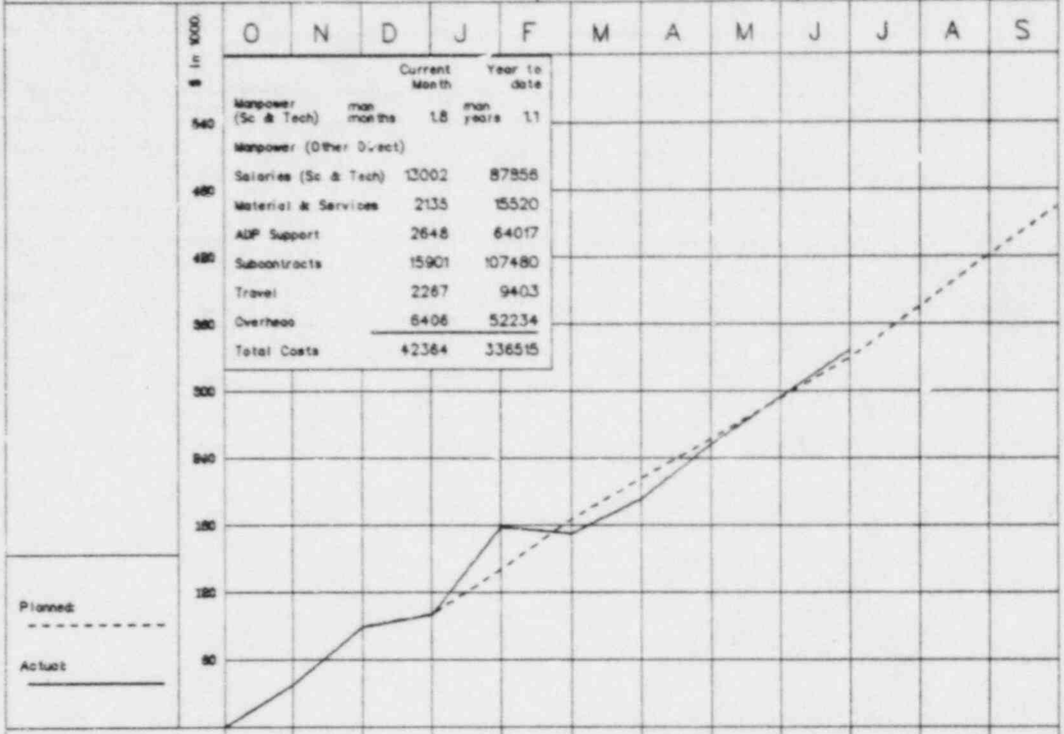
Program Title: Analysis of Reliability Data From Nuclear Power Plants

NRC Div.: RES/: RA

ORNL Div.: ETD

Program Manager: J. P. Drago

Principal Investigator: J. P. Drago



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.8	man years	1.1
Manpower (Other Direct)				
Salaries (Sc & Tech)		13002		87858
Material & Services		2135		15520
ADP Support		2648		64017
Subcontracts		15901		107480
Travel		2267		9403
Overhead		6406		52234
Total Costs		42384		336515

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	37	52	11	40	45	36	36	36	36	46	46	44
Cumulative Planned	37	89	100	140	185	221	257	293	329	375	421	465
Monthly Actual	37	52	11	78	-6	31	49	42	42			
Cumulative Actual	37	89	100	178	172	203	252	294	336			
Monthly Variance	0	0	0	+38	-51	-5	+13	+6	+6			
Cumulative Variance	0	0	0	+38	-13	-18	-5	+1	+7			

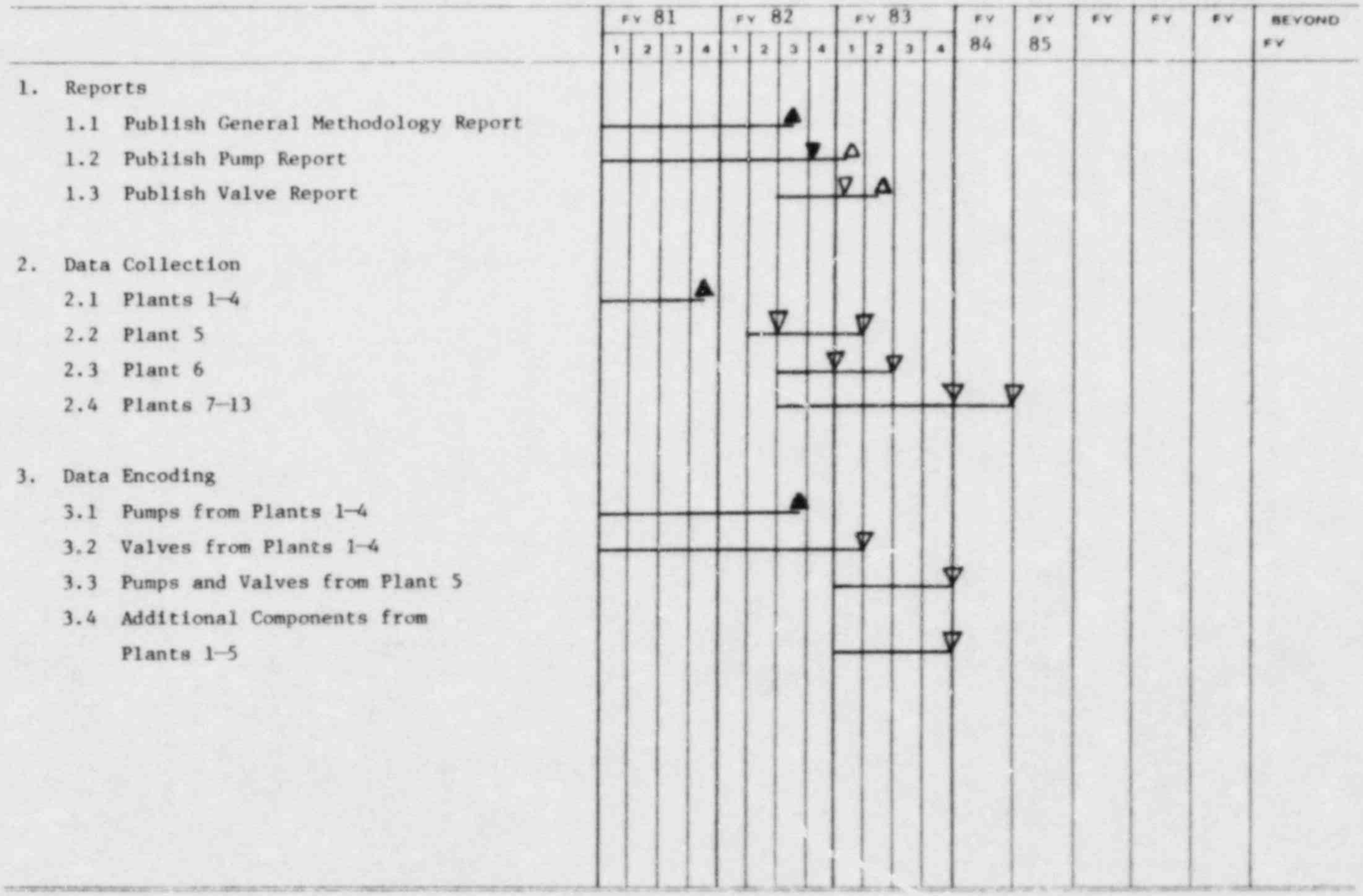
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	35	0	0	35	400
2	35	400	0	435	0
3	35	480	50	465	0
4					

Comments: Variance: +2.1%

MILESTONE BAR CHART

TITLE: Analysis of Reliability Data from Nuclear Power Plants

ACTIVITY NO: 41 88 55 03 01 B0445



UCN 14127 (3 5-80)

COST/BUDGET REPORT

FIN No.: B0459

NRC Project Manager: W. E. Vesely

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 7

NRC Act. No. 60 81 19 08

Program Director: Lutts/Flanagan

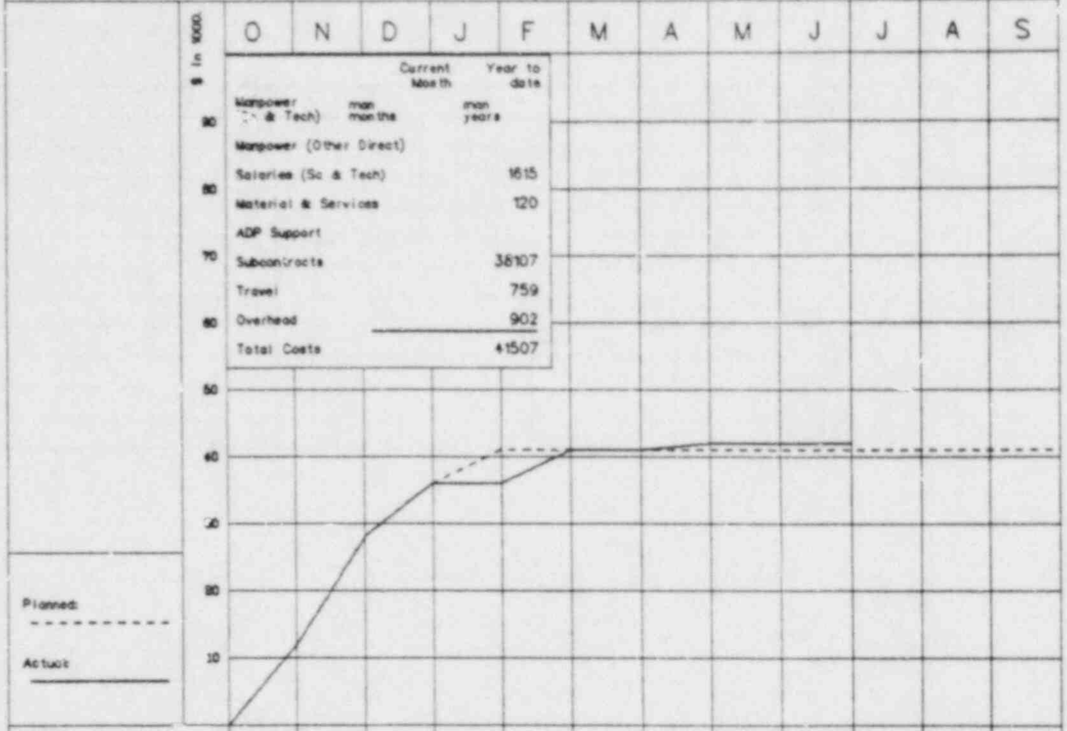
Program Title: Common Cause Evaluations in Applied Risk Analysis

NRC Div.: RES/ RA

ORNL Div.: EHD

Program Manager: G. F. Flanagan

Principal Investigator: G. F. Flanagan



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		1615
Material & Services		120
ADP Support		
Subcontracts		38107
Travel		759
Overhead		902
Total Costs		41507

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	12	16	8	5	0	0	0	0	0	0	0	0
Cumulative Planned	12	28	36	41	41	41	41	41	41	41	41	41
Monthly Actual	12	16	8	0	5	0	1	0	0			
Cumulative Actual	12	28	36	36	41	41	42	42	42			
Monthly Varianc	0	0	0	-5	+5	0	+1	0	0			
Cumulative Variance	0	0	0	-5	0	0	+1	+1	+1			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	41	0	0	41	0
2	41	0	0	41	0
3	41	0	0	41	0
4					

Comments: Variance: +2.4%

MILESTONE BAR CHART

TITLE: Common-Cause Evaluation (CCF) in Applied Risk Analysis

ACTIVITY NO: 41 88 55 03 7 B0459

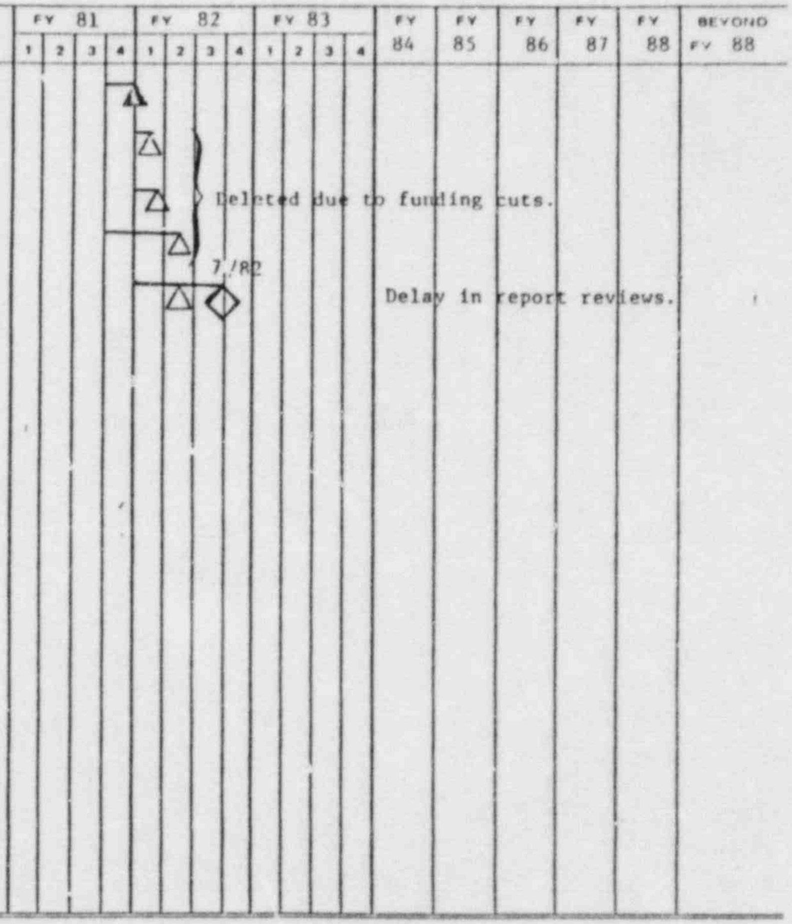
A. Identify key variables

B. Use check lists to develop rankings

C. Develop alternate approaches

D. Apply proposed approaches

E. Final report



COST/BUDGET REPORT

FIN No.: B0456

NRC Project Manager: P. K. Niyogi

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 3

NRC Act. No. 60 81 26 04

Program Director: Lotts/Flanagan

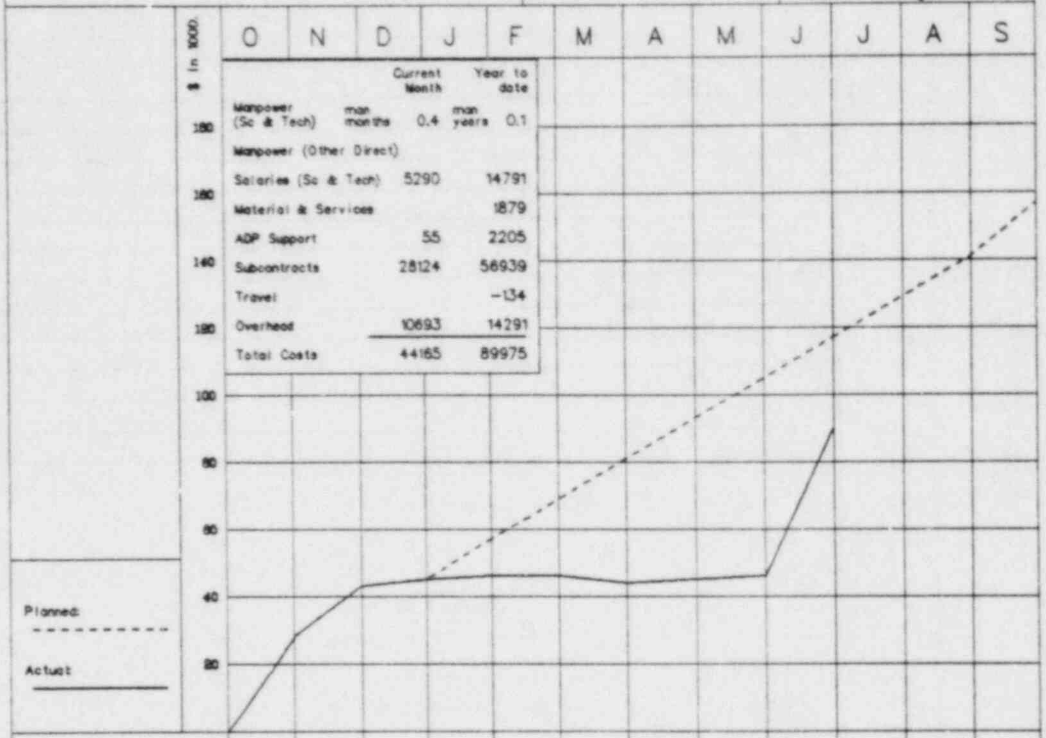
Program Title:
Common Cause Screening
Failure Analysis Procedures

NRC Div.: RES/: RA

ORNL Div.: EPD

Program Manager: G. F. Flanagan

Principal Investigator: G. F. Flanagan



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.4	man years	0.1
Manpower (Other Direct)				
Salaries (Sc & Tech)		5290		14791
Material & Services				1879
ADP Support		55		2205
Subcontracts		28124		56939
Travel				−134
Overhead		10693		14291
Total Costs		44165		89975

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	28	15	2	12	12	12	12	12	12	12	12	16
Cumulative Planned	28	43	45	57	69	81	93	105	117	129	141	157
Monthly Actual	28	15	2	1	0	−2	1	1	44			
Cumulative Actual	28	43	45	46	46	44	45	46	90			
Monthly Variance	0	0	0	−11	−12	−14	−11	−11	+32			
Cumulative Varianc	0	0	0	−11	−23	−37	−48	−59	−27			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	37	0	30	7	150
2	37	0	30	7	150
3	37	200	100	157	0
4					

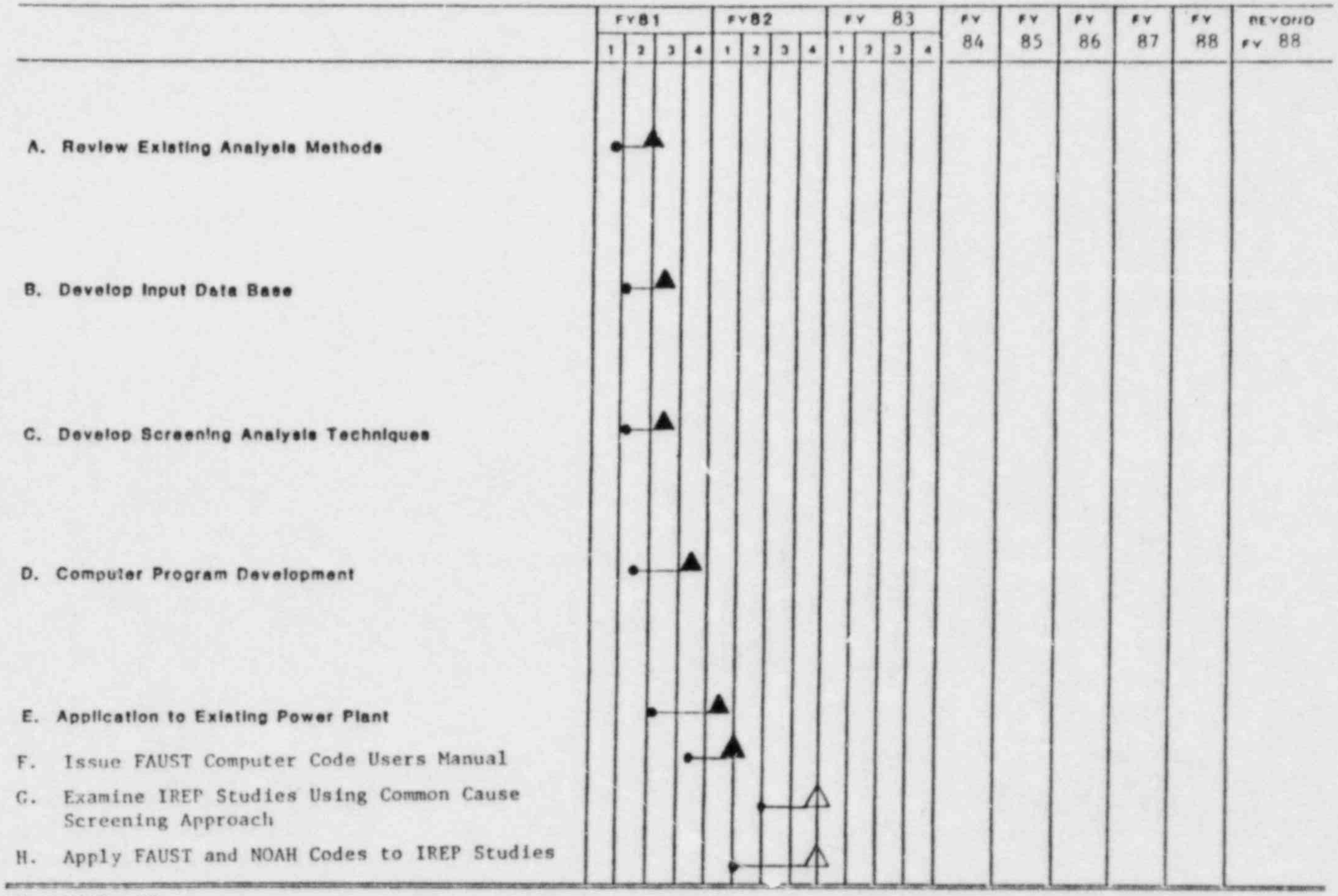
Comments: Variance: −23.1%

Problems were encountered in subcontract approval resulting in spending delay.

MILESTONE BAR CHART

TITLE: Common Cause Screening Failure Analysis Procedures (formerly Common Cause Screening Methodology)

ACTIVITY NO: 41 88 55 03 3 B0456



COST/BUDGET REPORT

FIN No.: B0495

NRC Project Manager: S. Brernstein

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 05 6

NRC Act. No. 60 19 21

Program Director: Lotts/Flangan

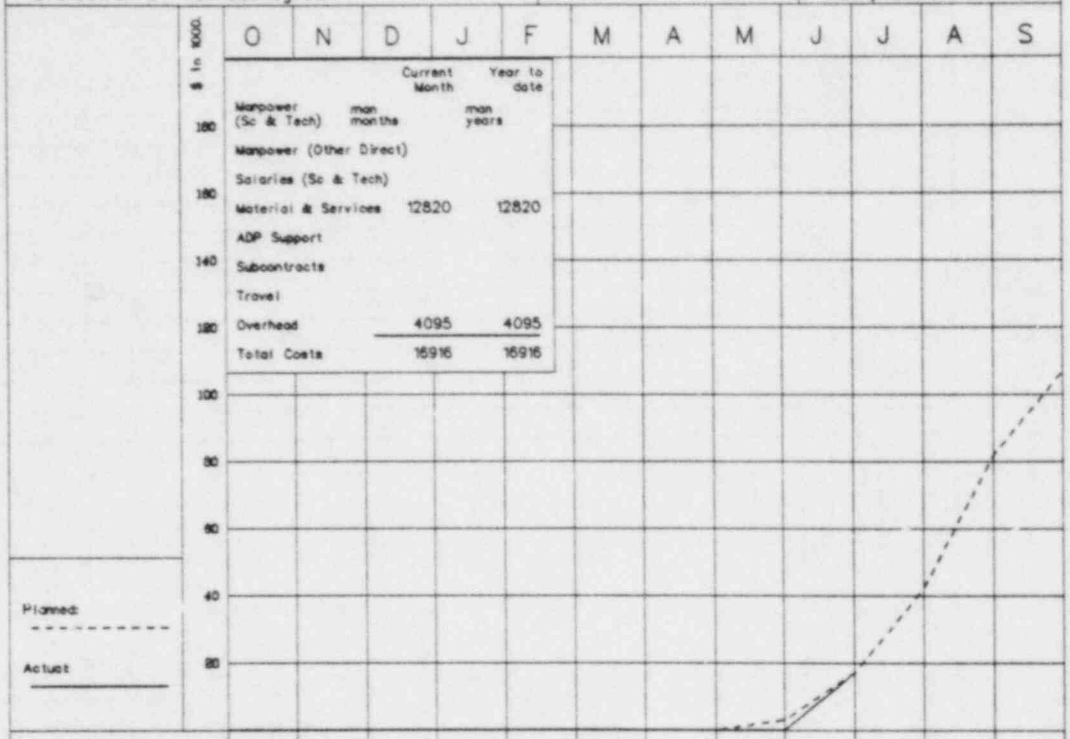
Program Title: Definition of Scenarios and Evaluation of Methodologies

NRC Div.: RES/: RA

ORNL Div.: ENG.

Program Manager: Siman-Tov

Principal investigator: Just/Huxtable



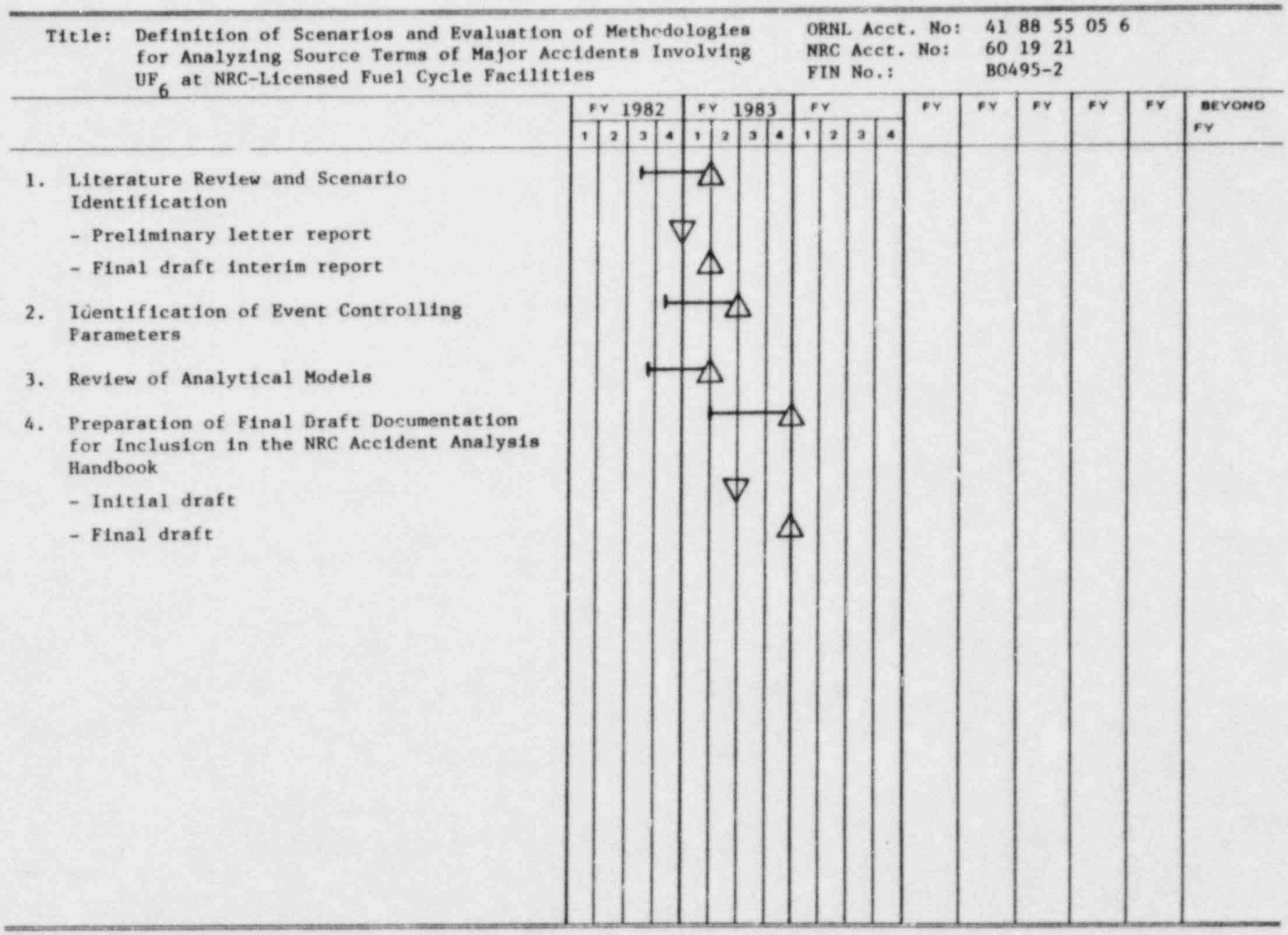
	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services	12820	12820
ADP Support		
Subcontracts		
Travel		
Overhead	4095	4095
Total Costs	16916	16916

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	0	0	3	14	25	40	25
Cumulative Planned	0	0	0	0	0	0	0	3	17	42	82	107
Monthly Actual	0	0	0	0	0	0	0	0	17			
Cumulative Actual	0	0	0	0	0	0	0	0	17			
Monthly Variance	0	0	0	0	0	0	0	-3	+3			
Cumulative Variance	0	0	0	0	0	0	0	-3	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	155	48	107	0
4					

Comments: Variance: 0.0%

MILESTONE BAR CHART



Title: Definition of Scenarios and Evaluation of Methodologies for Analyzing Source Terms of Major Accidents Involving UF_6 at NRC-Licensed Fuel Cycle Facilities

ORNL Acct. No: 41 88 55 05 6
NRC Acct. No: 60 19 21
FIN No.: B0495-2

1. Literature Review and Scenario Identification
   - Preliminary letter report
   - Final draft interim report
2. Identification of Event Controlling Parameters
3. Review of Analytical Models
4. Preparation of Final Draft Documentation for Inclusion in the NRC Accident Analysis Handbook
   - Initial draft
   - Final draft

COST/BUDGET REPORT

FIN No.: B0468

NRC Project Manager: P. K. Niyogi

Report For Period Ending: 06-31-82

ORNL Act No.: 41 88 55 04 1

NRC Act. No.: 60 19 03 10

Program Director: Lotts/Flanagan

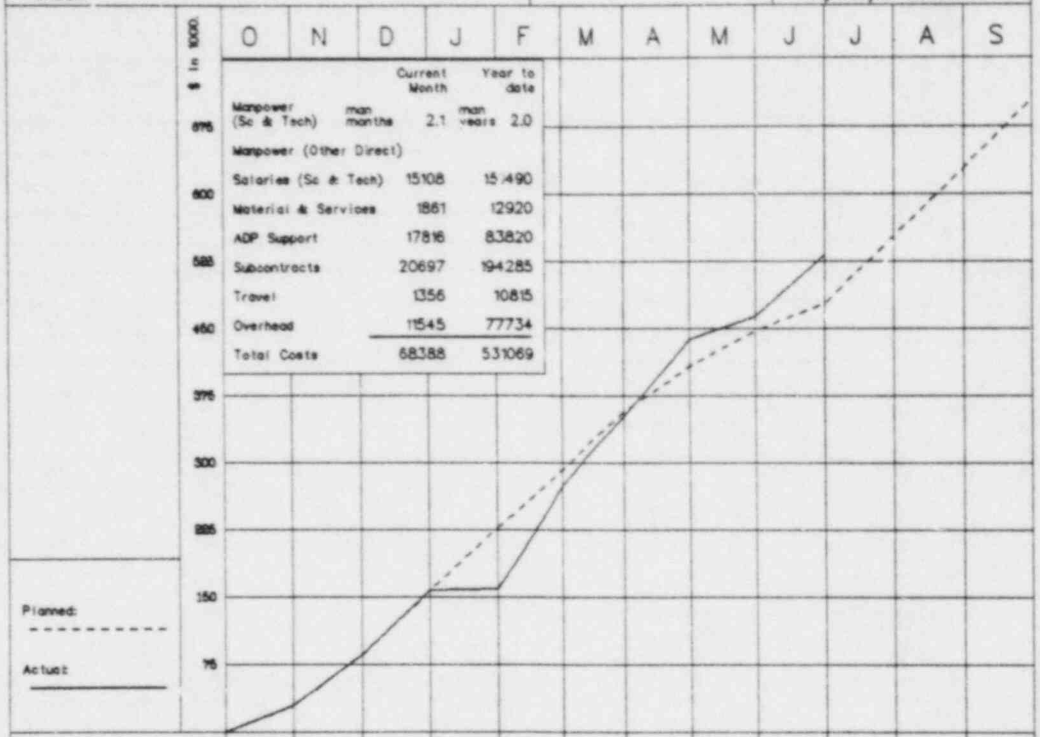
Program Title: Evaluation of Pressurized Thermal Shock

NRC Div.: RES/: RA

ORNL Div.: I&C

Program Manager: R. C. Kryter

Principal Investigator: Kryter/Cheverton



		Current Month		Year to date
Manpower (Sc & Tech)	man months	2.1	man years	2.0
Manpower (Other Direct)				
Salaries (Sc & Tech)		15108		15:490
Material & Services		1861		12920
ADP Support		17816		83820
Subcontracts		20697		194285
Travel		1356		10815
Overhead		11545		77734
Total Costs		68388		531069

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	29	57	71	70	65	65	50	40	30	76	76	76
Cumulative Planned	29	86	157	227	292	357	407	447	477	553	629	705
Monthly Actual	29	57	71	2	116	78	84	26	68			
Cumulative Actual	29	86	157	159	275	353	437	463	531			
Monthly Variance	0	0	0	−68	+51	+13	+34	−14	+38			
Cumulative Variance	0	0	0	−68	−17	−4	+30	+16	+54			

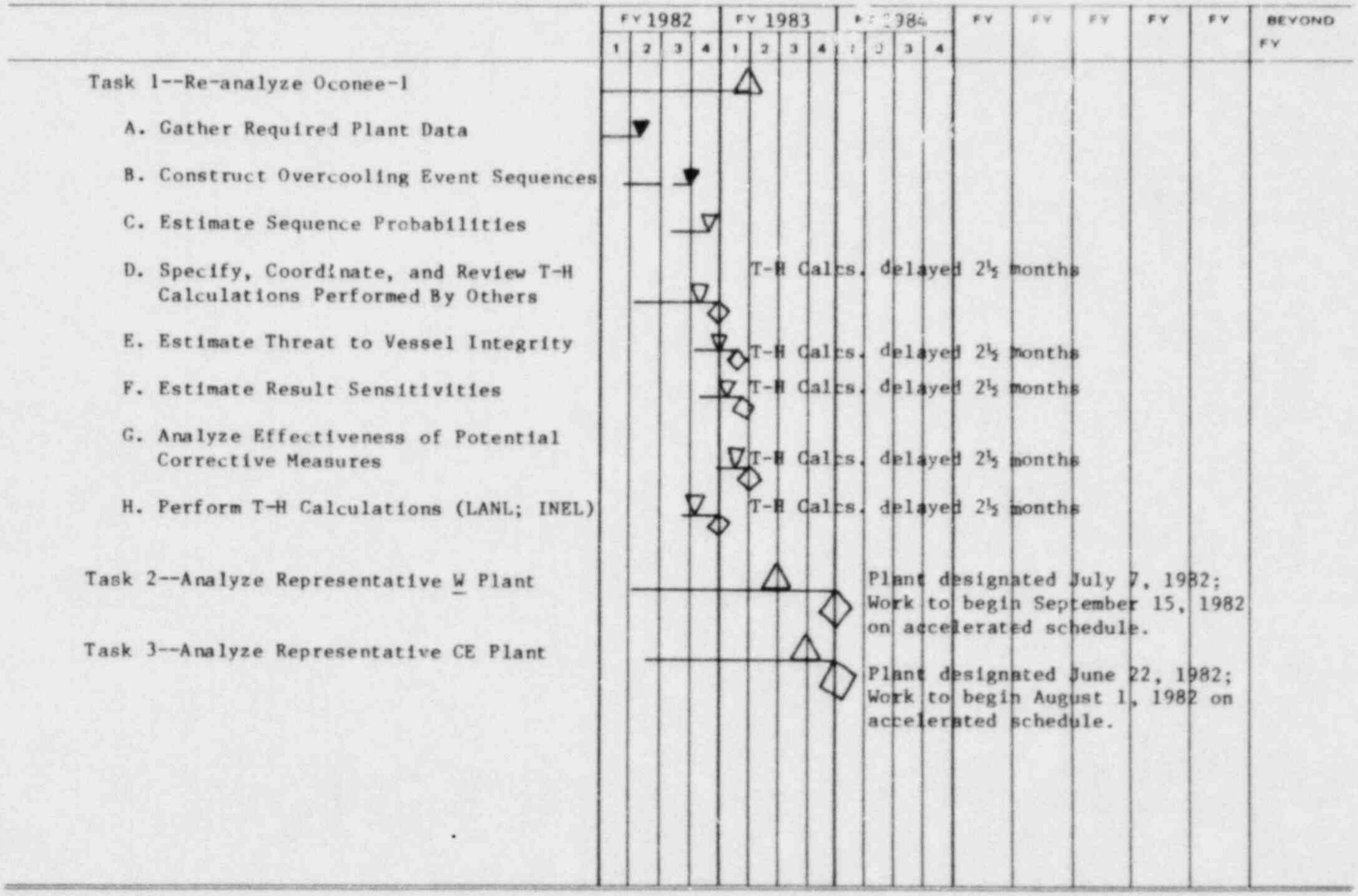
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	90	70	0	160	430
2	90	500	0	590	100
3	90	600	35	655	50
4					

Comments: Variance: +11.3%

Program schedule has altered and work scope has increased beyond anticipated funding needs. NRC is supplying additional funding.

MILESTONE BAR CHART

Title: Evaluation of Pressurized Thermal Shock
Activity No.: 189 B0468/ORNL #41 88 55 04 1



T-H Calcs. delayed 2½ months

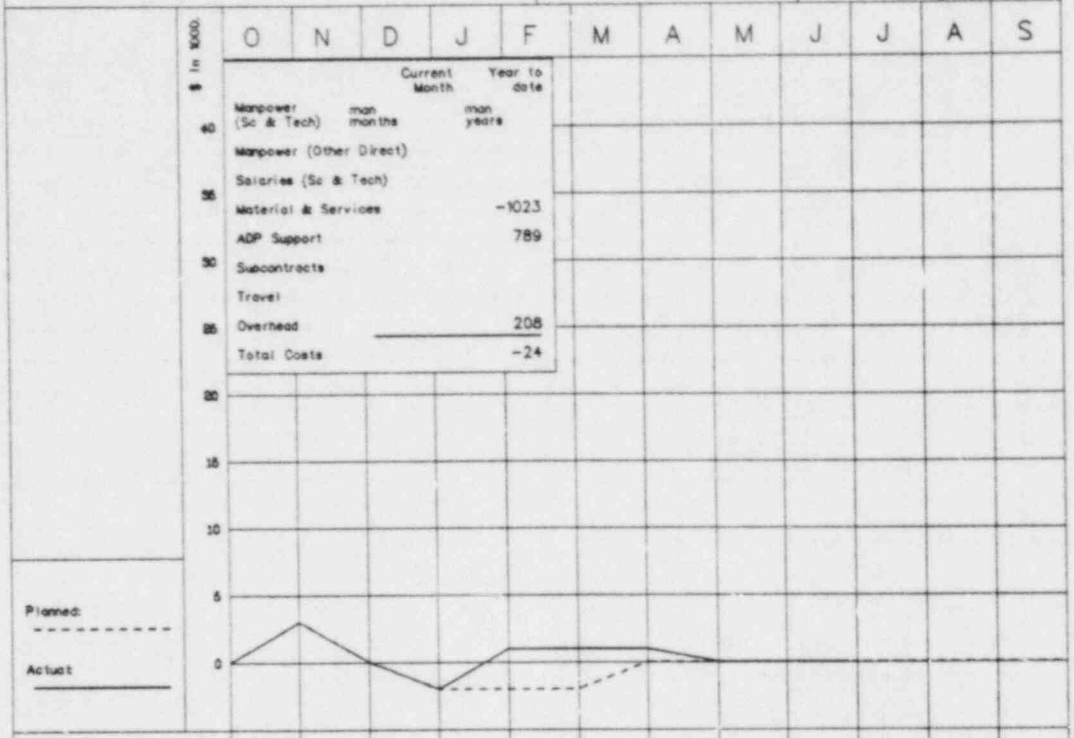
Plant designated July 7, 1982; Work to begin September 15, 1982 on accelerated schedule.

Plant designated June 22, 1982; Work to begin August 1, 1982 on accelerated schedule.

UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0436			NRC Project Manager: P. K. Niyogi
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 02 7	NRC Act. No. 60 81 03 10	Program Director: Lotts/Flanagan
Program Title: Methodology for Flood Risk Analysis		NRC Div.: RES/: RA	Program Manager: G. F. Flanagan
		ORNL Div.: EPD	Principal Investigator: G. F. Flanagan



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services		-1023
ADP Support		789
Subcontracts		
Travel		
Overhead		208
Total Costs		-24

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	3	−3	−2	0	0	2	0	0	0	0	0	0
Cumulative Planned	3	0	−2	−2	−2	0	0	0	0	0	0	0
Monthly Actual	3	−3	−2	3	0	0	−1	0	0			
Cumulative Actual	3	0	−2	1	1	1	0	0	0			
Monthly Variance	0	0	0	+3	0	−2	−1	0	0			
Cumulative Variance	0	0	0	+3	+3	+1	0	0	0			

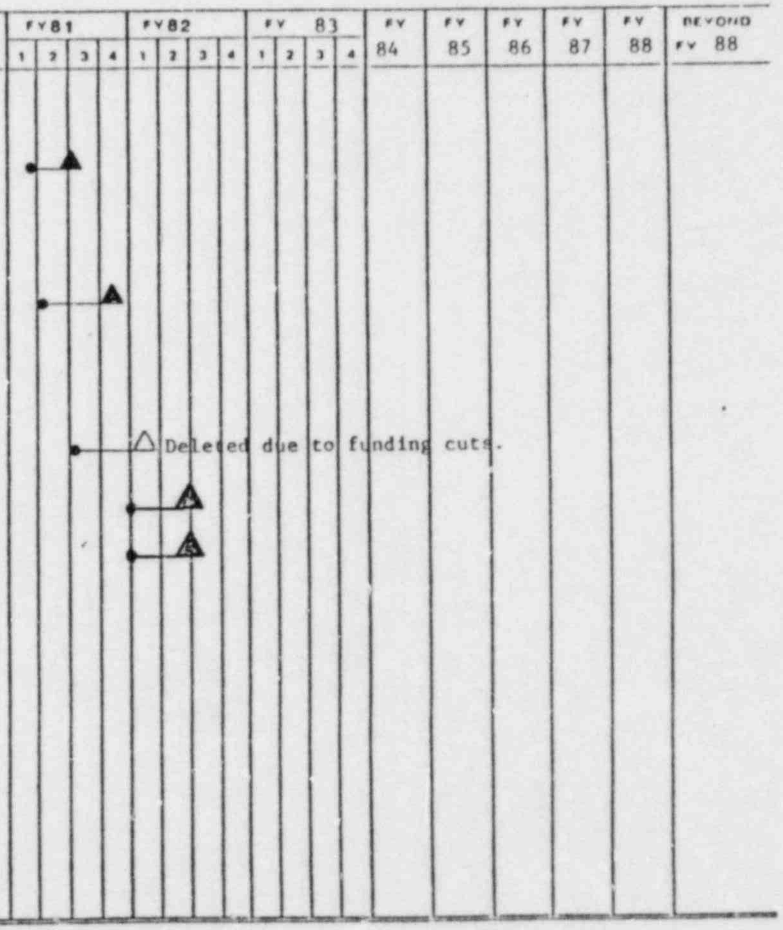
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	5	0	0	5	0
2	0	0	0	0	0
3	0	0	0	0	0
4					

Comments: Variance: 0.0%

MILESTONE BAR CHART

TITLE: **Flood Risk Analysis Methodology**

ACTIVITY NO: 41 88 55 02 7 B0436



A. **Develop Analysis Bounding Techniques**

B. **Computer Program Extensions**

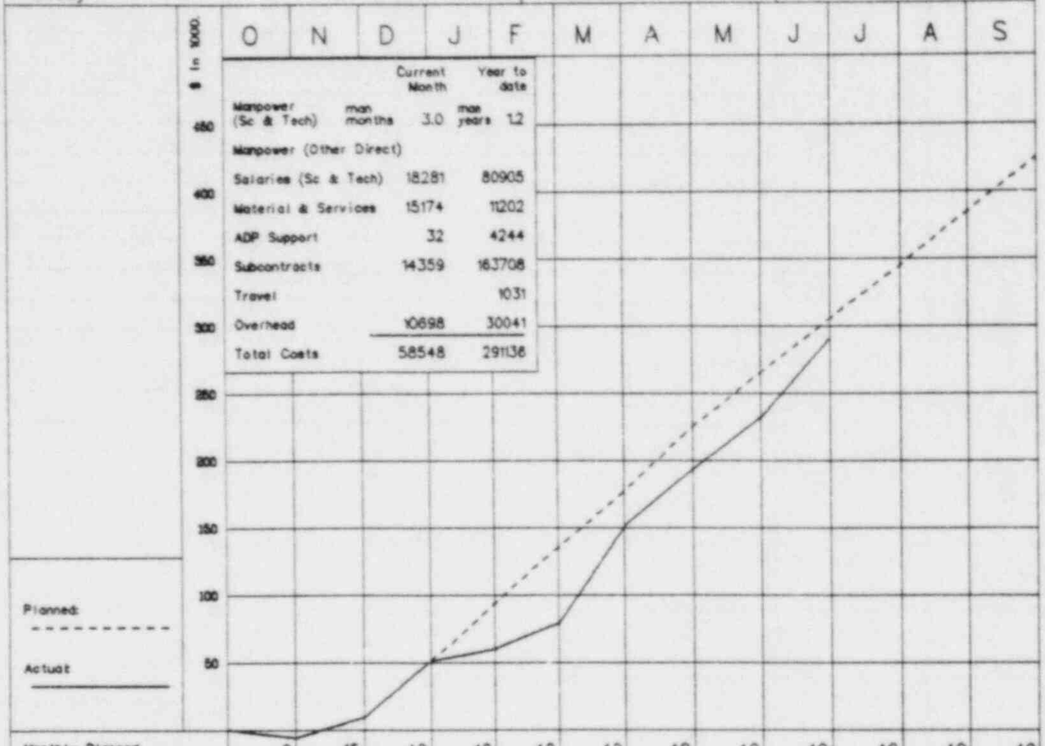
C. **Application to Existing Power Plant**

D. Issue Final Report

E. Issue Users Manual for NOAH Computer Code

COST/BUDGET REPORT

FIN No.: B0435			NRC Project Manager: F. Manning
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 02 6	NRC Act. No. 60 19 40 01	Program Director: Lotts/Flanagan
Program Title: LWR Accident Sequence Precursors Study		NRC Div.: RES/: RA	Program Manager: W. B. Cottrell
		ORNL Div.: ETD	Principal Investigator: W. B. Cottrell



		Current Month		Year to date
Manpower (Sc & Tech)	man months	3.0	man years	1.2
Manpower (Other Direct)				
Salaries (Sc & Tech)		18281		80905
Material & Services		15174		11202
ADP Support		32		4244
Subcontracts		14359		163708
Travel				1031
Overhead		10698		30041
Total Costs		58548		291138

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	-6	15	42	42	42	42	48	40	40	40	40	40
Cumulative Planned	-6	9	51	93	135	177	225	265	305	345	385	425
Monthly Actual	-6	15	42	9	19	72	42	39	59			
Cumulative Actual	-6	9	51	60	79	151	193	232	291			
Monthly Variance	0	0	0	-33	-23	+30	-6	-1	+19			
Cumulative Variance	0	0	0	-33	-56	-26	-32	-33	-14			

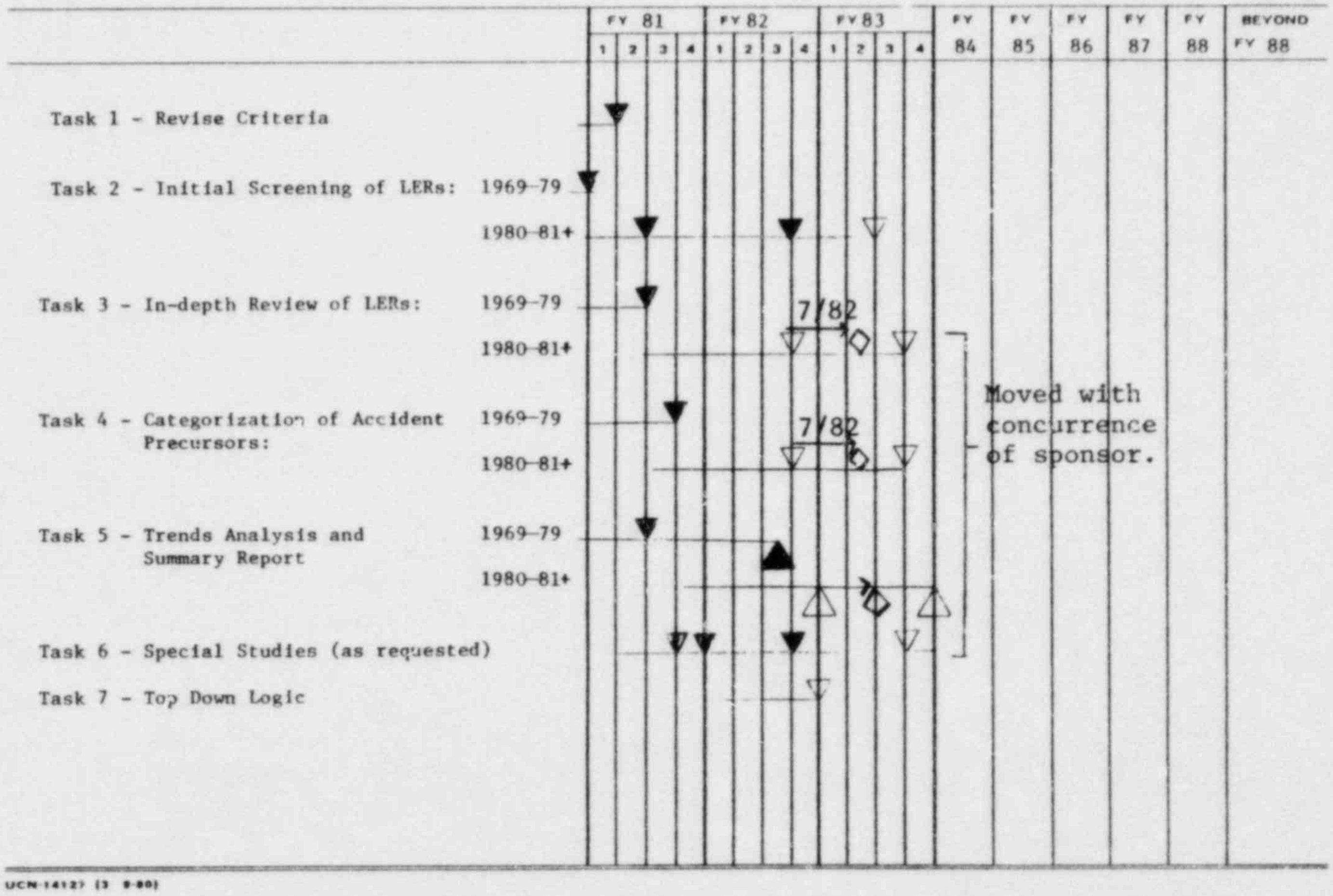
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	118	0	0	118	307
2	118	389	82	425	0
3	118	389	82	425	0
4					

Comments: Variance: -4.6%

MILESTONE BAR CHART

TITLE: Accident Sequence Precursors

ACTIVITY NO. 41 38 55 02 6
CONTRACTOR No. B0435



COST/BUDGET REPORT

FIN No.: B0431

NRC Project Manager: K. G. Murphy

Report For Period Ending: 06-31-82

ORNL Act No.: 41 88 55 02 4

NRC Act. No.: 60 19 40 00

Program Director: Lotts/Flanagan

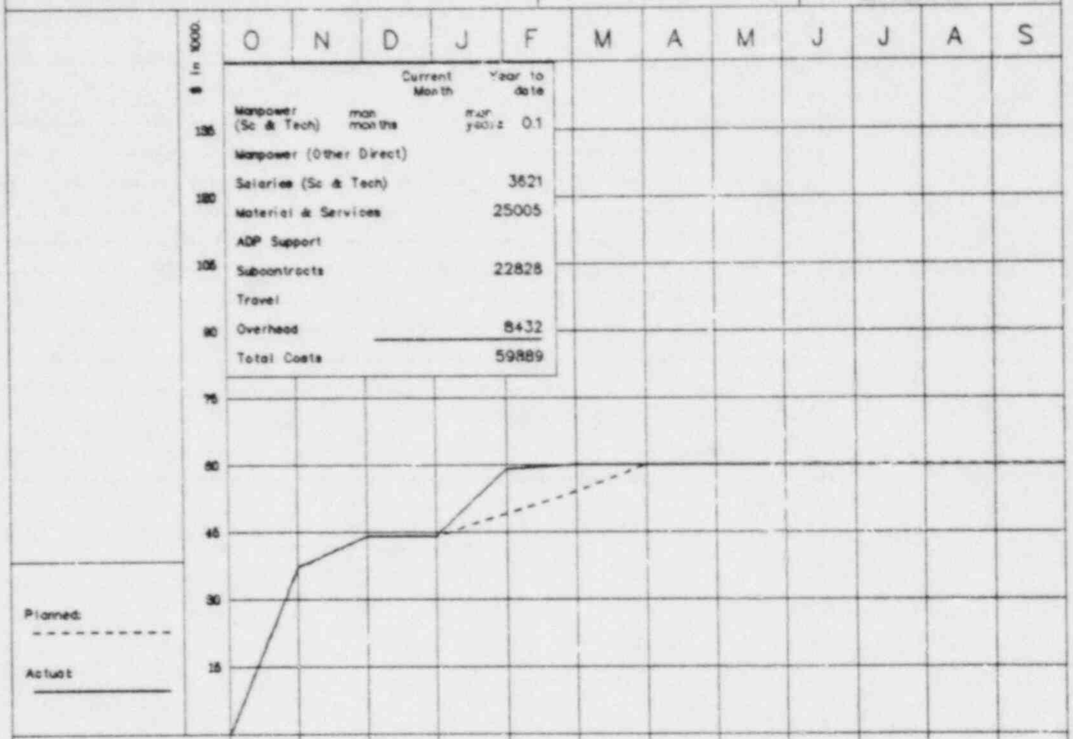
Program Title: LWR Systems Survey for PRA

NRC Div.: RES/: RA

ORNL Div.: ETD

Program Manager: W. B. Cottrell

Principal Investigator: W. B. Cottrell



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years: 0.1
Manpower (Other Direct)		
Salaries (Sc & Tech)		3621
Material & Services		25005
ADP Support		
Subcontracts		22828
Travel		
Overhead		8432
Total Costs		59889

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	37	7	0	5	5	6	0	0	0	0	0	0
Cumulative Planned	37	44	44	49	54	60	60	60	60	60	60	60
Monthly Actual	37	7	0	15	1	0	0	0	0			
Cumulative Actual	37	44	44	59	60	60	60	60	60			
Monthly Variance	0	0	0	+10	-4	-6	0	0	0			
Cumulative Variance	0	0	0	+10	+6	0	0	0	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	60	0	0	60	0
2	60	0	0	60	0
3	60	0	0	60	0
4					

Comments: Variance: 0.0%

Subcontract costs accrue irregularly and were responsible for high December and January costs. No costs were incurred last quarter pending arrangements to issue revised report.

MILESTONE BAR CHART

TITLE: LWR Systems Survey

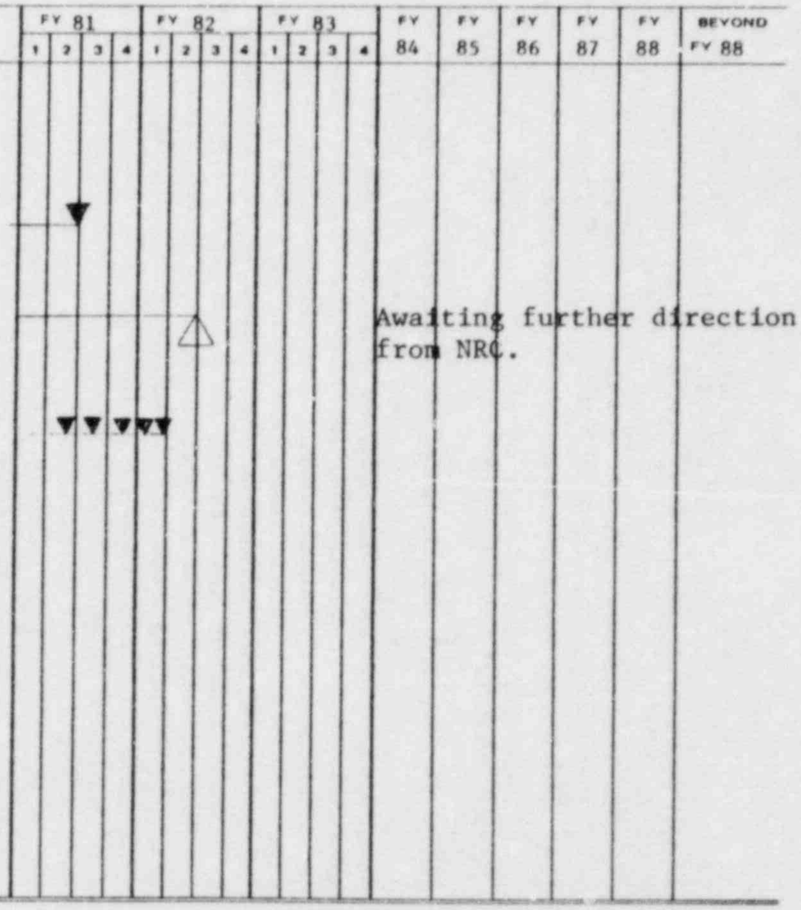
ACTIVITY NO. 41 88 55 02 4
CONTRACTOR NO. B0431

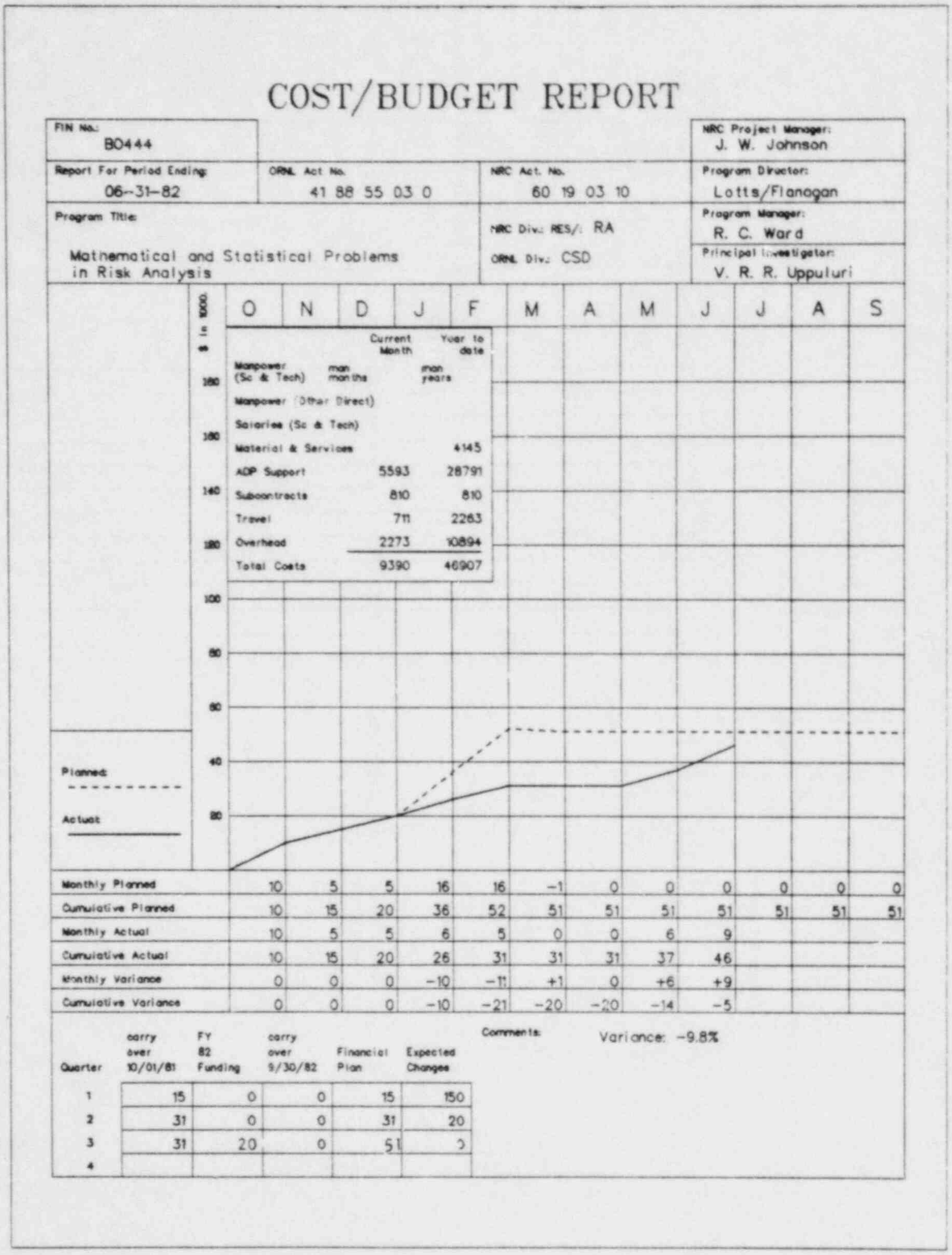
Task A: LWR Systems Survey

1. Preliminary Report (Data on all operating plants - updated annually)
2. Final Report (Updated annually)

Task B: Evaluation Data

1. Comparison of Data by units, vendors, AE, etc.





COST/BUDGET REPORT

FIN No.: B0444

NRC Project Manager: J. W. Johnson

Report For Period Ending: 06-31-82

ORNL Act No.: 41 88 55 03 0

NRC Act. No.: 60 19 03 10

Program Director: Lotts/Flanagan

Program Title: Mathematical and Statistical Problems in Risk Analysis

NRC Div.: RES/: RA

ORNL Div.: CSD

Program Manager: R. C. Ward

Principal Investigator: V. R. R. Uppuluri

	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services		4145
ADP Support	5593	28791
Subcontracts	810	810
Travel	711	2263
Overhead	2273	10894
Total Costs	9390	46907

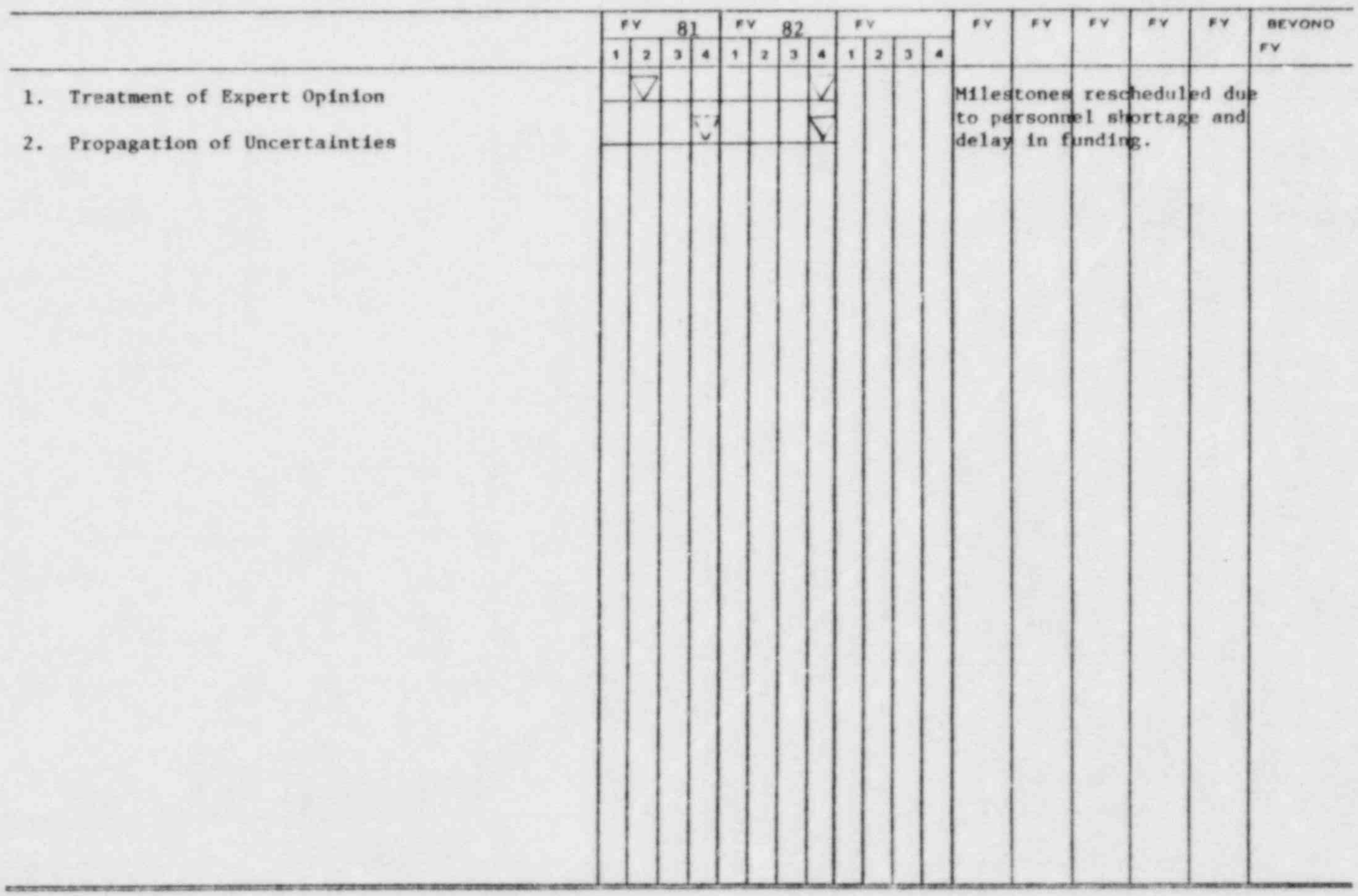
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	10	5	5	16	16	−1	0	0	0	0	0	0
Cumulative Planned	10	15	20	36	52	51	51	51	51	51	51	51
Monthly Actual	10	5	5	6	5	0	0	6	9			
Cumulative Actual	10	15	20	26	31	31	31	37	46			
Monthly Variance	0	0	0	−10	−11	+1	0	+6	+9			
Cumulative Variance	0	0	0	−10	−21	−20	−20	−14	−5			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	15	0	0	15	150
2	31	0	0	31	20
3	31	20	0	51	0
4					

Comments: Variance: −9.8%

MILESTONE BAR CHART

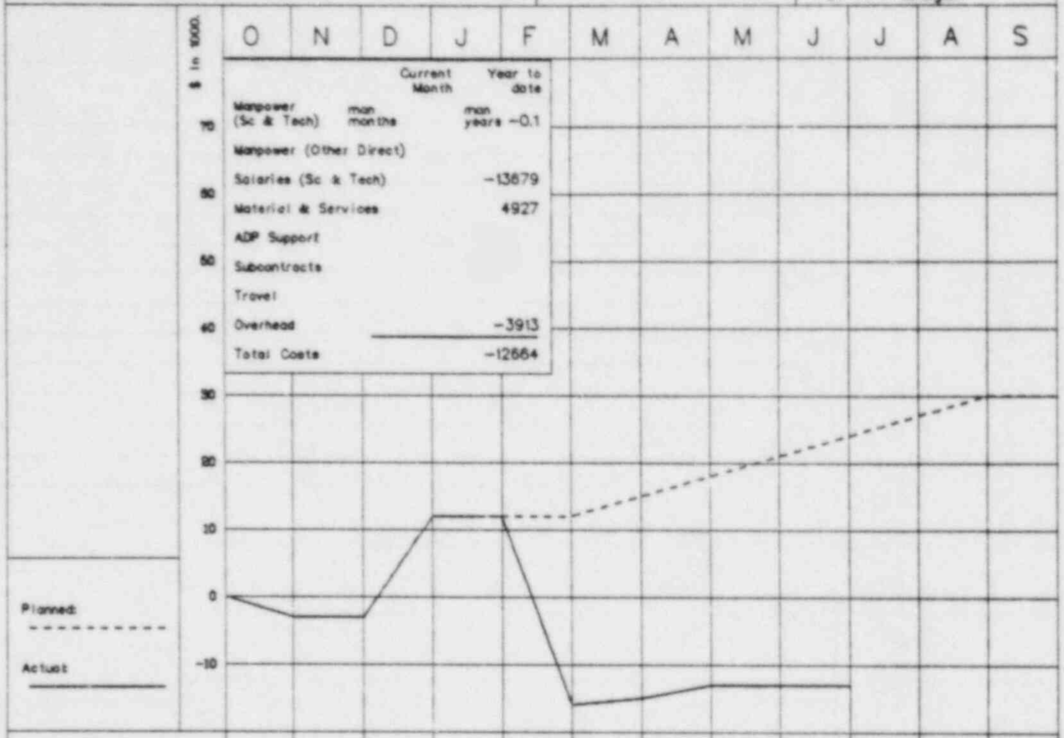
Title: Mathematical and Statistical Problems in Risk Analysis
Activity No. 189 B0344/ORNL # 41 88 55 03 0



Milestones rescheduled due to personnel shortage and delay in funding.

COST/BUDGET REPORT

FIN No.: B0465			NRC Project Manager: P. K. Niyogi
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 03 9	NRC Act. No. 60 81 22 7	Program Director: Lotts/Flanagan
Program Title: Risk Analysis Evaluations		NRC Div.: RES/: RA	Program Manager: G. F. Flanagan
		ORNL Div.: EPD	Principal Investigator: G. F. Flanagan



		Current Month	Year to date
Manpower (Sc & Tech)	man months		man years -0.1
Manpower (Other Direct)			
Salaries (Sc & Tech)			-13679
Material & Services			4927
ADP Support			
Subcontracts			
Travel			
Overhead			-3913
Total Costs			-12664

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	-3	0	15	0	0	3	3	3	3	3	3	0
Cumulative Planned	-3	-3	12	12	12	15	18	21	24	27	30	30
Monthly Actual	-3	0	15	0	-28	1	2	0	0			
Cumulative Actual	-3	-3	12	12	-16	-15	-13	-13	-13			
Monthly Variance	0	0	0	0	-28	-2	-1	-3	-3			
Cumulative Variance	0	0	0	0	-28	-30	-31	-34	-37			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	30	0	0	30	0
2	30	0	0	30	0
3	30	0	0	30	0
4					

Comments: Variance: -154.2%

Incorrect charges were backed out of account in anticipation of subcontractor charges to be accrued next quarter.

MILESTONE BAR CHART

TITLE: Risk Analysis Evaluations

ACTIVITY NO: 40 10 01 06 5 B0465

A. Define and Evaluate Issues Presented in PRA

B. Evaluate the Implications of the Results with Regard to Numerical Safety Criteria

C. Evaluate and Illustrate By Example the Techniques to Introduce Formal Decision Making Approaches into NRC's Use of Risk Analysis

[illegible]

COST/BUDGET REPORT

FIN No.: B0172

NRC Project Manager: W. R. Lahs

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 01 0

NRC Act. No. 60 19 02 30 3

Program Director: Lotts/Flanagan

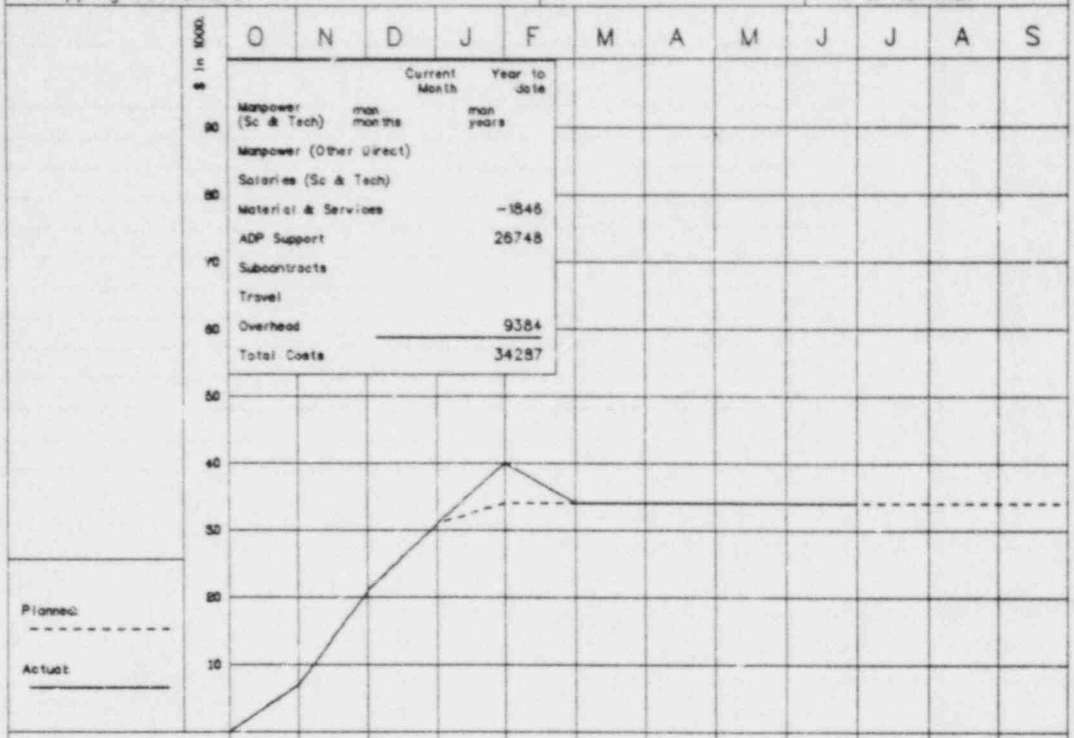
Program Title: Standardized Analysis of Fuel Shipping Containers

NRC Div.: RES/: RA

ORNL Div.: CSD

Program Manager: C. V. Parks

Principal Investigator: T. J. Hoffman



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services		-1846
ADP Support		26748
Subcontracts		
Travel		
Overhead		9384
Total Costs		34287

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	7	14	10	3	0	0	0	0	0	0	0	0
Cumulative Planned	7	21	31	34	34	34	34	34	34	34	34	34
Monthly Actual	7	14	10	9	-6	0	0	0	0			
Cumulative Actual	7	21	31	40	34	34	34	34	34			
Monthly Variance	0	0	0	+6	-6	0	0	0	0			
Cumulative Variance	0	0	0	+6	0	0	0	0	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	34	0	0	34	0
2	34	0	0	34	0
3	34	0	0	34	0
4					

Comments: Variance: 0.0%

COST/BUDGET REPORT

FIN No.: B0458

NRC Project Manager: P. Rathbun

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 5

NRC Act. No. 60 19 03 10

Program Director: Lotts/Flanagan

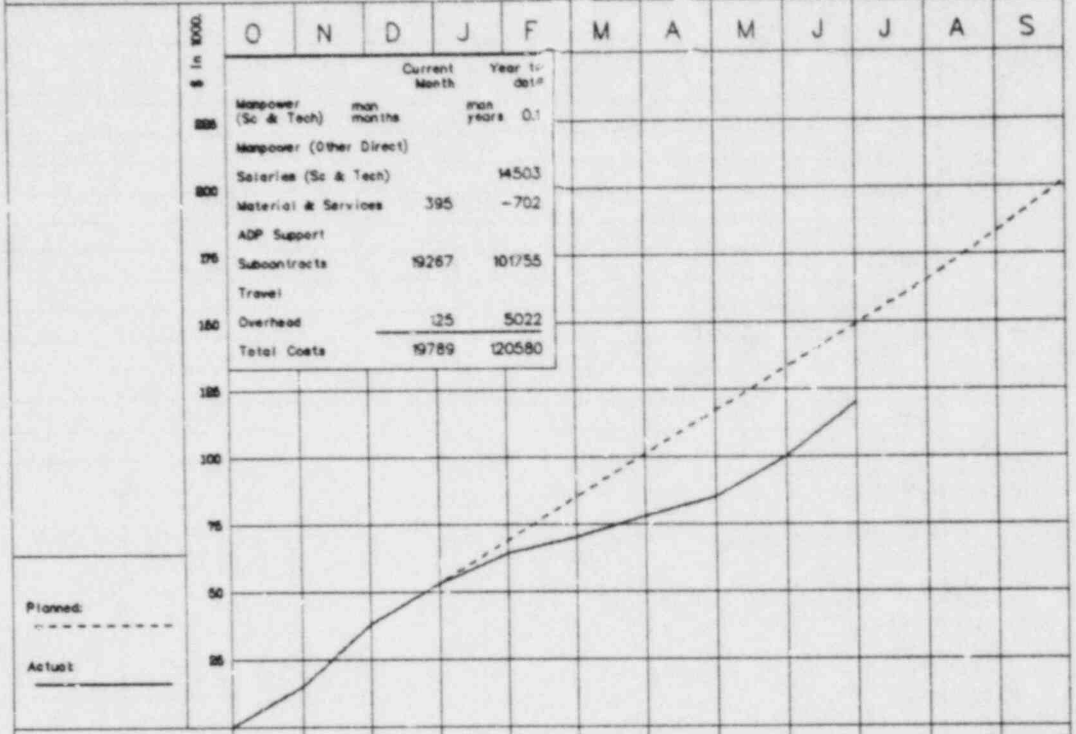
Program Title: Utilization of Risk Analysis and Risk Criteria

NRC Div.: RES. RA

ORNL Div.: EPD

Program Manager: G. F. Flanagan

Principal Investigator: G. F. Flanagan



		Current Month		Year to date
Manpower (Sc & Tech)	man months		man years	0.1
Manpower (Other Direct)				
Salaries (Sc & Tech)				14503
Material & Services		395		-702
ADP Support				
Subcontracts		19267		101755
Travel				
Overhead		125		5022
Total Costs		19789		120580

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	15	23	15	16	16	16	16	16	16	16	18	19
Cumulative Planned	15	38	53	69	85	101	117	133	149	165	183	202
Monthly Actual	15	23	15	11	6	8	7	15	20			
Cumulative Actual	15	38	53	64	70	78	85	100	120			
Monthly Variance	0	0	0	-5	-10	-8	-9	-1	+4			
Cumulative Variance	0	0	0	-5	-15	-23	-32	-33	-29			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	127	0	125	2	200
2	127	0	125	2	200
3	127	0	125	2	200
4					

Comments: Variance: -19.5%

Program has been delayed due to delay in receipt of FY 1982 funding.

MILESTONE BAR CHART

TITLE: Utilization of Risk Analysis and Risk Criteria

ACTIVITY NO: 40 10 01 06 5 B0458

A. Review Documents

B. Detail Project Objectives

C. Define Risk Criteria Performance Characteristics

D. Evaluate Criteria
   1. Identify
   2. Evaluate
   3. Interim Report (WD) on Tasks 1 and 2

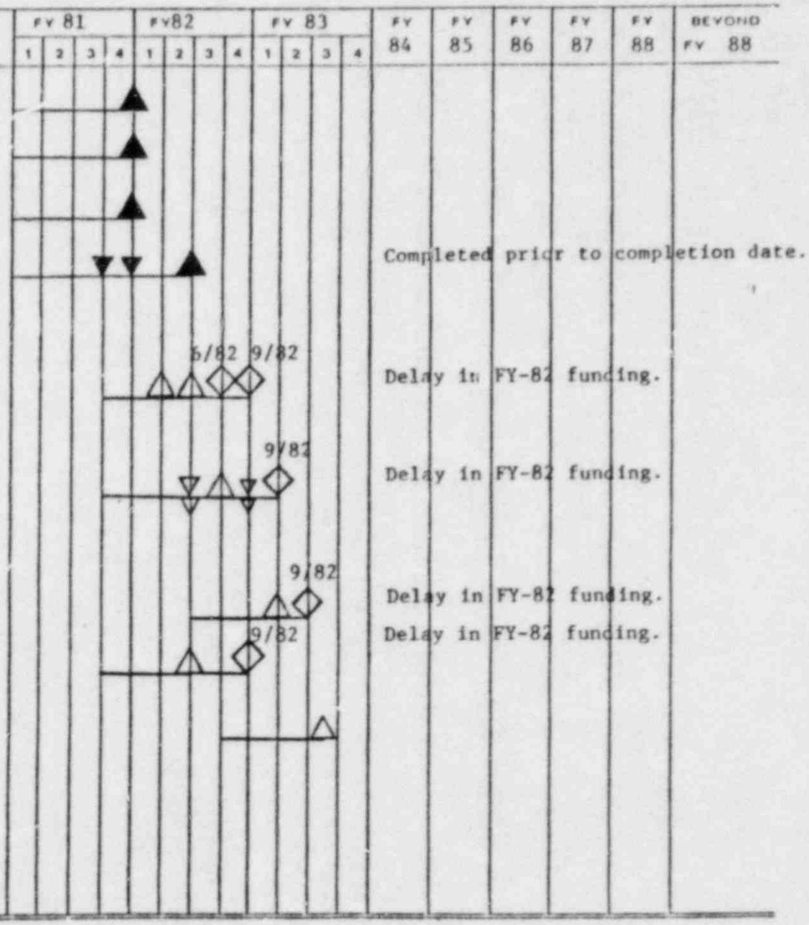
E. Rank Proposed Criteria
   1. Develop weighting scheme
   2. Apply weighting scheme

F. Approaches to Risk Management
   1. Identify alternatives
   2. Evaluate alternatives
   3. Interim Report (WD) on Tasks 1 and 2

G. Prepare NUREG Report

H. Identify Hierarchy of Objectives that an Appropriate Risk Goal Should Serve

I. Develop Implementation Scheme for Managing Risks within NRC Organizational Structure



DIVISION OF FACILITY OPERATIONS

COST/BUDGET REPORT

FIN No.:

NRC Project Manager:

Report For Period Ending: 06-31-82

ORNL Act No.:

NRC Act. No.:

Program Director:

Program Title: Summary

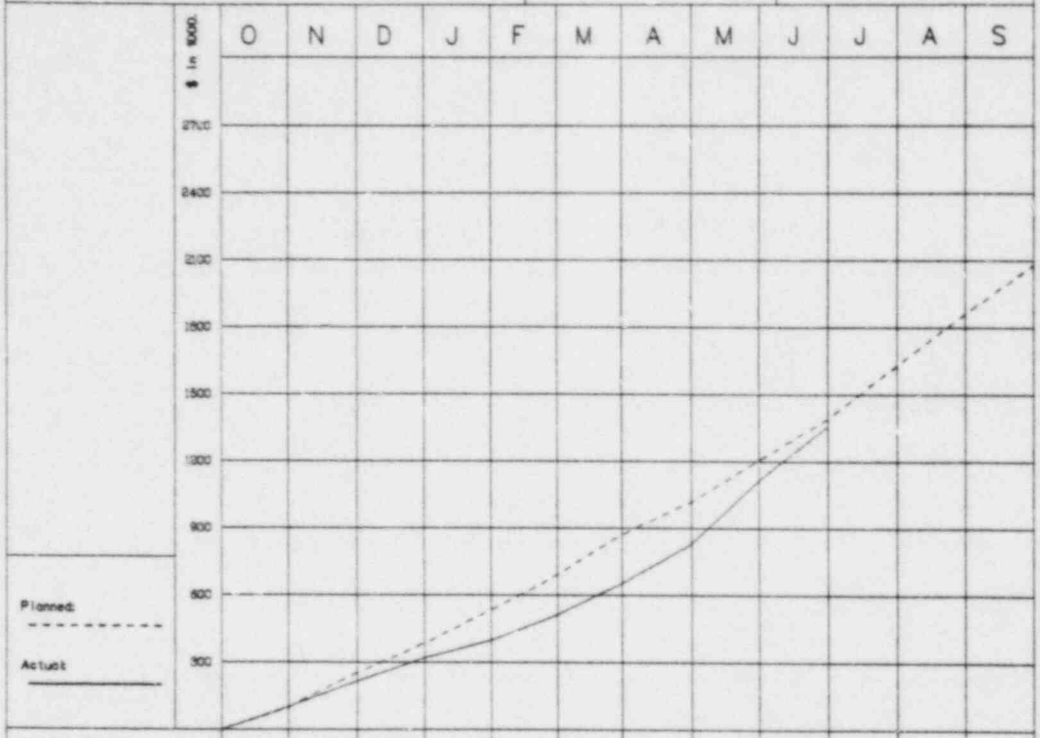
Office of Nuclear
Regulatory Research

NRC Div.: RES/: FO

ORNL Div.:

Program Manager:

Principal Investigator:



	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	99	153	133	147	158	182	146	188	182	242	232	218
Cumulative Planned	99	252	385	532	690	872	1018	1206	1388	1630	1862	2080
Monthly Actual	101	113	104	79	116	138	177	288	242			
Cumulative Actual	101	214	318	397	513	651	828	1116	1358			
Monthly Variance	+2	−40	−29	−68	−42	−44	+31	+100	+60			
Cumulative Variance	+2	−38	−67	−135	−177	−221	−190	−90	−30			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	112	458	138	432	1192
2	112	1655	184	1583	215
3	112	2343	375	2080	0
4					

Comments: Variance: −2.2%

COST/BUDGET REPORT

FIN No.: B0480

NRC Project Manager: R. E. Alexander

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 04 6

NRC Act. No.

Program Director: Lotts/Fry

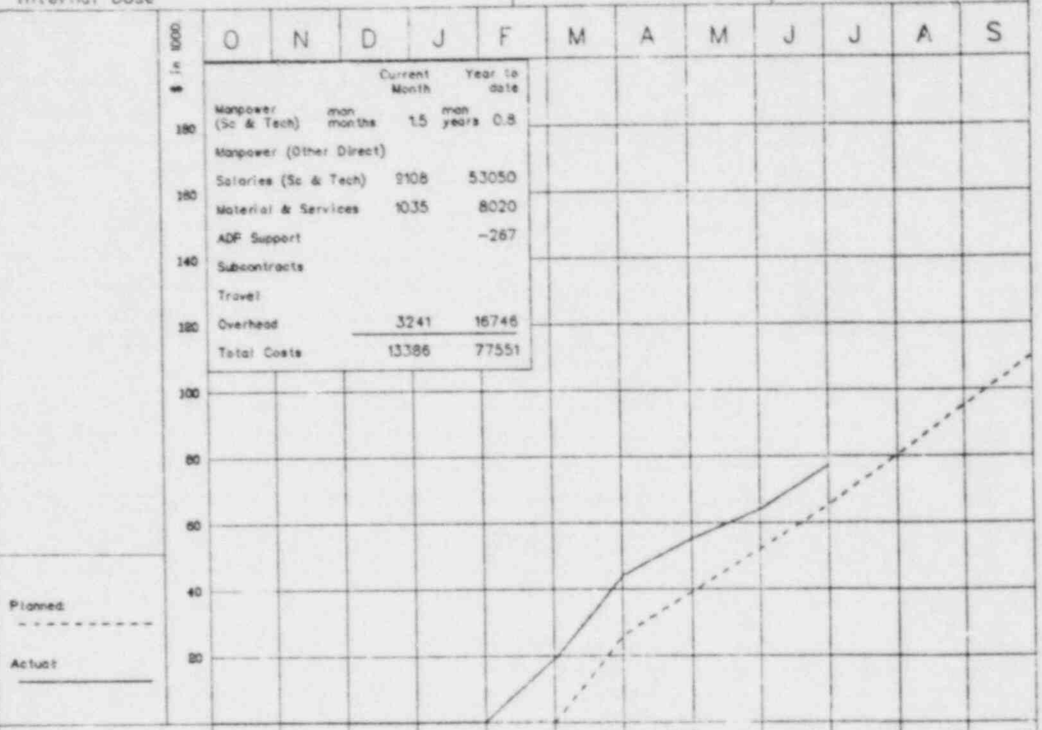
Program Title: Bioassay Methods Estimation of Internal Dose

NRC Div. RES/: FO

ORNL Div. HASRD

Program Manager: K. F. Eckerman

Principal Investigator: K. F. Eckerman



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.5	man years	0.8
Manpower (Other Direct)				
Salaries (Sc & Tech)		9108		53050
Material & Services		1035		8020
ADP Support				-267
Subcontracts				
Travel				
Overhead		3241		16746
Total Costs		13386		77551

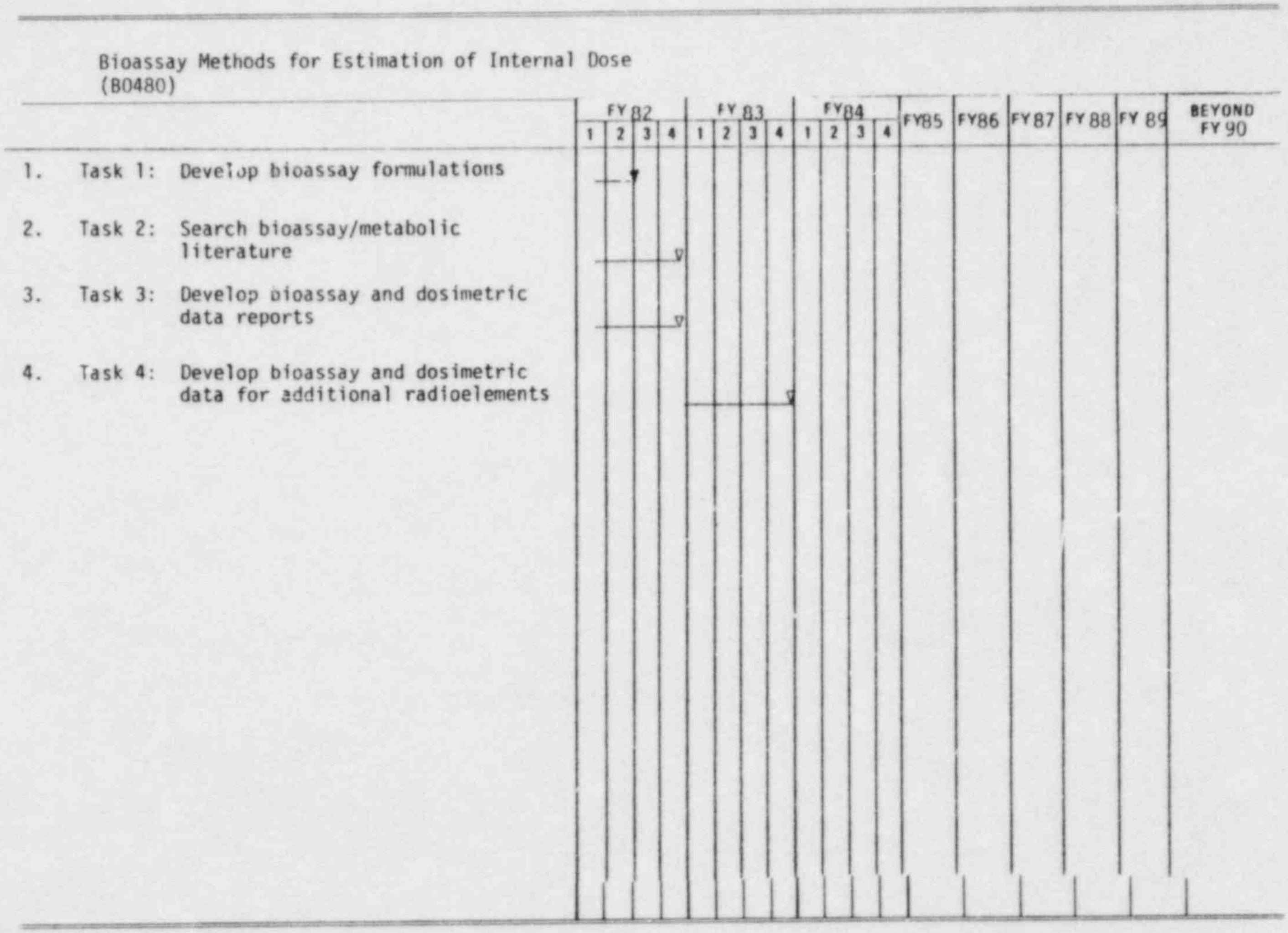
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	26	13	13	13	15	15	15
Cumulative Planned	0	0	0	0	0	26	39	52	65	80	95	110
Monthly Actual	0	0	0	0	19	25	11	9	13			
Cumulative Actual	0	0	0	0	19	44	55	64	77			
Monthly Variance	0	0	0	0	+19	-1	-2	-4	0			
Cumulative Variance	0	0	0	0	+19	+18	+16	+12	+12			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	156	46	110	0
3	0	156	46	110	0
4					

Comments: Variance: +18.5%

Variance due to unexpected delay in FY 1982 funding. Costs charged before funds received.

MILESTONE BAR CHART



UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0442

NRC Project Manager: G. S. ewis

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 12 8

NRC Act. No.: 60 19 11 01

Program Director: Lotts/Fry

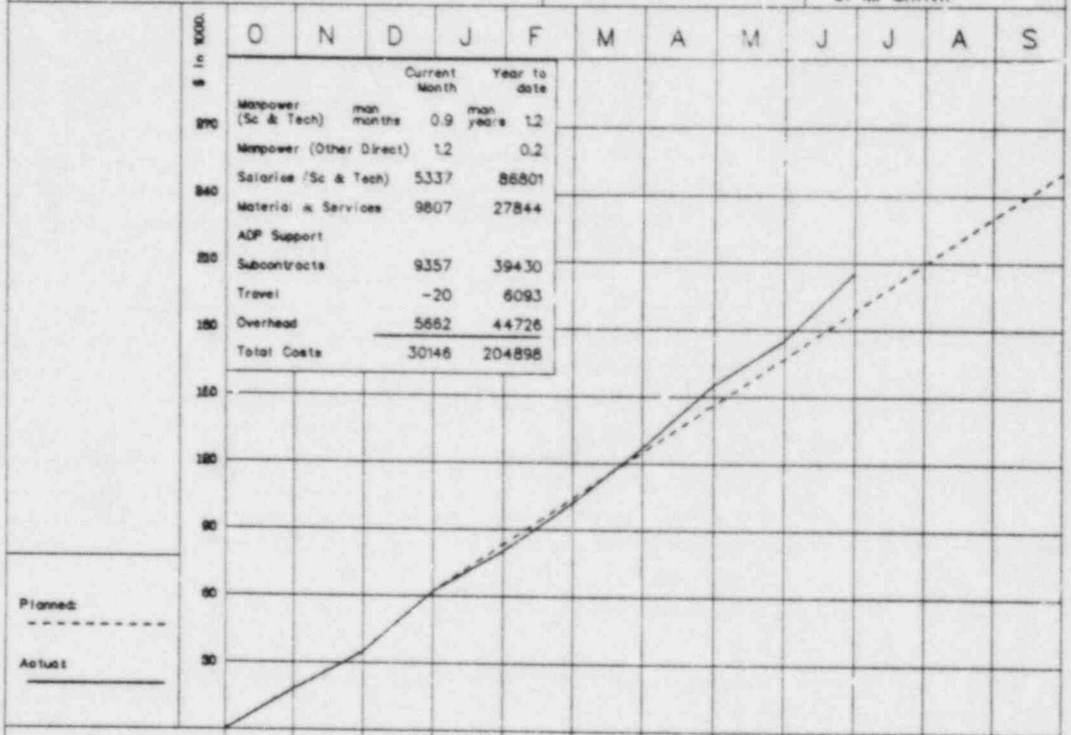
Program Title: Continuous On-Line Reactor Surveillance System

NRC Div.: RES/: FO

ORNL Div.: I&C

Program Manager: D. N. Fry

Principal Investigator: C. M. Smith



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.9	man years	1.2
Manpower (Other Direct)		1.2		0.2
Salaries (Sc & Tech)		5337		86801
Material & Services		9807		27844
ADP Support				
Subcontracts		9357		39430
Travel		-20		6093
Overhead		5662		44726
Total Costs		30146		204898

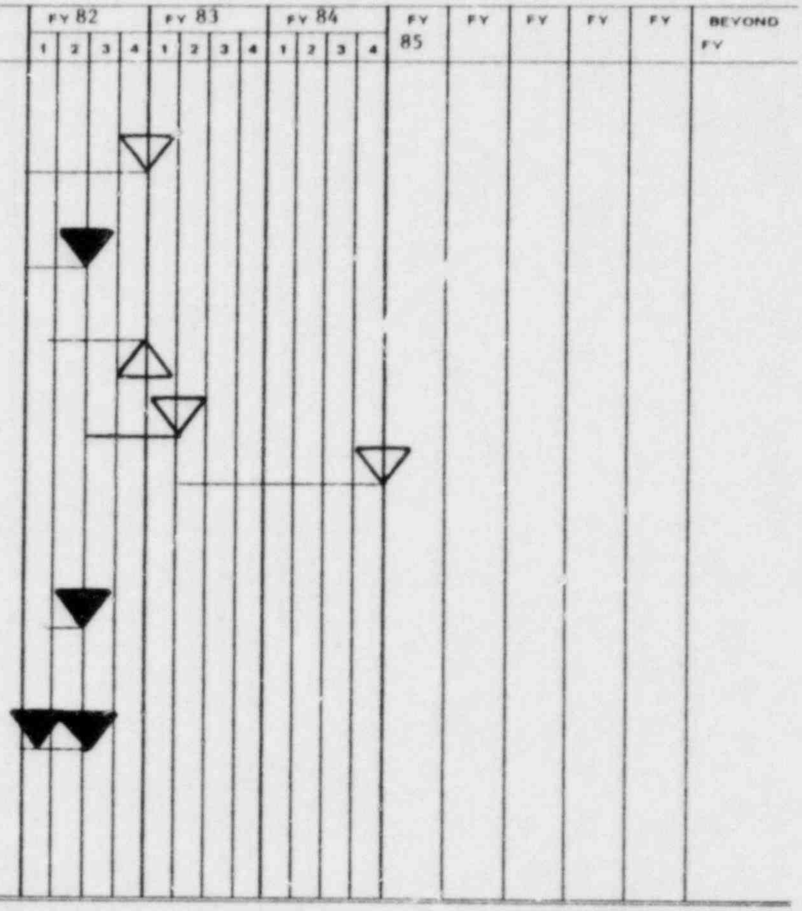
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	18	17	27	21	21	21	21	21	21	21	21	20
Cumulative Planned	18	35	62	83	104	125	146	167	188	209	230	250
Monthly Actual	18	17	27	18	22	25	28	20	30			
Cumulative Actual	18	35	62	80	102	127	155	175	205			
Monthly Variance	0	0	0	-3	+1	+4	+7	-1	+9			
Cumulative Variance	0	0	0	-3	-2	+2	+9	+8	+17			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	40	0	40	210
2	0	250	0	250	0
3	0	250	0	250	0
4					

Comments: Variance: +9.0%

MILESTONE BAR CHART

Title: Continuous On-Line Reactor Noise Surveillance System Evaluations
Activity No: 41 89 55 12 2/NRC #60 19 11 01 (B0442)



Task 1: In-Plant Demonstration of On-Line Noise Surveillance System

a. Complete in-plant demonstration of the surveillance system at Sequoyah Unit 1.

b. Submit plan for demonstration of the surveillance system at a BWR.

c. Complete draft description of hardware and software for the surveillance system.

d. Transfer surveillance system to BWR.

e. Perform in-plant demonstration of surveillance system at BWR.

Task 2: Procurement of NRC Surveillance System

a. Submit letter cost estimate for a second surveillance system.

Task 3: Data from Test Facilities

a. Record noise data during tests at LOFT.

MILESTONE BAR CHART

Title: Continuous On-Line Reactor Noise Surveillance System Evaluations
Activity No: 41 89 55 12 8/NRC #60 19 11 01 (B0442)

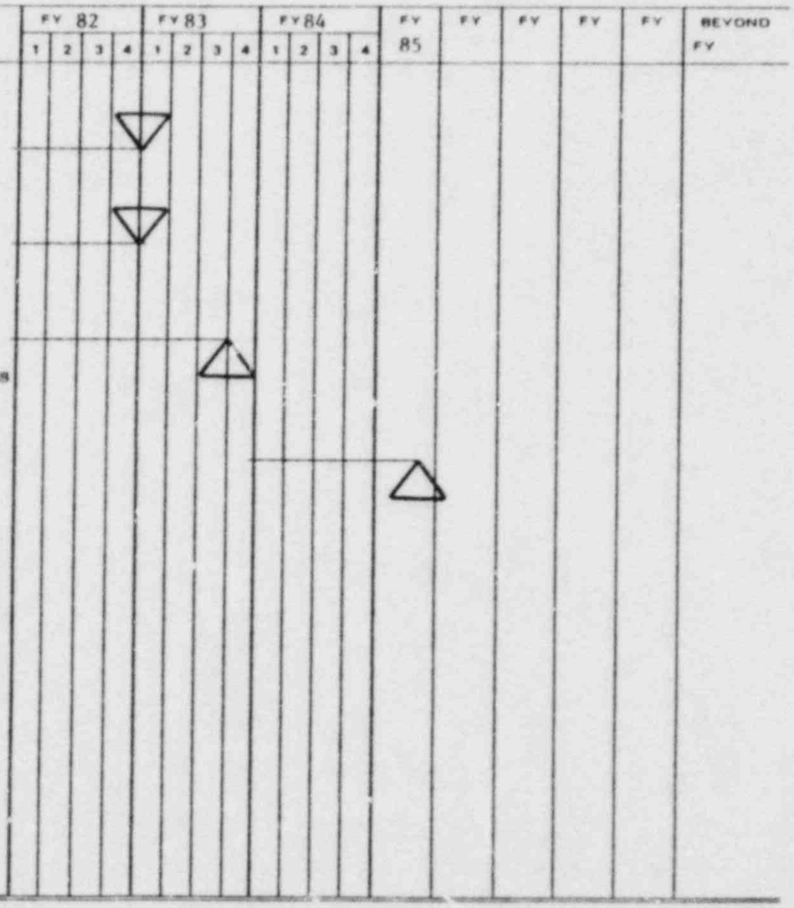
Task 4: <u>Data Analysis</u>

a. Establish a baseline signature for normal Sequoyah PWR operating characteristics.

b. Submit preliminary report on analysis of LOFT and Semiscale noise data.

c. Submit draft report on feasibility of on-line surveillance system for detection and diagnosis of anomalous PWR operating conditions.

d. Complete evaluation of surveillance system in BWR and establish a BWR baseline signature for normal operating characteristics.



COST/BUDGET REPORT

FIN No.: B0461

NRC Project Manager: J. P. Jenkins

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 6

NRC Act. No. 60 81 12 5

Program Director: Loits/Fry

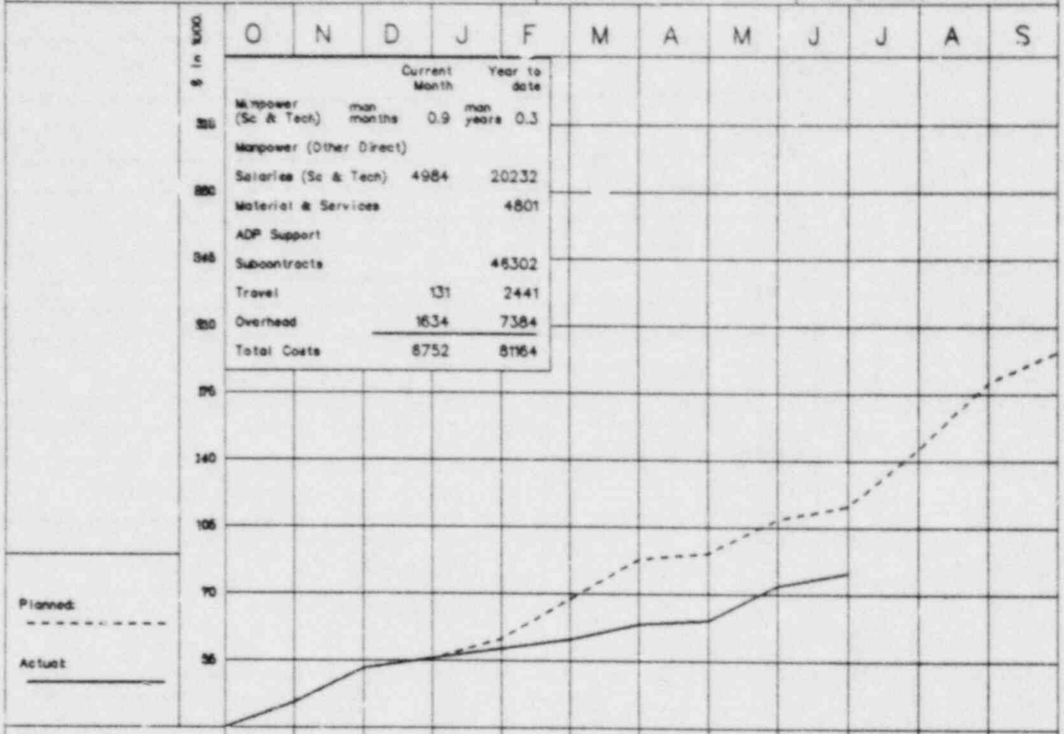
Program Title: Maintenance Error Model

NRC Div.: RES/: FO

ORNL Div.: EPD

Program Manager: P. M. Haas

Principal Investigator: H. E. Knee



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.9	man years	0.3
Manpower (Other Direct)				
Salaries (Sc & Tech)		4984		20232
Material & Services				4801
ADP Support				
Subcontracts				46302
Travel		131		2441
Overhead		1634		7384
Total Costs		8752		81164

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	13	18	5	10	21	21	3	18	7	30	35	16
Cumulative Planned	13	31	36	46	67	88	91	109	116	146	181	197
Monthly Actual	13	18	5	5	5	8	2	18	7			
Cumulative Actual	13	31	36	41	46	54	56	74	81			
Monthly Variance	0	0	0	−5	−16	−13	−1	0	0			
Cumulative Variance	0	0	0	−5	−21	−34	−35	−35	−35			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	44	0	80	−36	250
2	44	35	80	−1	215
3	44	323	170	197	0
4					

Comments: Variance −30.2%

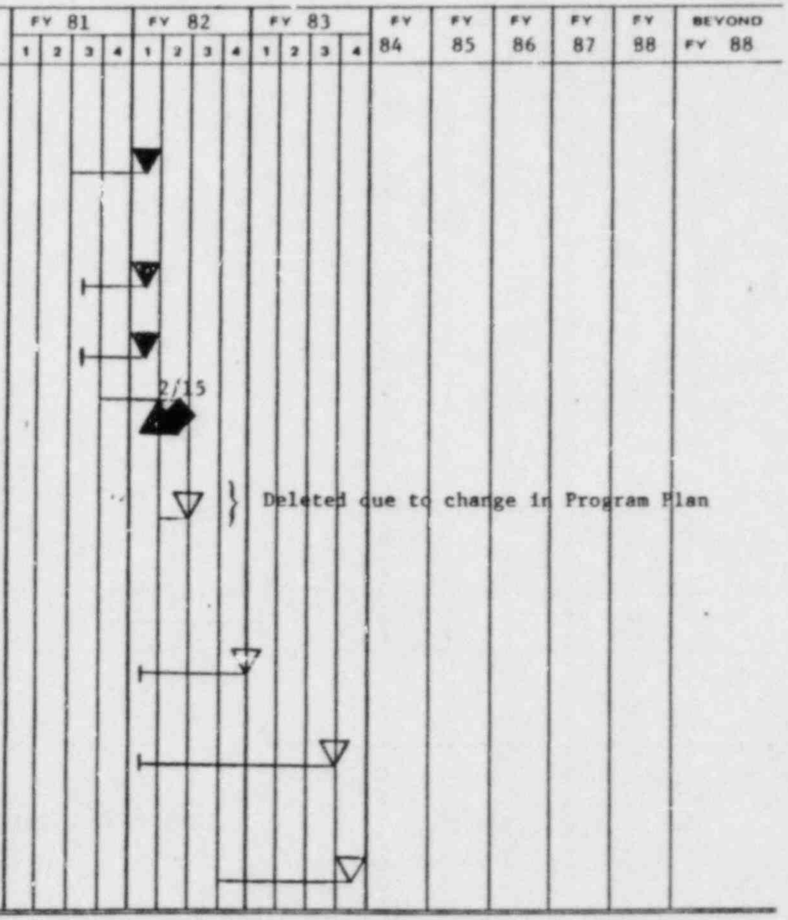
Program slowed due to delay in receipt of FY 1982 funds.

MILESTONE BAR CHART

TITLE: Maintenance Error Model

ACTIVITY NO: 41 88 55 03 6 B0461

1. Task 1: <u>Scoping Study</u>
   - a. Review existing human reliability methodology for application to NPP maintenance tasks
   - b. Survey potential users to identify model requirements
   - c. Perform initial job/task analysis
   - d. Issue comprehensive program plan
   - e. Review current job performance aids (JPAs) for NPP maintenance tasks and provide comments to NRC on potential JPAs
2. Task 2: <u>Model Development</u>
   - a. Formulate analytical model using existing methodology as possible
   - b. Collect necessary job/task analytic data to support model development
   - c. Develop computer simulation model

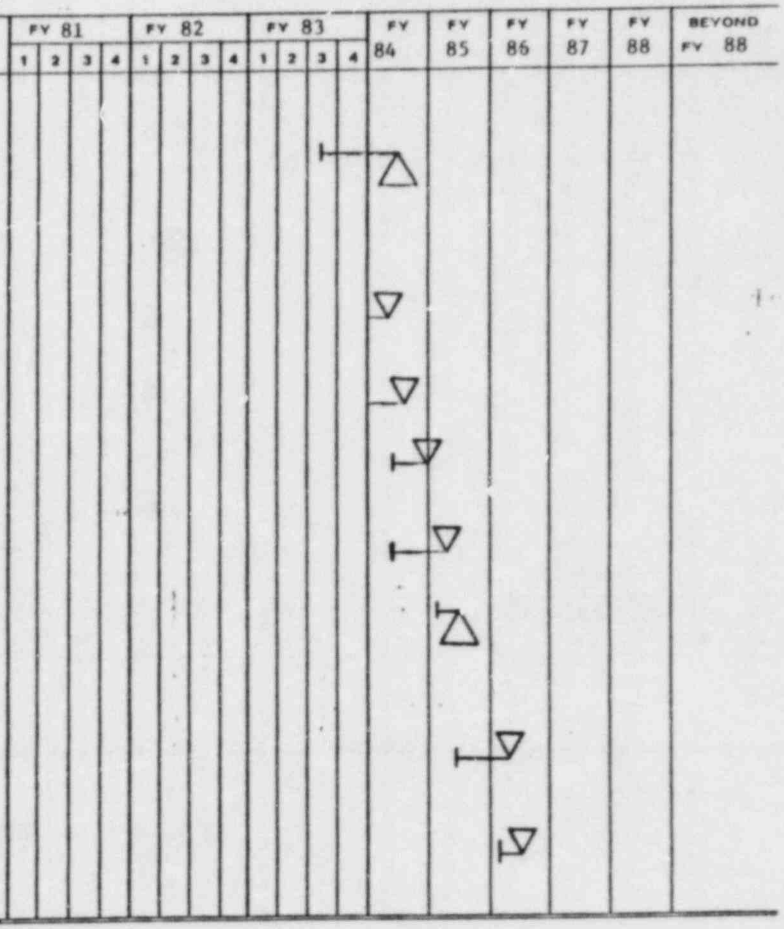


UCN-14127 (3 9-80)

MILESTONE BAR CHART

TITLE: Maintenance Error Model

ACTIVITY NO: 41 88 55 03 6 B0461



2. Task 2: Model Development (Continued)

    d. Debug and document computer model

3. Task 3: Model Validation

    a. Select sample cases and identify required input data for validation

    b. Collect necessary input data

    c. Apply model to predict maintenance personnel reliability for sample cases

    d. Collect and assess available data to validate model prediction

    e. Document model validation

4. Task 4: Transfer Model to Users

    a. Develop necessary training materials and documentation

    b. Provide training courses as necessary to transfer methodology and data collected to users

UCN-14137 (3 9-30)

COST/BUDGET REPORT

FIN No.: B0191

NRC Project Manager: G. S. Lewis

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 11 4

NRC Act. No. 60 19 11 01

Program Director: Lotts/Fry

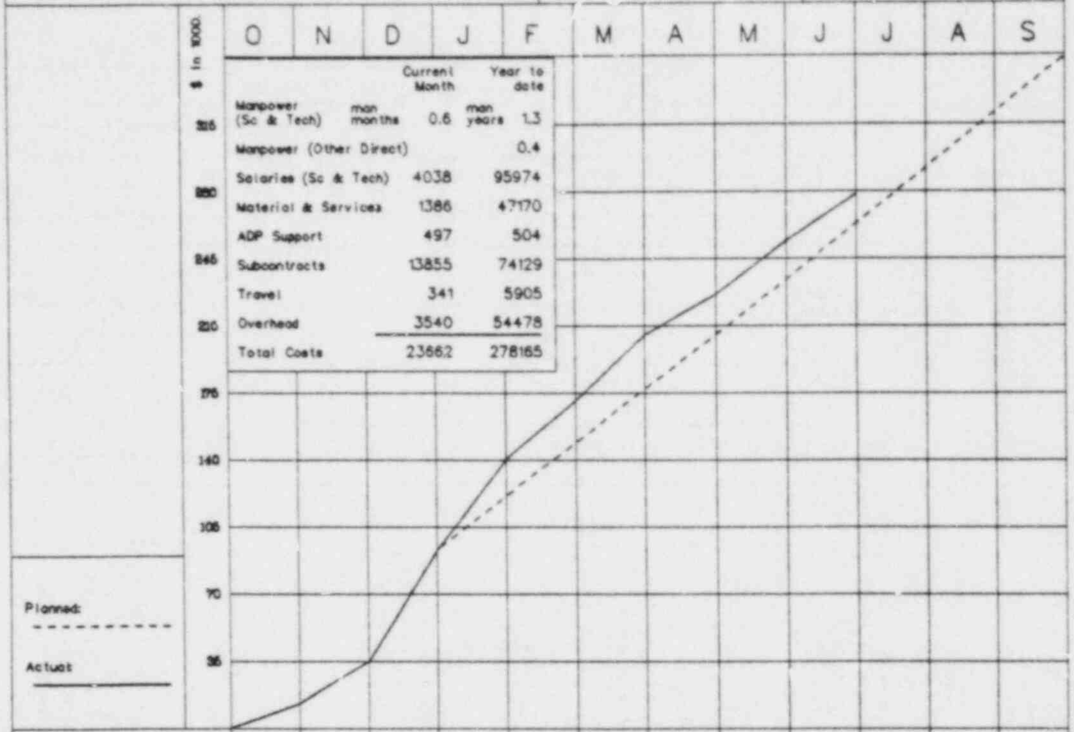
Program Title: Noise Diagnostics for Safety Assessment

NRC L v.: RES/: FO

ORNL Di : I&C

Program Manager: D. N. Fry

Principal Investigator: J. A. Mullens



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.6	man years	1.3
Manpower (Other Direct)				0.4
Salaries (Sc & Tech)		4038		95974
Material & Services		1386		47170
ADP Support		497		504
Subcontracts		13855		74129
Travel		341		5905
Overhead		3540		54478
Total Costs		23662		278165

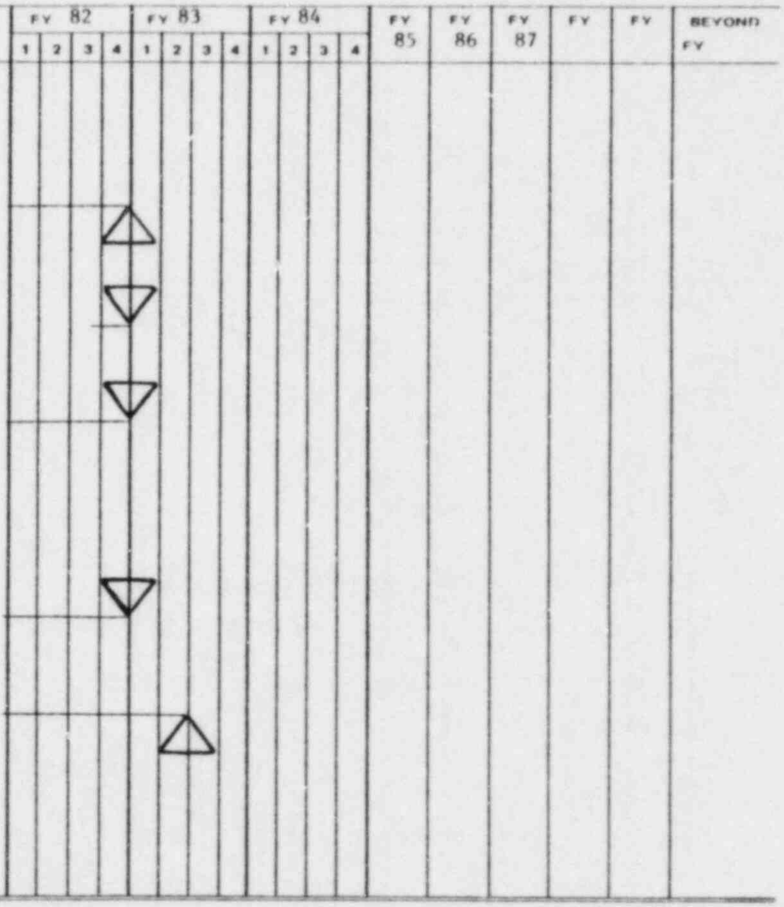
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	13	22	58	28	28	28	28	29	29	29	29	29
Cumulative Planned	13	35	93	121	149	177	205	234	263	292	321	350
Monthly Actual	13	22	58	47	31	34	21	28	24			
Cumulative Actual	13	35	93	140	171	205	226	254	278			
Monthly Variance	0	0	0	+19	+3	+6	−7	−1	−5			
Cumulative Variance	0	0	0	+19	+22	+28	+21	+20	+15			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	48	0	48	302
2	0	350	0	350	0
3	0	350	0	350	0
4					

Comments: Variance: +5.7%

MILESTONE BAR CHART

Title: Noise Diagnostic Methods for Safety Assessments
Activity No: 41 89 55 11 4/NRC #60 19 11 01 (B0191)



Task 1: Monitoring Methods to Detect and Quantify Flow-Induced Vibrations of In-Vessel Components

a. Complete assessment of sensitivity of neutron noise for PWR fuel assembly vibration monitoring and submit draft report.

b. Initiate study of feasibility of detecting thermal shield vibration with neutron noise.

c. Develop program to obtain capability to calculate vibrational frequencies of in-vessel components for NRC approval.

Task 2: Surveillance and Diagnostics by Noise Analysis

a. Obtain continuous baseline neutron noise signatures from Sequoyah Unit 1 PWR.

b. Complete analysis and cataloging of baseline neutron noise signatures obtained from operating reactors and issue draft of final report of baseline neutron noise signatures.

MILESTONE BAR CHART

Title: Noise Diagnostic Methods for Safety Assessments
Activity No: 41 89 55 11 4/NRC #60 19 11 01 (B0191)

Task 2: Surveillance and Diagnostics by Noise Analysis (continued)

c. Complete assessment of feasibility of PWR boiling detection by neutron noise and submit draft report.

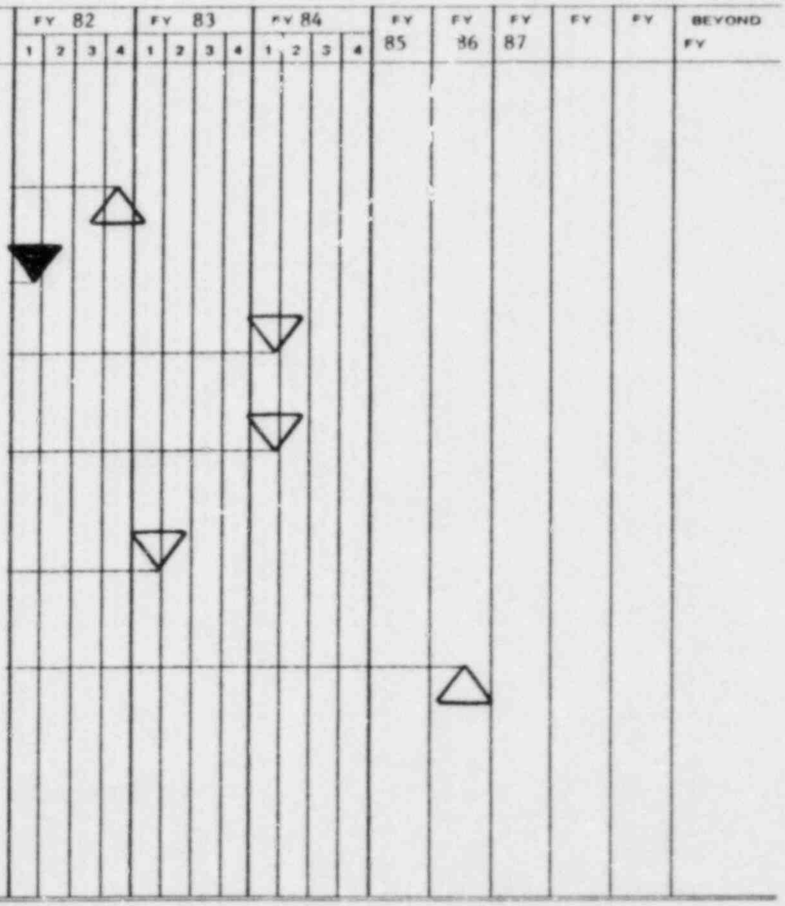
d. Complete SMORN benchmark analysis and submit draft report.

e. Complete study to determine sources of pressure noise in PWRs and issue letter report.

f. Complete study to understand propagation of pressure noise in PWR primary system and issue letter report

g. Complete assessment of pressure noise measurement methods and issue letter report.

h. Complete study of application of pressure noise for diagnosis of primary system anomalies and issue final report on assessment of pressure noise.



UCN-14127 (3 9-80)

MILESTONE BAR CHART

Title: Noise Diagnostic Methods for Safety Assessments
Activity No: 41 89 55 11 4/NRC #60 19 11 01 (B0191)

Task 2: Surveillance and Diagnostics by Noise Analysis (continued)

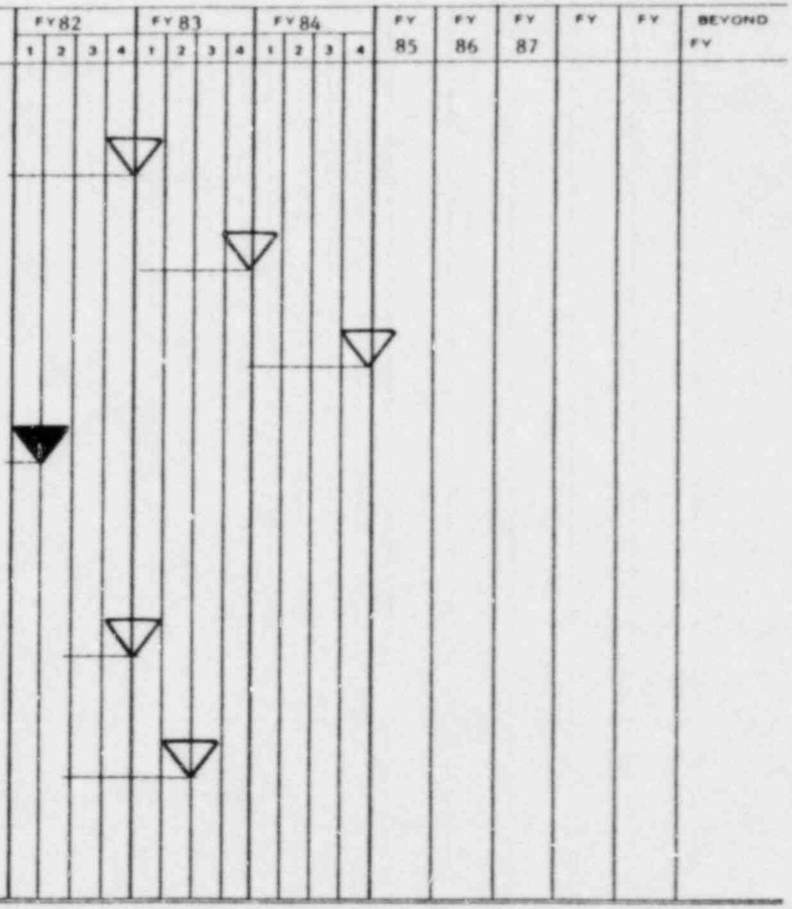
- i. Develop program plan for temperature noise diagnostics and submit letter report.
- j. Complete preliminary assessment of temperature noise.
- k. Complete final assessment of temperature noise.

Task 3: Primary Water Inventory Surveillance

- a. Submit letter report on feasibility study of primary water inventory monitoring.

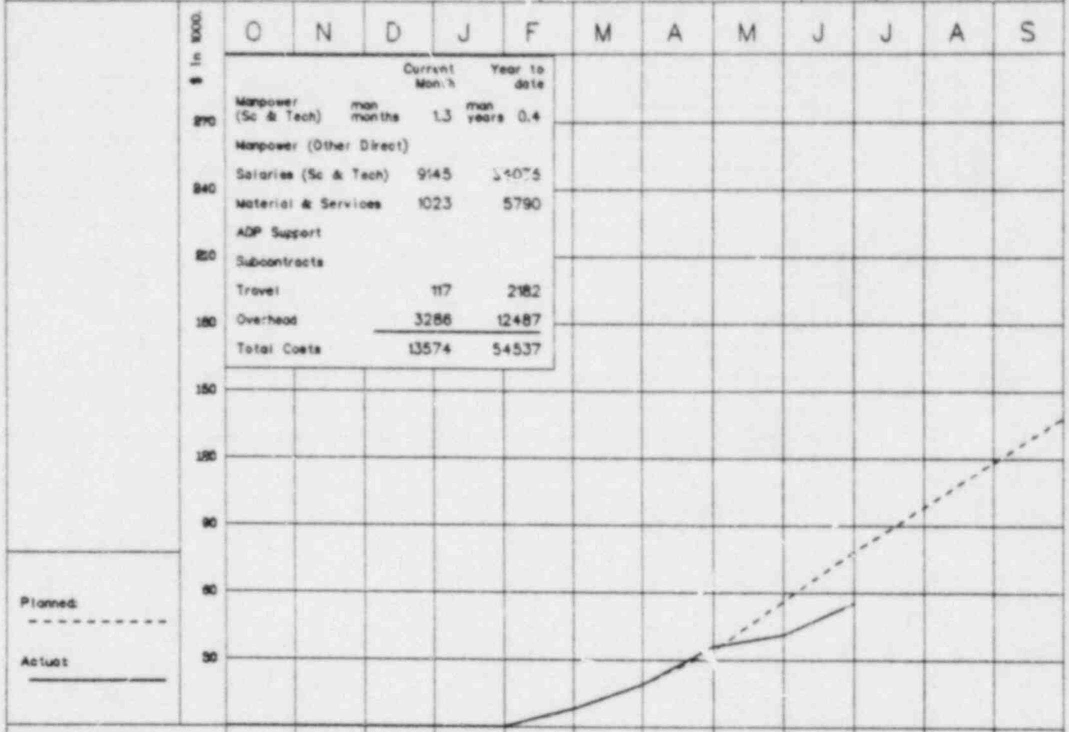
Task 4: Evaluate New Surveillance and Diagnostic Methods for Reactor System Fault Detection

- a. Complete feasibility study of signal verification using functional redundancy and submit draft letter report.
- b. Investigate advanced concepts of non-linear signal analysis.



COST/BUDGET REPORT

FIN No.: B0466			NRC Project Manager: E. Merschoff
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 04 8	NRC Act. No. 60 19 31	Program Director: Lotts/Fry
Program Title: NPP Personnel Selection and Training		NRC Div.: RES/: FO	Program Manager: P. M. Haas
		ORNL Div.: EPD	Principal Investigator: Selby/Haas



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.3	man years	0.4
Manpower (Other Direct)				
Salaries (Sc & Tech)		9145		34075
Material & Services		1023		5790
ADP Support				
Subcontracts				
Travel		117		2182
Overhead		3286		12487
Total Costs		13574		54537

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	8	11	15	22	22	20	20	20
Cumulative Planned	0	0	0	0	8	19	34	56	78	98	118	138
Monthly Actual	0	0	0	0	8	11	17	5	14			
Cumulative Actual	0	0	0	0	8	19	36	41	55			
Monthly Variance	0	0	0	0	0	0	+2	−17	−8			
Cumulative Variance	0	0	0	0	0	0	+2	−15	−23			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	300	155	145	0
3	0	300	162	138	0
4					

Comments: Variance: −29.5%

Variance due to delay in charging of subcontracts - will be corrected next quarter.

MILESTONE BAR CHART

TITLE: NPP Personnel Selection and Training

ACTIVITY NO: 40 10 01 06 B0466

	FY 82				FY 83				FY 84				FY 85	FY 86	FY 87	FY 88	FY 89	BEYOND FY 89
	1	2	3	4	1	2	3	4	1	2	3	4						
1. Task 1: <u>Program Plan</u>																		
a. Define the elements and performance shaping factors related to selection and training reactor operators, senior reactor operators, shift supervisors, and shift technical advisors			—	▽														
b. Assess the applicability of existing methods such as Systems Approach to Training and Instructional System Design (SAT/ISD) to the area of selection, qualification, and training of nuclear power plant operators			—	—	▽													
c. Using the INPO job/task analytic data, demonstrate the methods used to determine selection, qualification, and training program requirements			—	—	▽													
d. Provide a comprehensive program plan for development, validation and application of a system such as the SAT/ISD method of establishing operator selection, qualification and training requirements			—	—	—	△												

MILESTONE BAR CHART

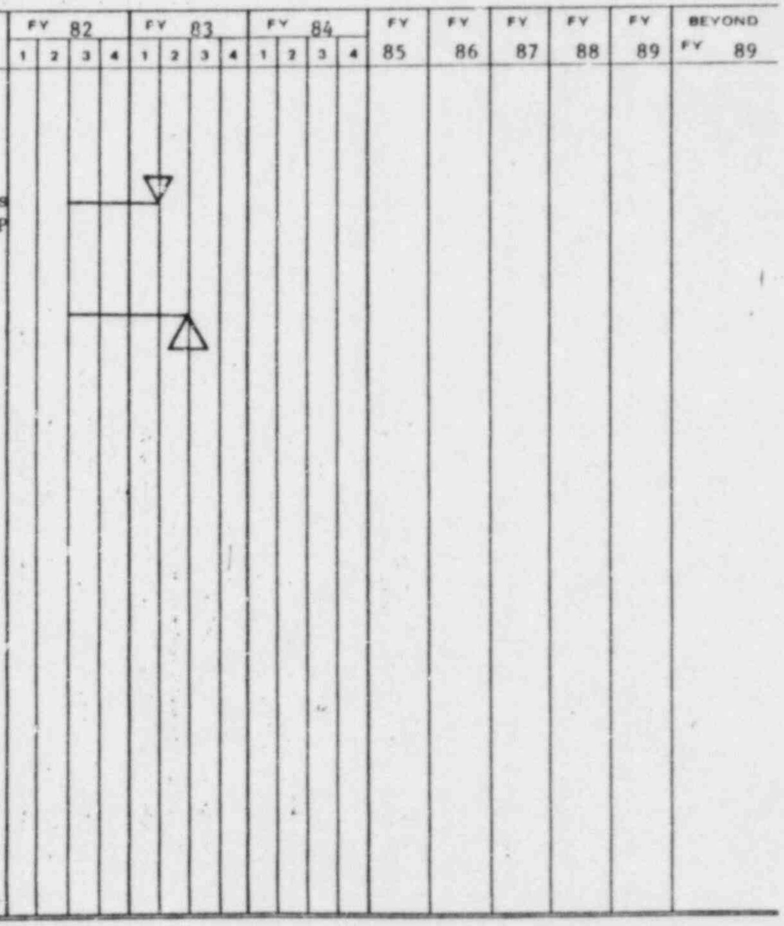
TITLE: NPP Personnel Selection and Training

ACTIVITY NO: 40 10 01 06 B0466

2. Task 2: <u>Evaluation and Upgrading of NPP Training Simulators</u>

   a. Develop and demonstrate a technique to select malfunctions which should be required for NPP training simulators

   b. Develop, as part of the comprehensive program plan in Task 1.d, a plan for research and assessment necessary to specify and validate NPP training simulator requirements



COST/BUDGET REPORT

FIN No.: B0486

NRC Project Manager: S. D. Richardson

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 05 0

NRC Act. No. 60 19 51

Program Director: Lotts/Fry

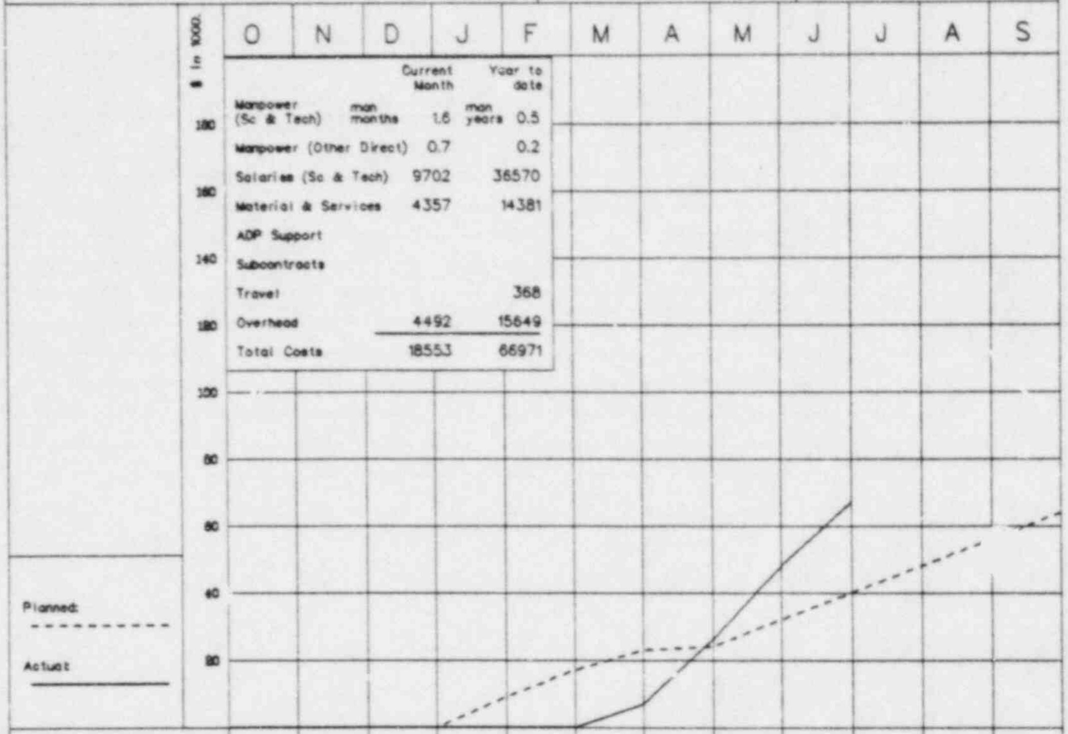
Program Title: Nuclear Plant Management Appraisals

NRC Div.: RES/: FO

ORNL Div.: ETD

Program Manager: W. B. Cottrell

Principal Investigator: W. B. Cottrell



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.6	man years	0.5
Manpower (Other Direct)		0.7		0.2
Salaries (Sc & Tech)		9702		36570
Material & Services		4357		14381
ADP Support				
Subcontracts				
Travel				368
Overhead		4492		15649
Total Costs		18553		66971

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	9	8	6	1	8	8	8	8	8
Cumulative Planned	0	0	0	9	17	23	24	32	40	48	56	64
Monthly Actual	0	0	0	0	0	7	19	22	19			
Cumulative Actual	0	0	0	0	0	7	26	48	67			
Monthly Variance	0	0	0	−9	−8	+1	+18	+14	+11			
Cumulative Variance	0	0	0	−9	−17	−16	+2	+16	+27			

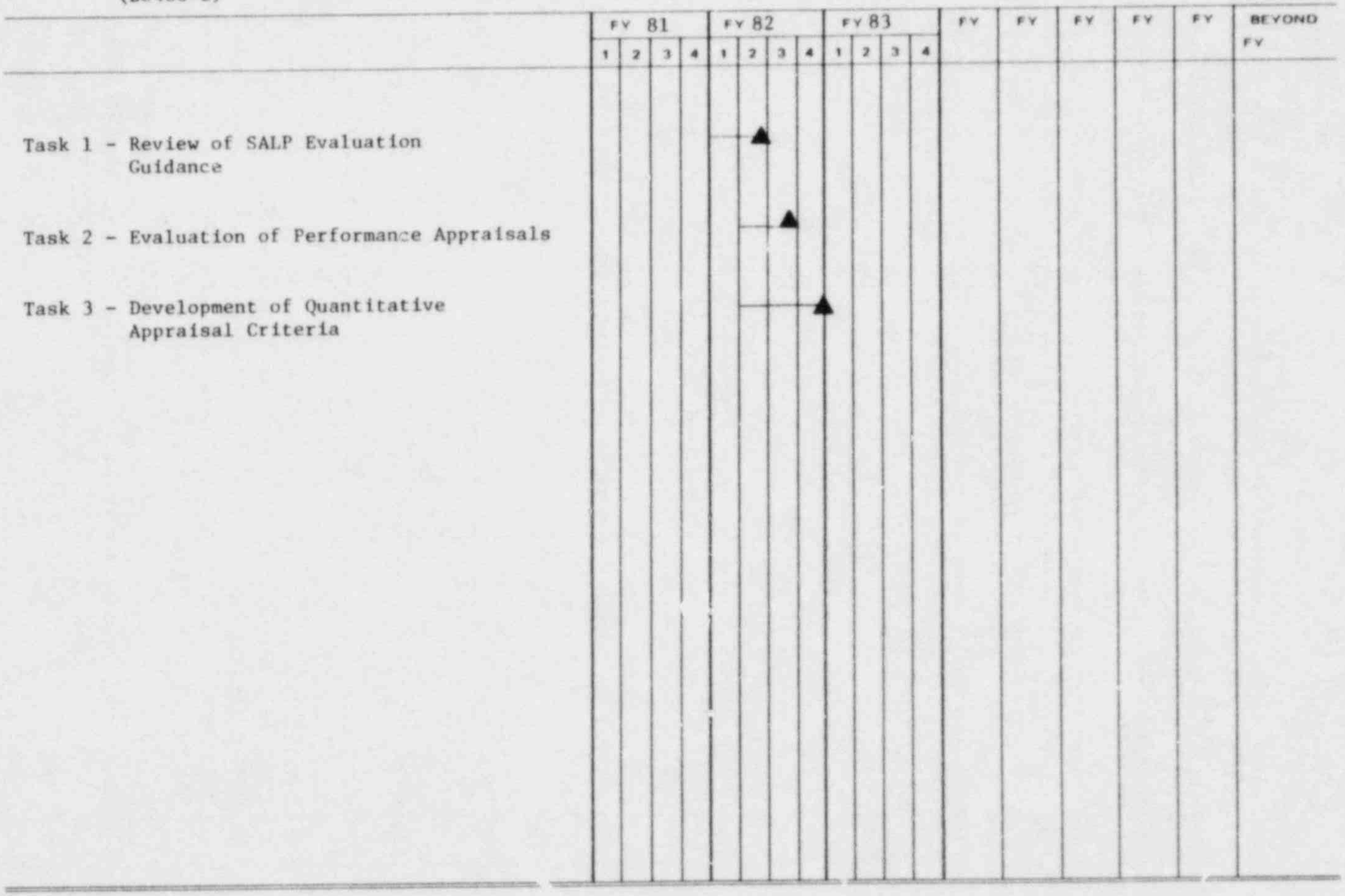
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	64	0	64	0
3	0	64	0	64	0
4					

Comments: Variance: +67.5%

Program closed out, costs will be adjusted next quarter.

MILESTONE BAR CHART

TITLE: Nuclear Plant Management Appraisals
(B0486-2)



UCN 14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0485

NRC Project Manager: S. A. McQuire

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 04 9

NRC Act. No. 60 19 31

Program Director: A. L. Lotts

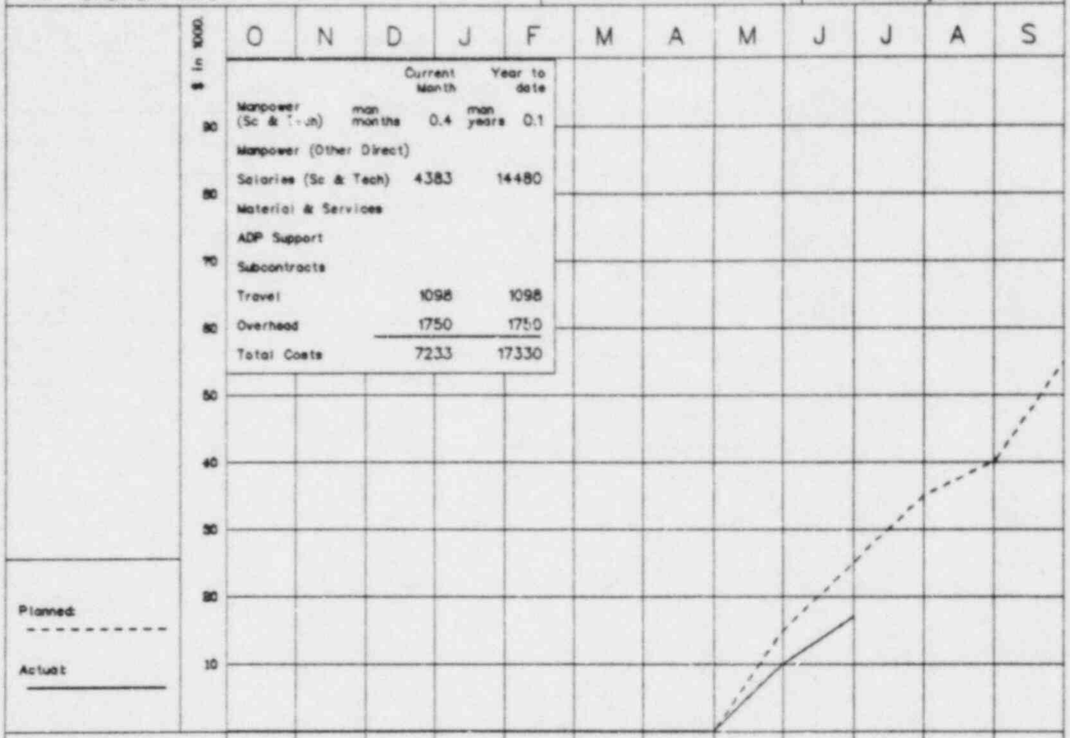
Program Title: Occupational Radiological Monitering AT Uranium Mills

NRC Div.: RES/: FO

ORNL Div.: HSR

Program Manager: C. S. Sims

Principal Investigator: R. E. Swaja



	Current Month		Year to date
Manpower (Sc & Tech)	man months	0.4	man years 0.1
Manpower (Other Direct)			
Salaries (Sc & Tech)		4383	14480
Material & Services			
ADP Support			
Subcontracts			
Travel		1098	1098
Overhead		1750	1750
Total Costs		7233	17330

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	0	0	15	10	10	5	15
Cumulative Planned	0	0	0	0	0	0	0	15	25	35	40	55
Monthly Actual	0	0	0	0	0	0	0	10	7			
Cumulative Actual	0	0	0	0	0	0	0	10	17			
Monthly Variance	0	0	0	0	0	0	0	-5	-3			
Cumulative Variance	0	0	0	0	0	0	0	-5	-8			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	100	45	55	0
4					

Comments: Variance: -32.0%

Variance to be made up next quarter.

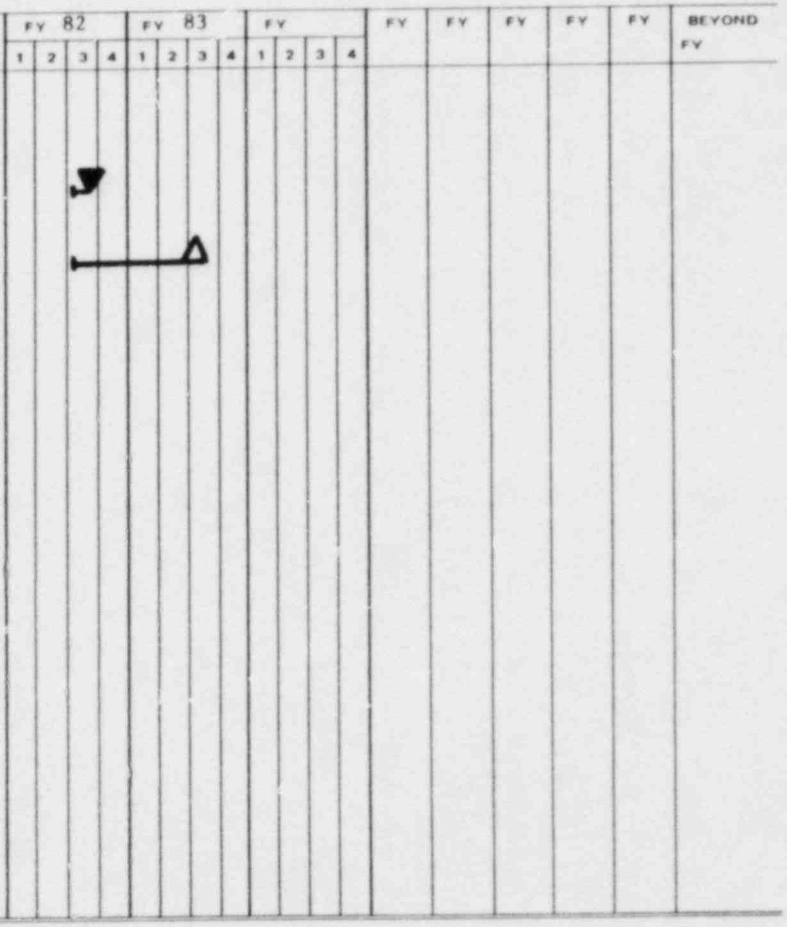
MILESTONE BAR CHART

Title: Occupational Radiological Monitoring at Uranium Mills
Activity Number: ORNL #41 88 55 04 9 (189 #B0485)/NRC #60 19 31

Tasks

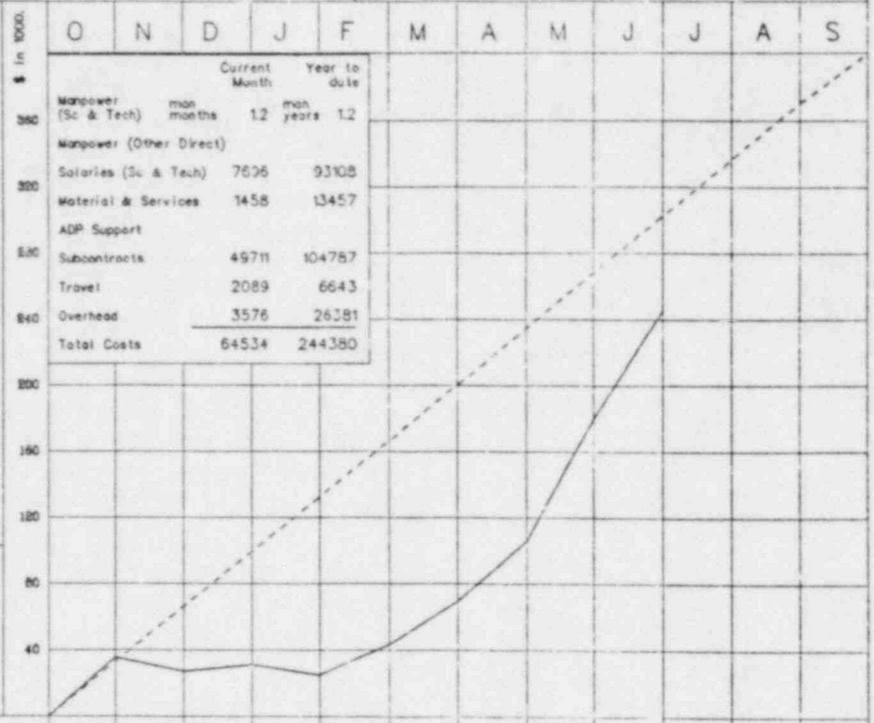
1. Submit detailed outline of manual entitled "Occupational Radiological Monitoring at Uranium Mills" to NRC for approval by May 31, 1982.

2. Provide NRC with 400 copies of the completed manual by May 1, 1983.



COST/BUDGET REPORT

FIN No.: B0438			NRC Project Manager: J. P. Jenkins
Report For Period Ending: 06-31-82	ORNL Act No. 41 89 55 13 3	NRC Act. No. 60 19 31 01	Program Director: A. L. Lotts
Program Title: Operational Aids for Reactor Operators		NRC Div.: RES/: FO ORNL Div.: I&C	Program Manager: J. L. Anderson Principal Investigator: R. A. Kisner



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.2	man years	1.2
Manpower (Other Direct)				
Salaries (Sc & Tech)		7606		93108
Material & Services		1458		13457
ADP Support				
Subcontracts		49711		104787
Travel		2089		6643
Overhead		3576		26381
Total Costs		64534		244380

Planned: - - - - - - - - - -

Actual: ————

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	33	33	33	33	34	34	34	34	34	34	34	30
Cumulative Planned	33	66	99	132	166	200	234	268	302	336	370	400
Monthly Actual	35	-8	4	-6	18	26	36	75	65			
Cumulative Actual	35	27	31	25	43	69	105	180	245			
Monthly Variance	+2	-41	-29	-39	-16	-8	+2	+41	+31			
Cumulative Variance	+2	-39	-68	-107	-123	-131	-129	-88	-57			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	300	0	300	0
2	0	300	0	300	0
3	0	400	0	400	0
4					

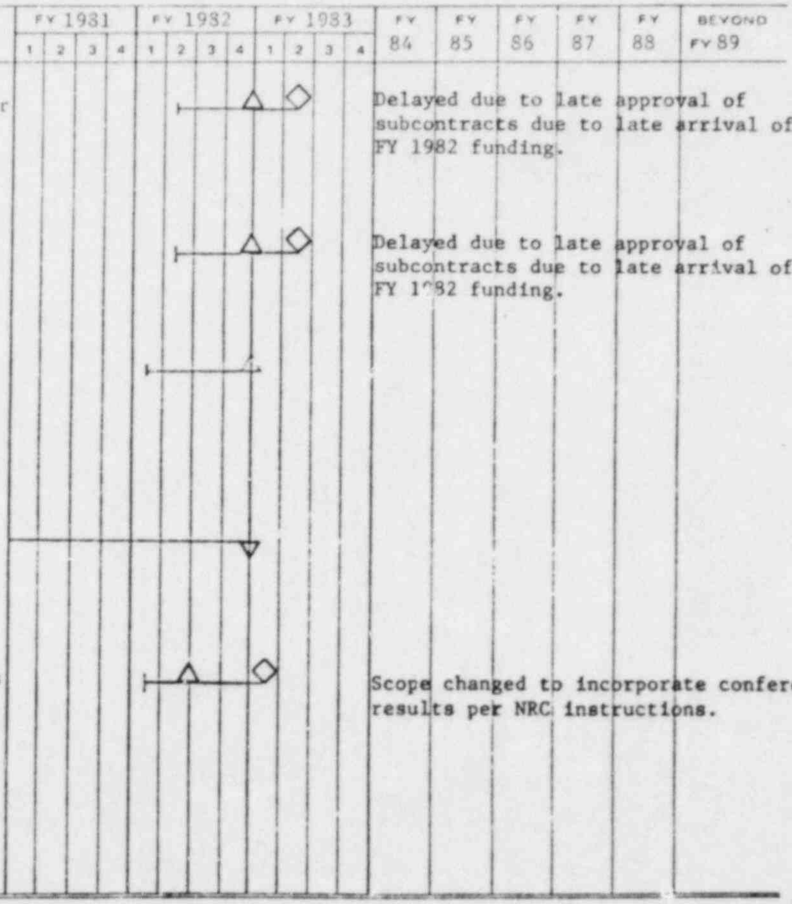
Comments: Variance: -13.9%

Subcontract accruals began in May. Subcontract completion will be extended into FY 1983 because of late start due to delayed receipt of FY 1982 funds.

MILESTONE BAR CHART

TITLE: OPERATIONAL AIDS FOR NUCLEAR POWER PLANT OPERATORS

ACTIVITY NO: 60 19 31 01 (ORNL 41 89 55 13 3) (FIN NO: B0438)



1. Evaluate Engineered Safety Features for level of automation, man-machine interaction and decision points for operator control.

   Delayed due to late approval of subcontracts due to late arrival of FY 1982 funding.

2. Complete development of criteria for allocation of function and apply criteria to a selected ESF system.

   Delayed due to late approval of subcontracts due to late arrival of FY 1982 funding.

3. Survey domestic process industries and selected foreign NPP's to determine impact of automation on operator selection, training qualification, and performance requirements.

4. Complete review and assessment of operational aids with perspective of adequacy, effectiveness and safety implications.

5. Report the findings and recommendations of a feasibility and need study of modeling of the man-machine interface.

   Scope changed to incorporate conference results per NRC instructions.

COST/BUDGET REPORT

FIN No.: B0481

NRC Project Manager: G. S. Lewis

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 05 2

NRC Act. No. 60 19 31

Program Director: Lotts/Fry

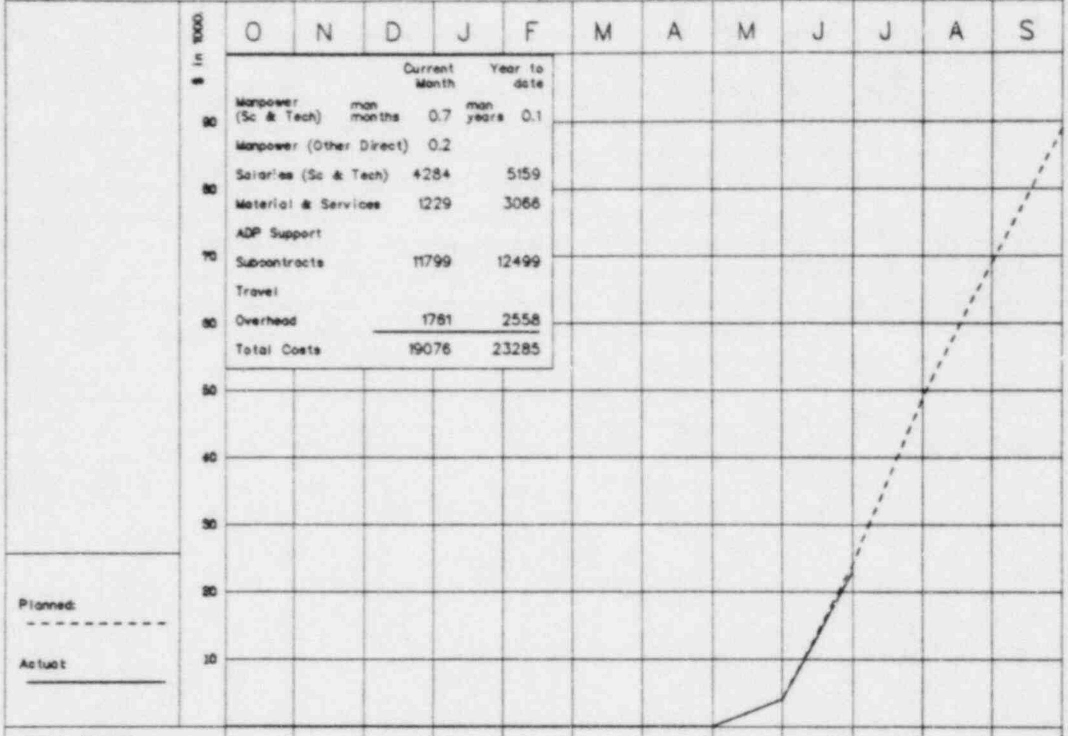
Program Title: Pressure Sensor/Sensing Line System Evaluation Research

NRC Div.: RES/: FO

ORNL Div.: I&C

Program Manager: D. N. Fry

Principal Investigator: J. A. Mullins



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.7	man years	0.1
Manpower (Other Direct)		0.2		
Salaries (Sc & Tech)		4284		5159
Material & Services		1229		3066
ADP Support				
Subcontracts		11799		12499
Travel				
Overhead		1761		2558
Total Costs		19076		23285

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	0	0	0	4	20	25	20	20
Cumulative Planned	0	0	0	0	0	0	0	4	24	49	69	89
Monthly Actual	0	0	0	0	0	0	0	4	19			
Cumulative Actual	0	0	0	0	0	0	0	4	23			
Monthly Variance	0	0	0	0	0	0	0	0	−1			
Cumulative Variance	0	0	0	0	0	0	0	0	−1			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	100	11	89	0
4					

Comments: Variance: −4.2%

MILESTONE BAR CHART

TITLE: Pressure Sensor/Sensing Line System Evaluation Research

ACTIVITY NO.: 41 88 55 05 2/ NRC #60 19 31 (B0481)

Task 1: Review Status of Pressure Sensor/Sensing Line System Standards, Practices and Technology

1.1. Complete survey of existing standards and current practices and submit letter report.

1.2. Complete review of Sequoyah sensor/sensing line design practices and issue letter report.

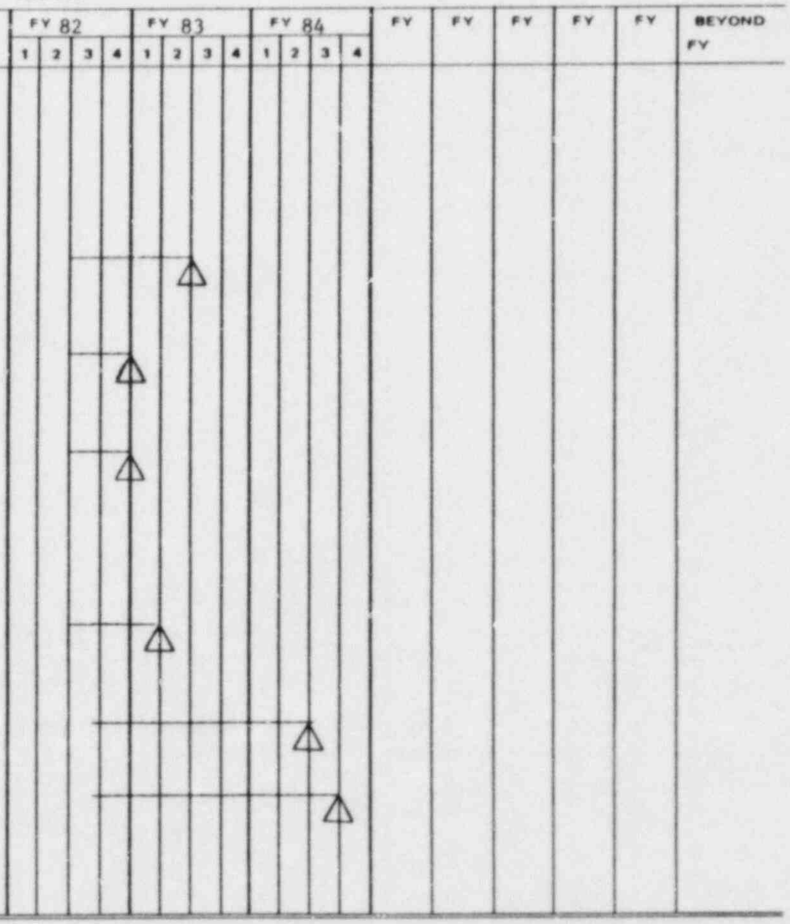
1.3. Complete survey of experience in sensor/sensing line degradation and issue letter report.

Task 2: Pressure Sensor/Sensing Line Model Development

2.1. Complete dynamic model of Foxboro E13DM force balance sensor and issue letter report.

2.2. Complete dynamic model of another pressure senosr and issue letter report.

2.3. Complete sensor/sensing line model development and testing.



MILESTONE BAR CHART

TITLE: Pressure Sensor/Sensing Line System Evaluation Research

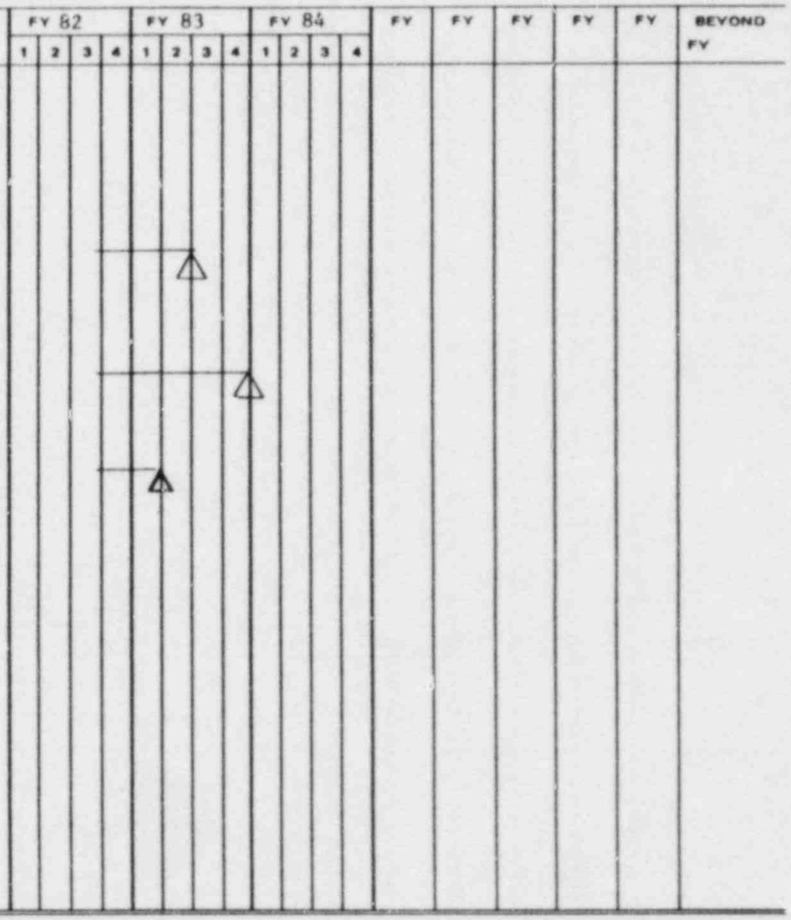
ACTIVITY NO.: 41 88 55 05/2/ NRC #60 19 31 (B0481)

Task 3: Evaluate In-Situ Methods for Remote Detection of Pressure Sensor/Sensing Line Degradation

3.1. Complete lab tests of in-situ method for Foxboro sensor and issue letter report.

3.2. Complete lab evaluation of noise analysis for detection of sensor/sensing line degradation and issue letter report.

3.3. Complete demonstration of Foxboro sensor in-situ method in operating reactor.



COST/BUDGET REPORT

FIN No.: B0467

NRC Project Manager: D. L. Basdekas

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 8

NRC Act. No. 40 10 01 06 5

Program Director: Lotts/Fry

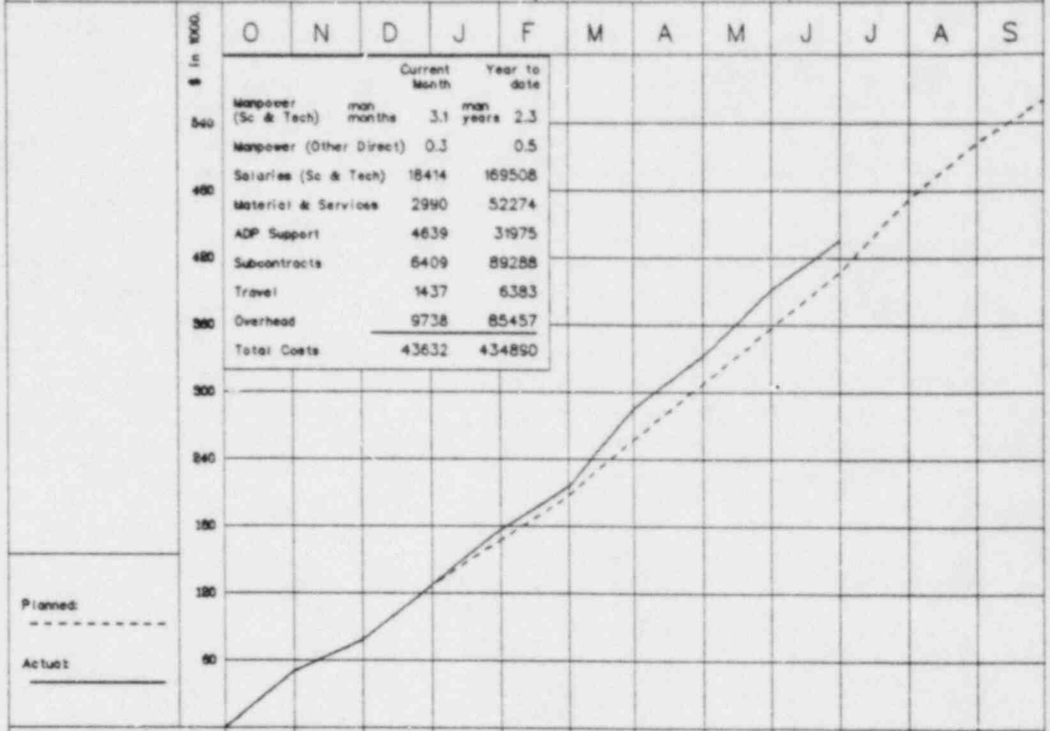
Program Title: Safety Implications of Control Systems

NRC Div.: RES/: FO

ORNL Div.: I&C

Program Manager: R. S. Stone

Principal Investigator: O. L. Smith



		Current Month		Year to date
Manpower (Sc & Tech)	man months	3.1	man years	2.3
Manpower (Other Direct)		0.3		0.5
Salaries (Sc & Tech)		18414		169508
Material & Services		2990		52274
ADP Support		4639		31975
Subcontracts		6409		89288
Travel		1437		6383
Overhead		9738		85457
Total Costs		43632		434890

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	50	28	49	40	40	50	50	50	50	65	50	38
Cumulative Planned	50	78	127	167	207	257	307	357	407	472	522	560
Monthly Actual	50	28	49	49	39	70	46	60	44			
Cumulative Actual	50	78	127	176	215	285	331	391	435			
Monthly Variance	0	0	0	+9	−1	+20	−4	+10	−6			
Cumulative Variance	0	0	0	+9	+8	+28	+24	+34	+28			

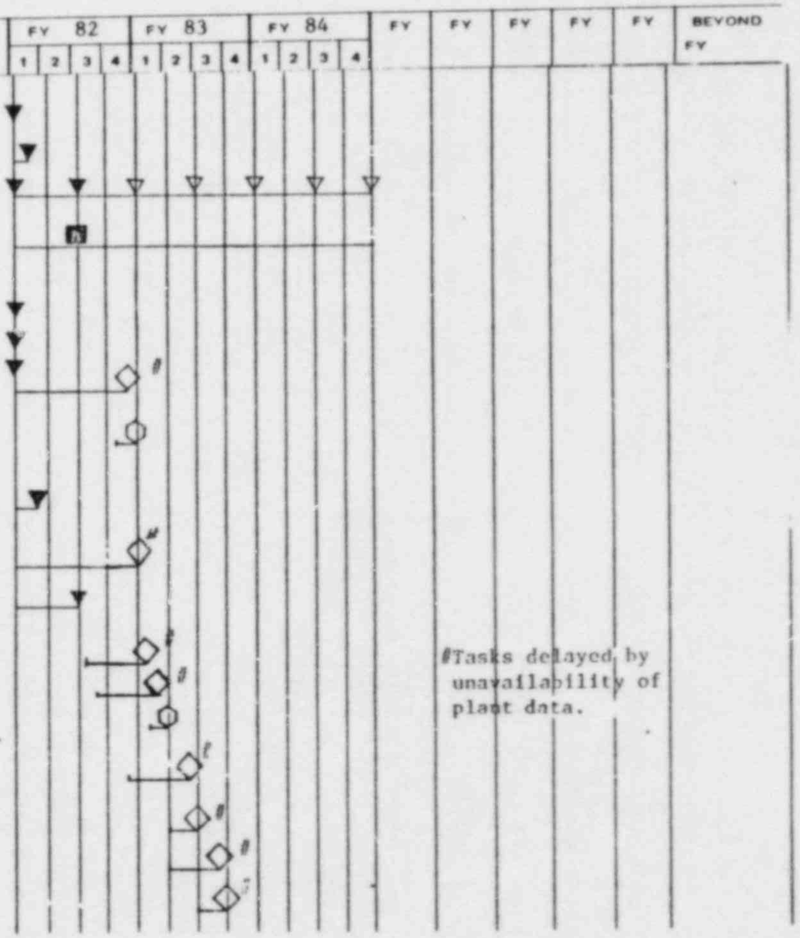
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	134	80	174	40	520
2	134	600	174	560	0
3	134	600	174	560	0
4					

Comments: Variance: +6.9%

MILESTONE BAR CHART

Safety Implications of Control Systems
B0467

- A. Program Planning and Management
  - 1. Complete preliminary program plan
  - 2. Complete final methods and program plan
  - 3. Review Progress
  - 4. Identify appropriate continuing problems in cooperation with RES, NRR, and representatives of industry
- B. Perform Generic Study
  - 1. Identify key components
  - 2. Search literature for existing models
  - 3. Determine model sophistication
  - 4. Develop generic B&W programming
  - 5. Examine overcooling transient and perform FMEA on generic model as requested
  - 6. Provide investigation of specific NRC concerns
- C. Study B&W Control System
  - 1. Document system design as installed
  - 2. Perform initial FMEA on controls for selected B&W plant
  - 3. Develop and apply controls simulation
    - a. Complete specialized B&W model
    - b. Implement hardware/software
    - c. Test model against benchmark RETRAN calculations and plant data
    - d. Complete initial simulator study, including overcooling problems
    - e. Apply study to identify additional problems
  - 4. Complete final FMEA, incorporating simulation results
  - 5. Issue report on results

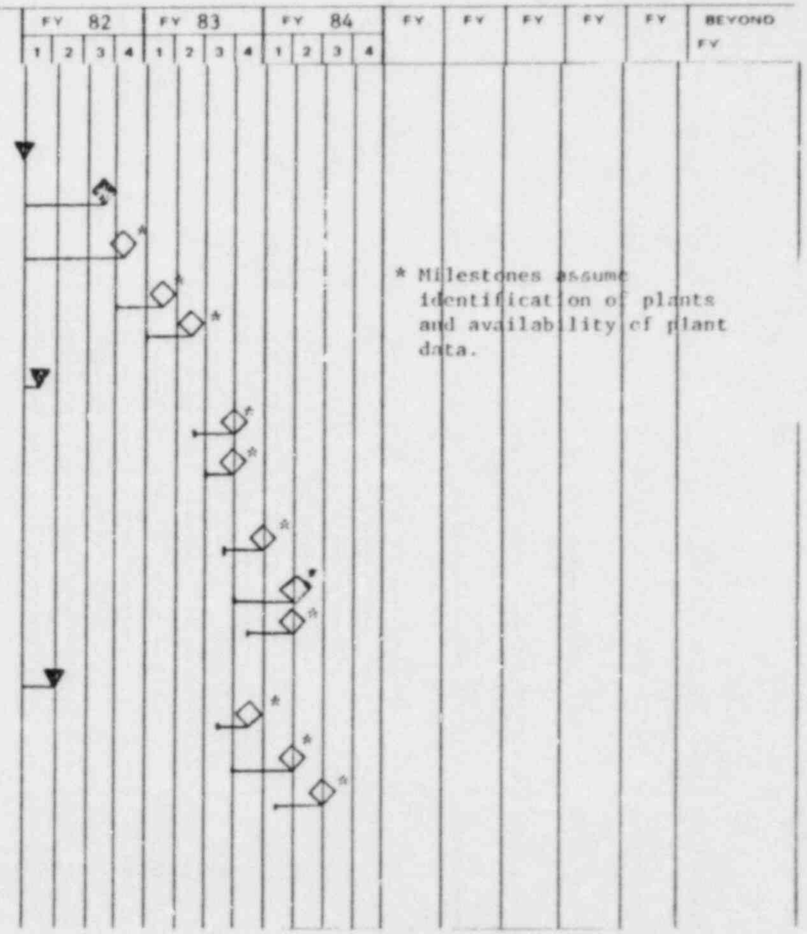


#Tasks delayed by unavailability of plant data.

MILESTONE BAR CHART

Safety Implications of Control Systems
B0467

D. Study Second Specific LWR Control System
- 1. Document control system design
  - a. Complete catalog of needed information
  - b. Initiate requests for data from one more representative plant
  - c. Complete preliminary data collection
  - d. Complete final data collection describing plant as installed
  - e. Issue documentary report.
- 2. Develop and apply controls simulation
  - a. Complete generic model of LWR
  - b. Complete specialized model of 2nd PWR type
  - c. Implement hardware/software for 2nd PWR
  - d. Complete initial simulator study of failure modes of 2nd PWR, including overcooling
  - e. Apply simulation study to identify additional problems
  - f. Issue report on results.
- 3. Perform FMEA of control systems
  - a. Develop and specify methodology
  - b. Complete initial FMEA for second representative PWR power plant
  - c. Complete final FMEA for second representative PWR power plant
  - d. Issue reports on results.

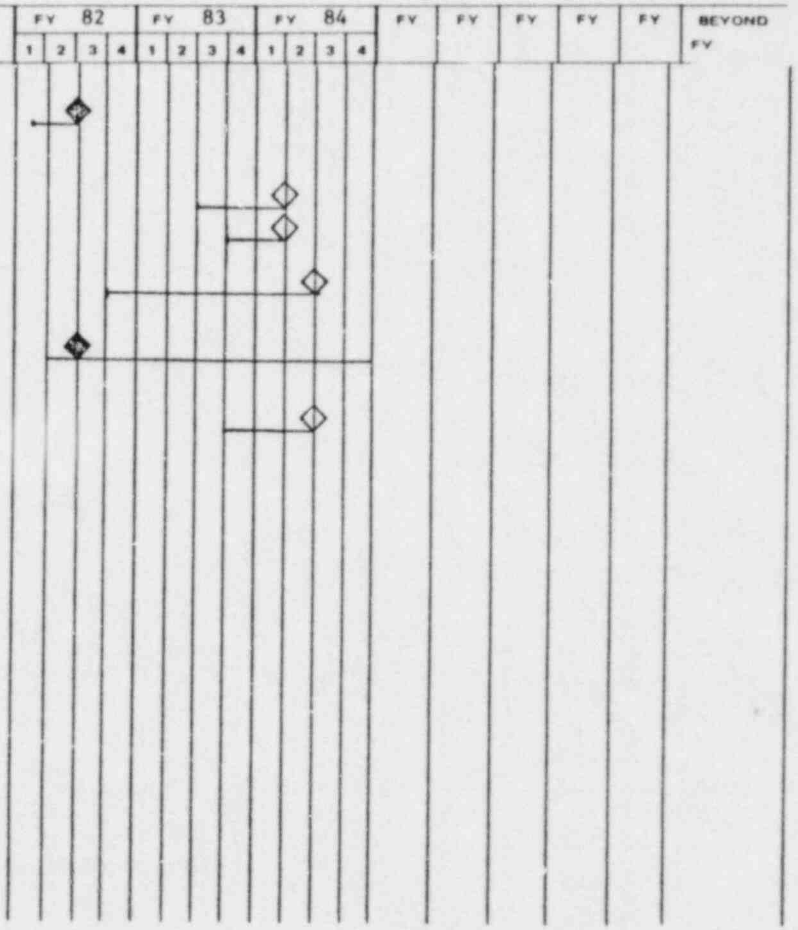


* Milestones assume identification of plants and availability of plant data.

MILESTONE BAR CHART

Safety Implications of Control Systems
B0467

E. Develop Criteria
   1. Finish criteria for safety vs. non-safety classification
   2. Develop recommendations for controls systems
      a. Recommend general design criteria
      b. Recommend reporting requirements
      c. Recommend steps concerning miscellaneous aspects of plant safety, present and future
      d. Assist RES, as requested, in development of a Regulatory Guide for the Classification of Systems Important to Safety
   3. Issue report on results



COST/BUDGET REPCRT

FIN No.: B0471

NRC Project Manager: D. L. Basdekas

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 04 2

NRC Act. No. 40 10 01 01 5

Program Director: Lotts/Fry

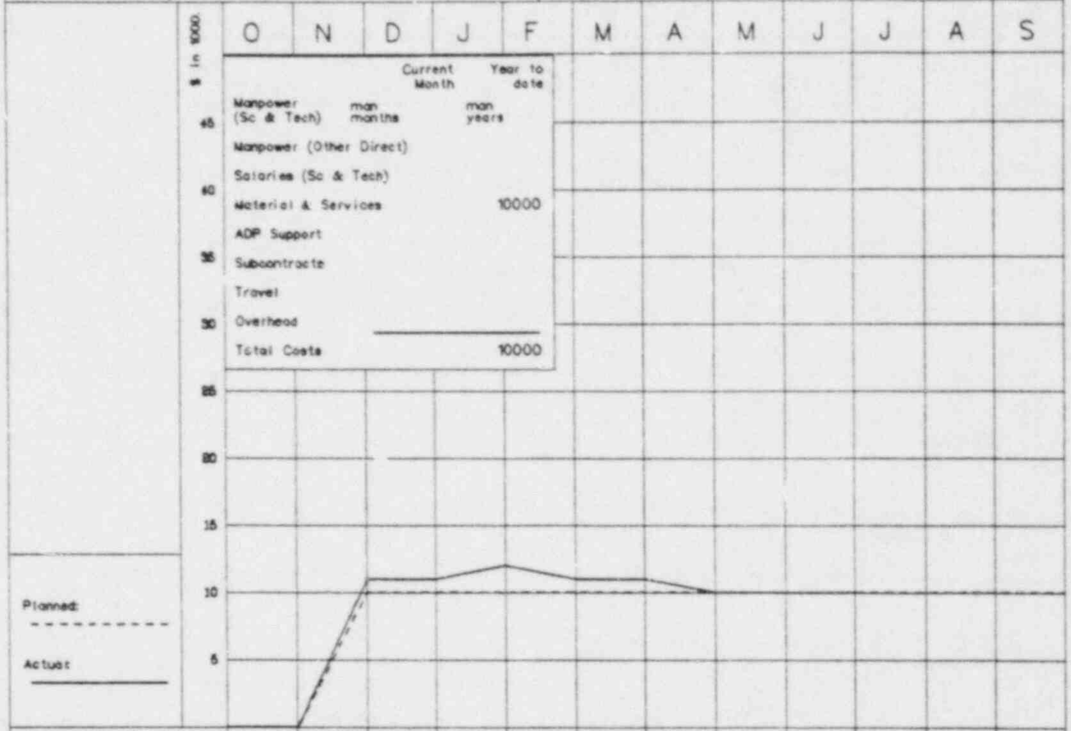
Program Title: Equipment for Safety Implications of Control Systems

NRC Div.: RES/: FO

ORNL Div.: I&C

Program Manager: R. S. Stone

Principal Investigator: R. S. Stone



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services		10000
ADP Support		
Subcontracts		
Travel		
Overhead		
Total Costs		10000

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	10	0	0	0	0	0	0	0	0	0	0
Cumulative Planned	0	10	10	10	10	10	10	10	10	10	10	10
Monthly Actual	0	11	0	1	−1	0	−1	0	0			
Cumulative Actual	0	11	11	12	11	11	10	10	10			
Monthly Variance	0	+1	0	+1	−1	0	−1	0	0			
Cumulative Variance	0	+1	+1	+2	+1	+1	0	0	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	10	0	0	10	0
2	10	0	0	10	0
3	10	0	0	10	0
4					

Comments: Variance: 0.0%

COST/BUDGET REPORT

FIN No.: B0421

NRC Project Manager: E. W. Merschoff

Report For Period Ending: 06-31-82

ORNL Act No. 41 89 55 12 3

NRC Act. No. 60 81 12 05

Program Director: Lotts/Fry

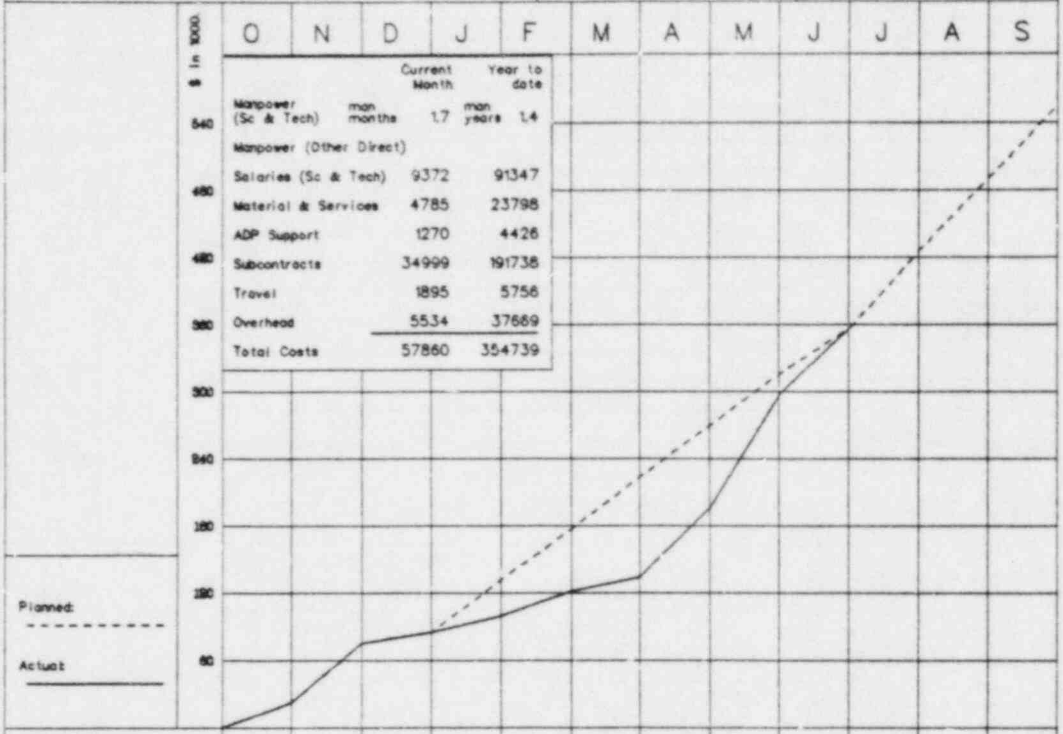
Program Title: Safety Related Operator Actions

NRC Div.: RES/: FO

ORNL Div.: EPD

Program Manager: P. M. Haas

Principal Investigator: P. M. Haas



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.7	man years	1.4
Manpower (Other Direct)				
Salaries (Sc & Tech)		9372		91347
Material & Services		4785		23798
ADP Support		1270		4426
Subcontracts		34999		191738
Travel		1895		5756
Overhead		5534		37689
Total Costs		57860		354739

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	22	53	10	46	46	46	46	46	40	70	65	65
Cumulative Planned	22	75	85	131	177	223	269	315	355	425	490	555
Monthly Actual	22	53	10	14	22	13	61	102	58			
Cumulative Actual	22	75	85	99	121	134	195	297	355			
Monthly Variance	0	0	0	−32	−24	−33	+15	+56	+18			
Cumulative Variance	0	0	0	−32	−56	−89	−74	−18	0			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	58	70	58	70	430
2	58	500	58	500	0
3	58	600	103	555	0
4					

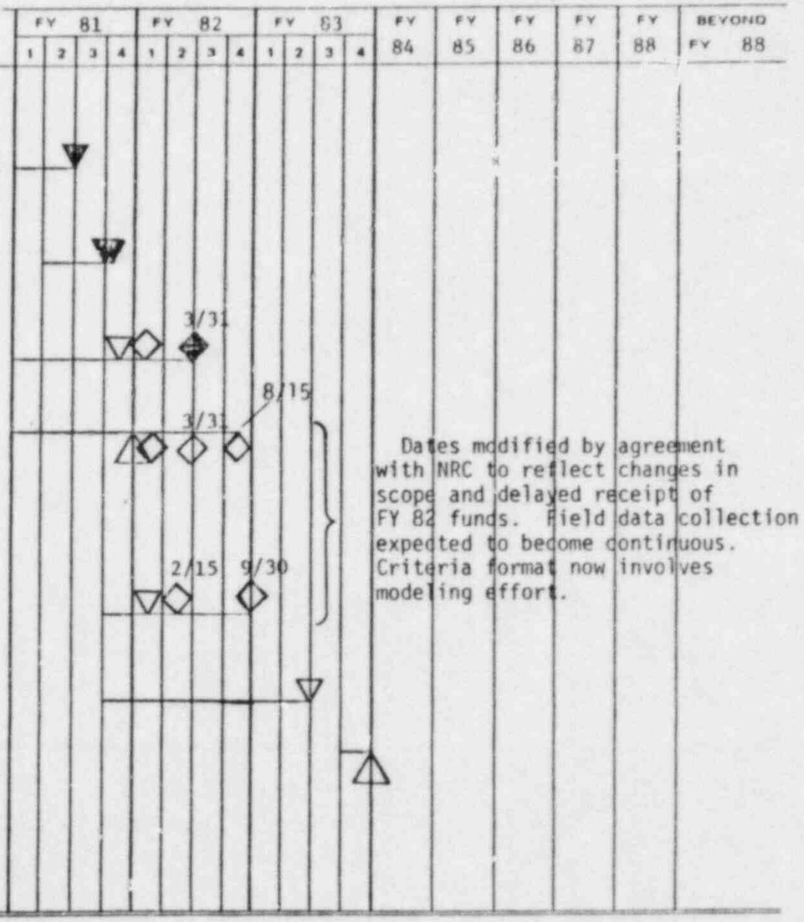
Comments: Variance: 0.0%

MILESTONE BAR CHART

TITLE: Safety Related Operator Actions

ACTIVITY NO: 40 10 01 06 01 B0421

1. Task 1: Simulator Calibration
   - a. Complete collection and analysis of PWR simulator data
   - b. Complete collection and analysis of BWR simulator data
   - c. Complete collection and analysis of PWR and BWR field data
   - d. Calibrate simulator results to field data
2. Task 2: Develop Criteria for Safety Related Operator Actions
   - a. Define proposed criteria format, additional data needs, and plans for data collection
   - b. Collect and analyze necessary simulator and field data
   - c. Publish criteria and supporting data base



Dates modified by agreement with NRC to reflect changes in scope and delayed receipt of FY 82 funds. Field data collection expected to become continuous. Criteria format now involves modeling effort.

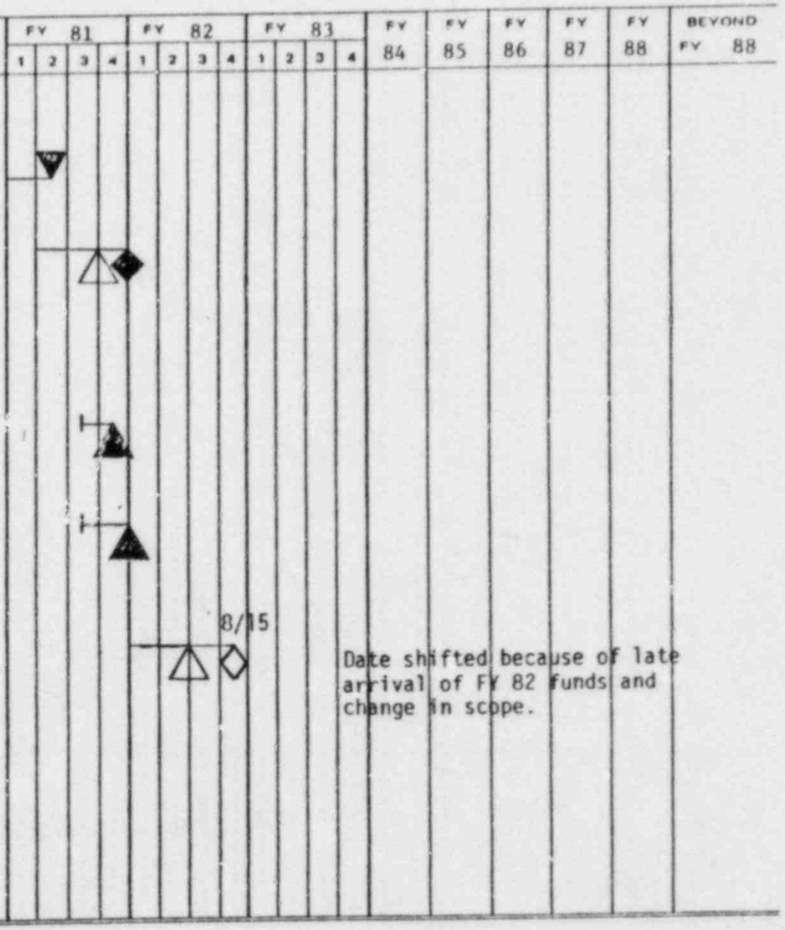
MILESTONE BAR CHART

TITLE: Safety Related Operator Actions

ACTIVITY NO: 40 10 01 06 01 B0421

3. Task 3: <u>Simulator Response Characteristics</u>
   - a. Collect and assess information on nuclear and non-nuclear industry practices
   - b. Develop recommendations for future nuclear industry practice including suggested revisions to ANSI/ANS 3.5

4. Task 4: <u>Task Analysis Techniques</u>
   - a. Perform traditional task analysis for PWR scenarios used in Task 1
   - b. Demonstrate the use of PWR simulator data to supplement and validate traditional task analysis
   - c. Perform a similar study using traditional task analysis techniques and simulator data for the BWR scenarios used in Task 1



Date shifted because of late arrival of FY 82 funds and change in scope.

MILESTONE BAR CHART

TITLE: Safety Related Operator Actions

ACTIVITY NO: 40 10 01 06 01 B0421

	FY 81				FY 82				FY 83				FY 84	FY 85	FY 86	FY 87	FY 88	BEYOND FY 88
	1	2	3	4	1	2	3	4	1	2	3	4						
5. Task 5: <u>Operator Performance Measurement</u>																		
a. Determine appropriate performance measures for operator response to abnormal/emergency events					▽													
b. Identify key performance shaping factors (PSF); identify those PSF which can be addressed by simulator experiments within the scope of the current program directed toward criteria development					▽													
c. Design and perform simulator experiments identified in Subtask 5.b, e.g., experiments to determine the effects on operator performance of symptoms vs. event-oriented procedures					─	─	─	─	─	─	▽							
6. Task 6: <u>Continued Simulator Experiments</u>																		
a. Identify key PSF which require experiments beyond the current scope; investigate the use of additional data-collection techniques such as cardiopulmonary monitoring, audio-visual recording, eye-motion monitoring, etc.						─	─	▽										

NOTE: Subtasks 5 and 6 merged and reduced due to decrease in FY 82 funding, from 600K to 500K.

MILESTONE BAR CHART

TITLE: Safety Related Operator Actions

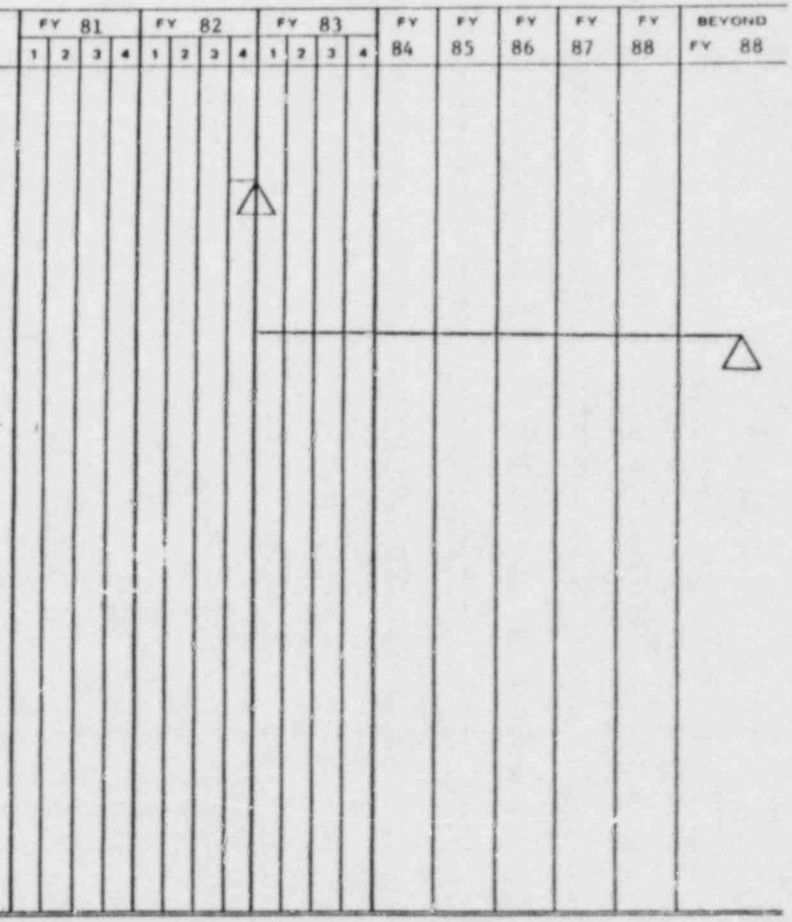
ACTIVITY NO: 40 10 01 06 01 B0421

6. Task 6: <u>Continued Simulator Experiments</u> (Continued)

   b. Define a program plan for continued simulator experiments to obtain data on operator performance under abnormal-emergency conditions

   c. Design, perform and analyze results of simulator experiments according to program plan in Subtask 6.b

NOTE: Subtasks 5 and 6 to be modified due to decrease in expected FY 82 funding.



DIVISION OF HEALTH, SITING AND WASTE MANAGEMENT

COST/BUDGET REPORT

FIN No.:

HRC Project Manager:

Report For Period Ending: 06 31-82

ORNL Act No.

NRC Act. No.

Program Director:

Program Title: Summary

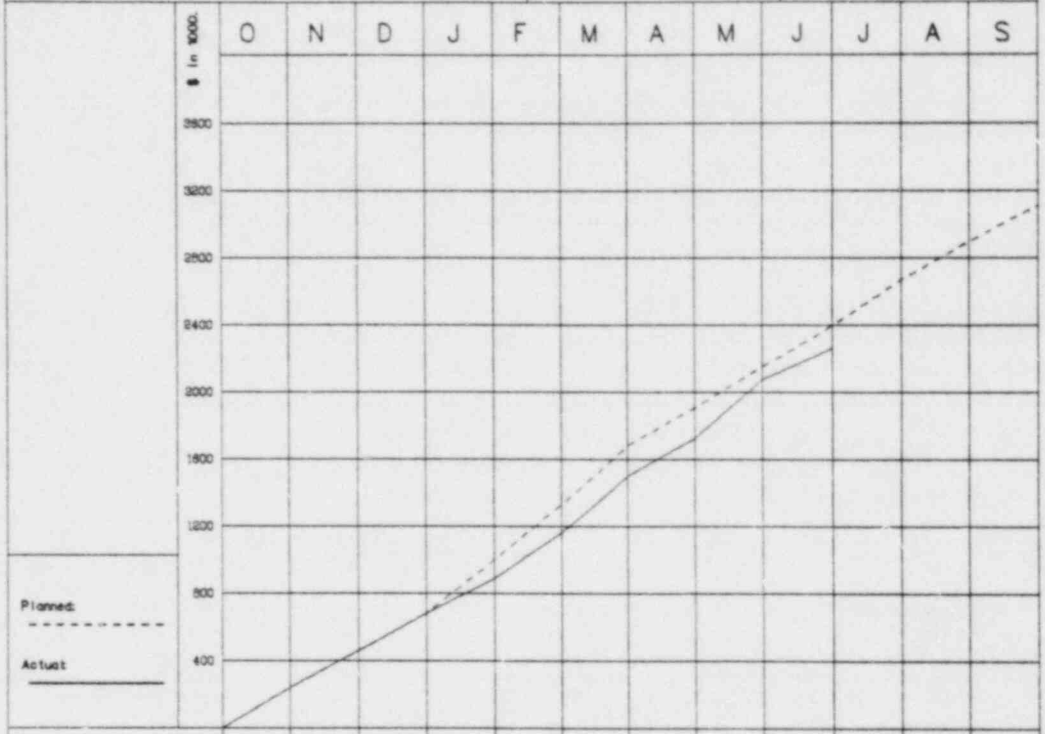
Office of Nuclear Regulatory Research

NRC Div.: RES/: HSWM

ORNL Div.:

Program Manager:

Principal Investigator:



	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	239	220	224	315	330	353	224	243	247	273	228	218
Cumulative Planned	239	459	683	998	1328	1681	1905	2148	2395	2668	2896	3114
Monthly Actual	239	220	224	202	275	341	221	352	185			
Cumulative Actual	239	459	683	885	1160	1501	1722	2074	2259			
Monthly Variance	0	0	0	−113	−55	−12	−3	+109	−62			
Cumulative Variance	0	0	0	−113	−168	−180	−183	−74	−136			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	1284	137	232	1189	2043
2	1284	2365	658	2958	130
3	1284	2365	665	2984	130
4					

Comments: Variance: −5.7%

COST/BUDGET REPORT

FIN No.: B0454

NRC Project Manager: C. Prichard

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 03 4

NRC Act. No. 60 19 02 10

Program Director: Lotts/Chester

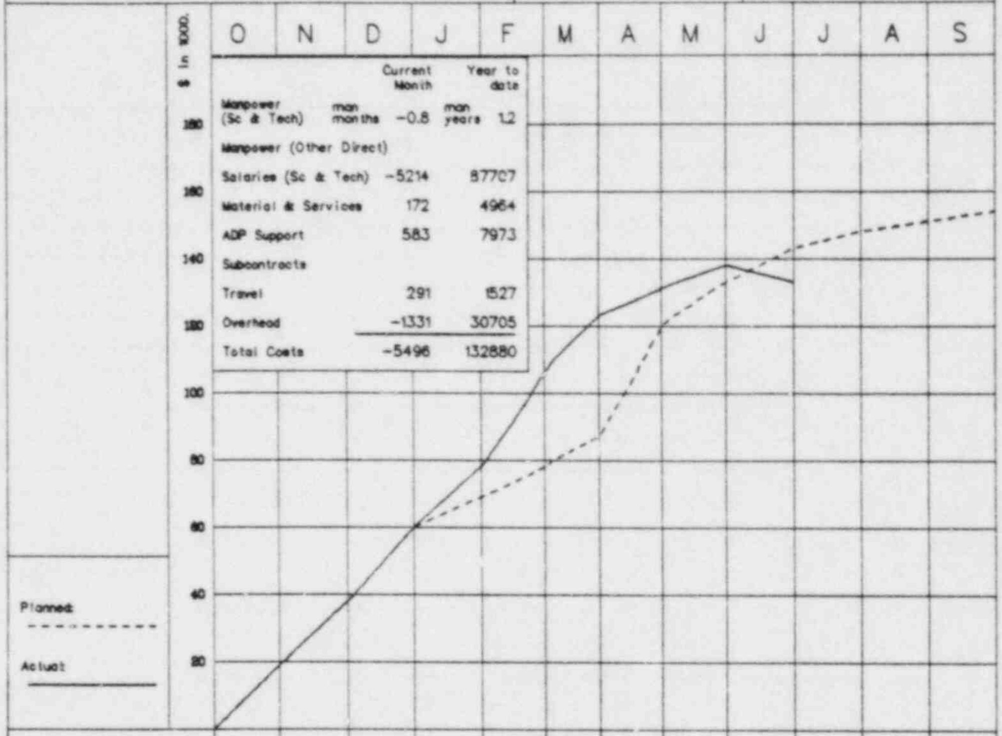
Program Title: CONCEPT/OMCOST Code Development

NRC Div.: RES/: HSWM

ORNL Div.: ETD

Program Manager: H. I. Bowers

Principal Investigator: H. I. Bowers



		Current Month		Year to date
Manpower (Sc & Tech)	man months	-0.8	man years	1.2
Manpower (Other Direct)				
Salaries (Sc & Tech)		-5214		87707
Material & Services		172		4964
ADP Support		583		7973
Subcontracts				
Travel		291		1527
Overhead		-1331		30705
Total Costs		-5496		132880

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	19	19	22	9	9	9	33	13	10	5	3	3
Cumulative Planned	19	38	60	69	78	87	120	133	143	148	151	154
Monthly Actual	19	19	22	18	28	17	8	7	-5			
Cumulative Actual	19	38	60	78	106	123	131	138	133			
Monthly Variance	0	0	0	+9	+19	+8	-25	-6	-15			
Cumulative Variance	0	0	0	+9	+28	+36	+11	+5	-10			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	44	25	0	69	75
2	44	110	0	154	0
3	44	110	0	154	0
4					

Comments: Variance: -7.0%

MILESTONE BAR CHART

TITLE: CONCEPT/OMCOST Code Development

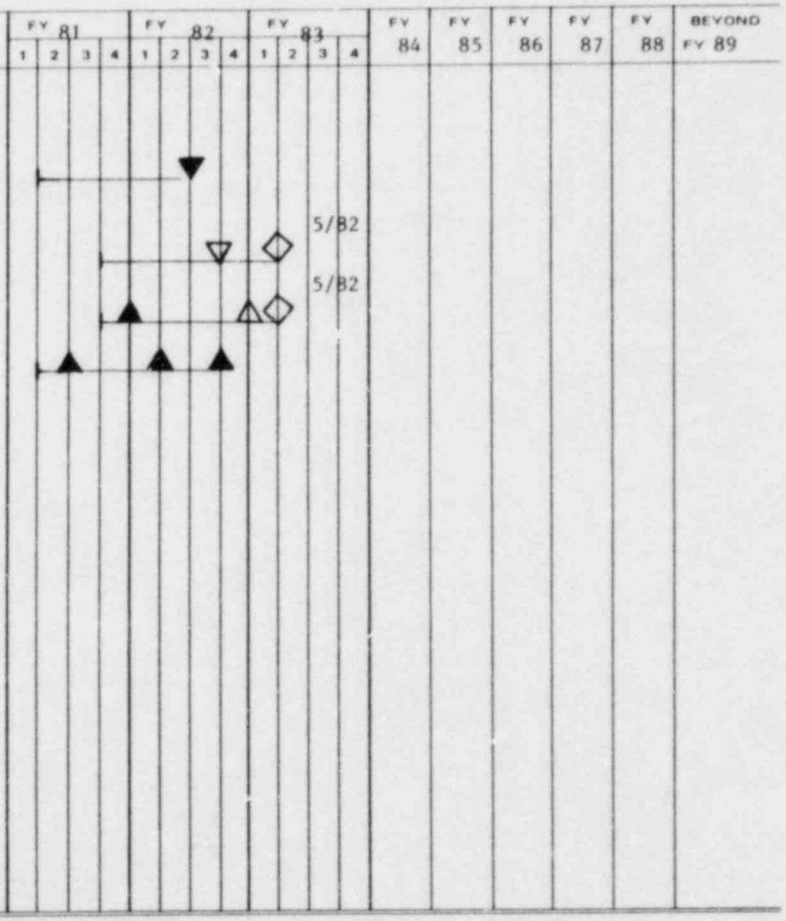
ACTIVITY NO: ORNL No. 41 88 55 03 4

1. Complete draft report on power plant O&M costs.

*2. Complete draft report on power plant capital investment costs.

*3. Validate cost models in CONCEPT code.

4. Validate cost index data in CONCEPT code.



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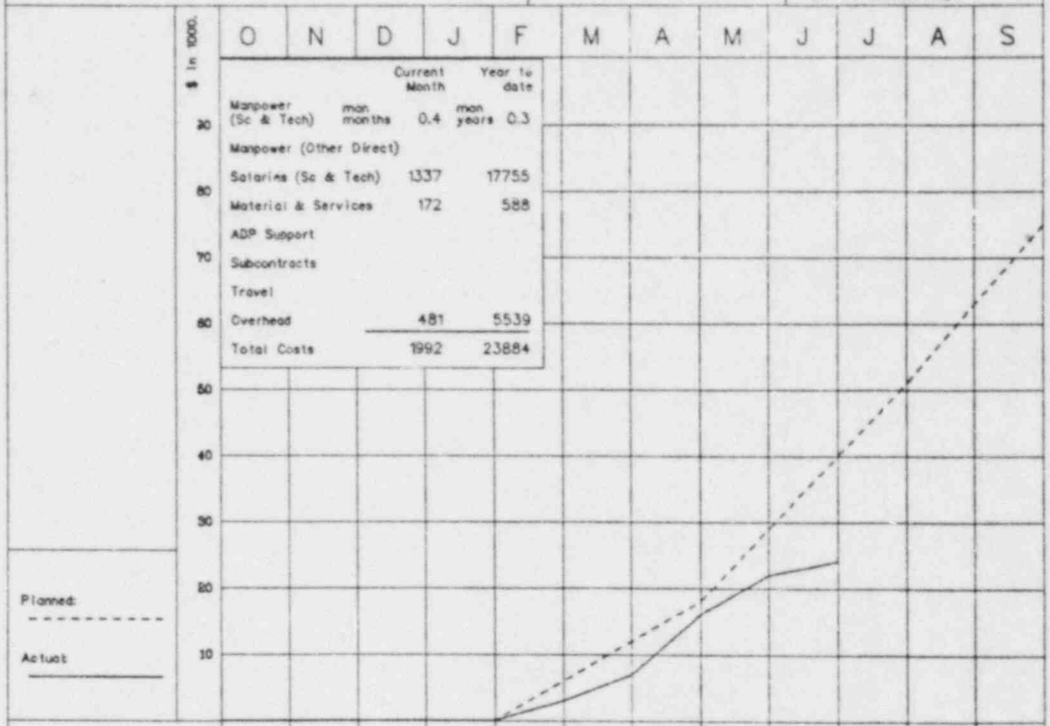
*Milestones 2 and 3 were re-scheduled because of delay in obtaining January, 1982, power plant cost data from DOE-NE.

UCN-14127 (3 9-80)

COST/BUDGET REPORT

FIN No.: B0477			NRC Project Manager: H. Peterson
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 04 7	NRC Act. No.	Program Director: Lotts/Chester
Program Title: Environmental Dose Indices		NRC Div.: RES/: HSWM	Program Manager: R. O. Chester
		ORNL Div.: HASRD	Principal Investigator: K. F. Eckerman



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.4	man years	0.3
Manpower (Other Direct)				
Salaries (Sc & Tech)		1337		17755
Material & Services		172		588
ADP Support				
Subcontracts				
Travel				
Overhead		481		5539
Total Costs		1992		23884

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	6	6	6	11	11	11	12	12
Cumulative Planned	0	0	0	0	6	12	18	29	40	51	63	75
Monthly Actual	0	0	0	0	3	4	9	6	2			
Cumulative Actual	0	0	0	0	3	7	16	22	24			
Monthly Variance	0	0	0	0	−3	−2	+3	−5	−9			
Cumulative Variance	0	0	0	0	−3	−5	−2	−7	−16			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	75	0	75	0
3	0	75	0	75	0
4					

Comments: Variance: −40.0%

Variance due to commitments of personnel to other programs - with concurrence of project officer.

MILESTONE BAR CHART

Environmental Dose Indices (B0477)

	FY 82				FY 83				FY84				FY85	FY86	FY 87	FY 88	FY89	BEYOND FY 89
	1	2	3	4	1	2	3	4	1	2	3	4						
TASK 1: Prepare technical progress report of pathway/dosimetric approach and list of radionuclides to be considered.		▼																
TASK 2: Assignment of environmental transport parameters.			▽	◇									Moved by agreement with project officer due to other commitments.					
TASK 3: Prepare draft report for comment.				▽														
TASK 4: Prepare final report entitled "Environmental Dose Indices for Assessment of Compliance with Emission Regulation."					▽													

COST/BUDGET REPORT

FIN No.: B0446

NRC Project Manager: R. F. Abbey

Report For Period Ending: 06-31-82

ORNL Act No.: 41 89 55 13 1

NRC Act. No.: 60 19 12 01

Program Director: Lotts/Chester

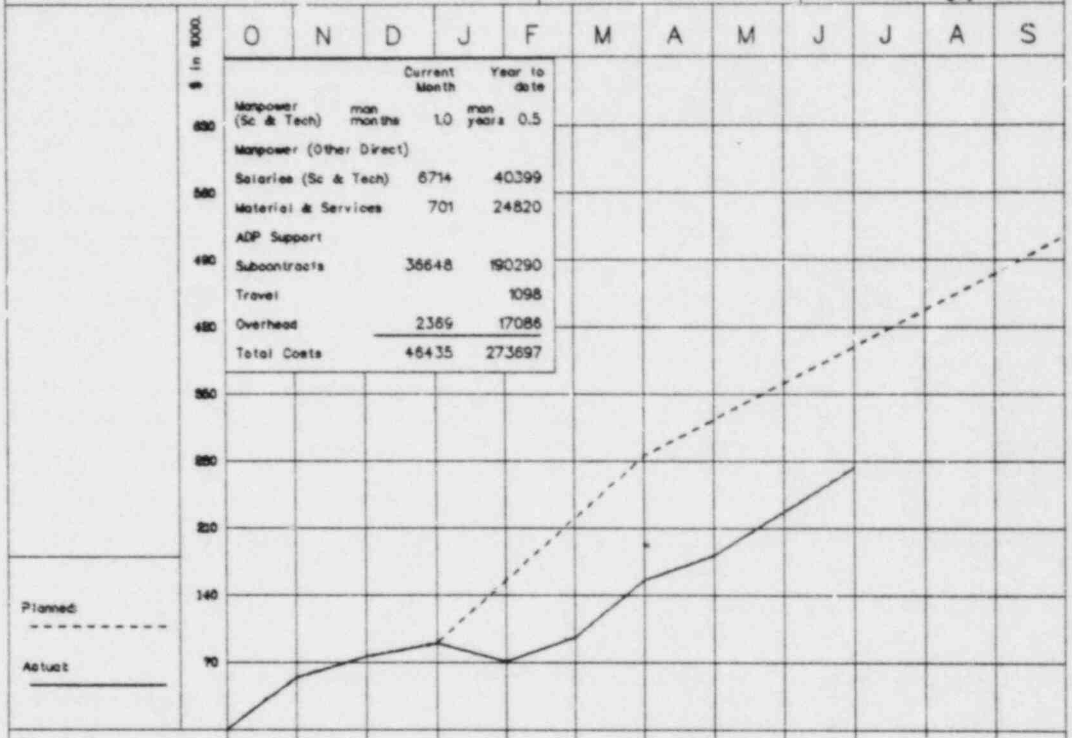
Program Title: Evaluation of Atmospheric Dispersion Models

NRC Div.: RES/: HSWM

ORNL Div.: EN

Program Manager: F. C. Kornegay

Principal Investigator: F. C. Kornegay



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.0	man years	0.5
Manpower (Other Direct)				
Salaries (Sc & Tech)		6714		40399
Material & Services		701		24820
ADP Support				
Subcontracts		36648		190290
Travel				1098
Overhead		2369		17088
Total Costs		46435		273697

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	54	22	14	65	65	65	38	38	38	38	38	39
Cumulative Planned	54	76	90	155	220	285	323	361	399	437	475	514
Monthly Actual	54	22	14	-19	25	59	26	46	46			
Cumulative Actual	54	76	90	71	96	155	181	227	273			
Monthly Variance	0	0	0	-84	-40	-6	-12	+8	+8			
Cumulative Variance	0	0	0	-84	-124	-130	-142	-134	-126			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	375	12	0	387	288
2	375	200	161	414	100
3	375	200	161	414	100
4					

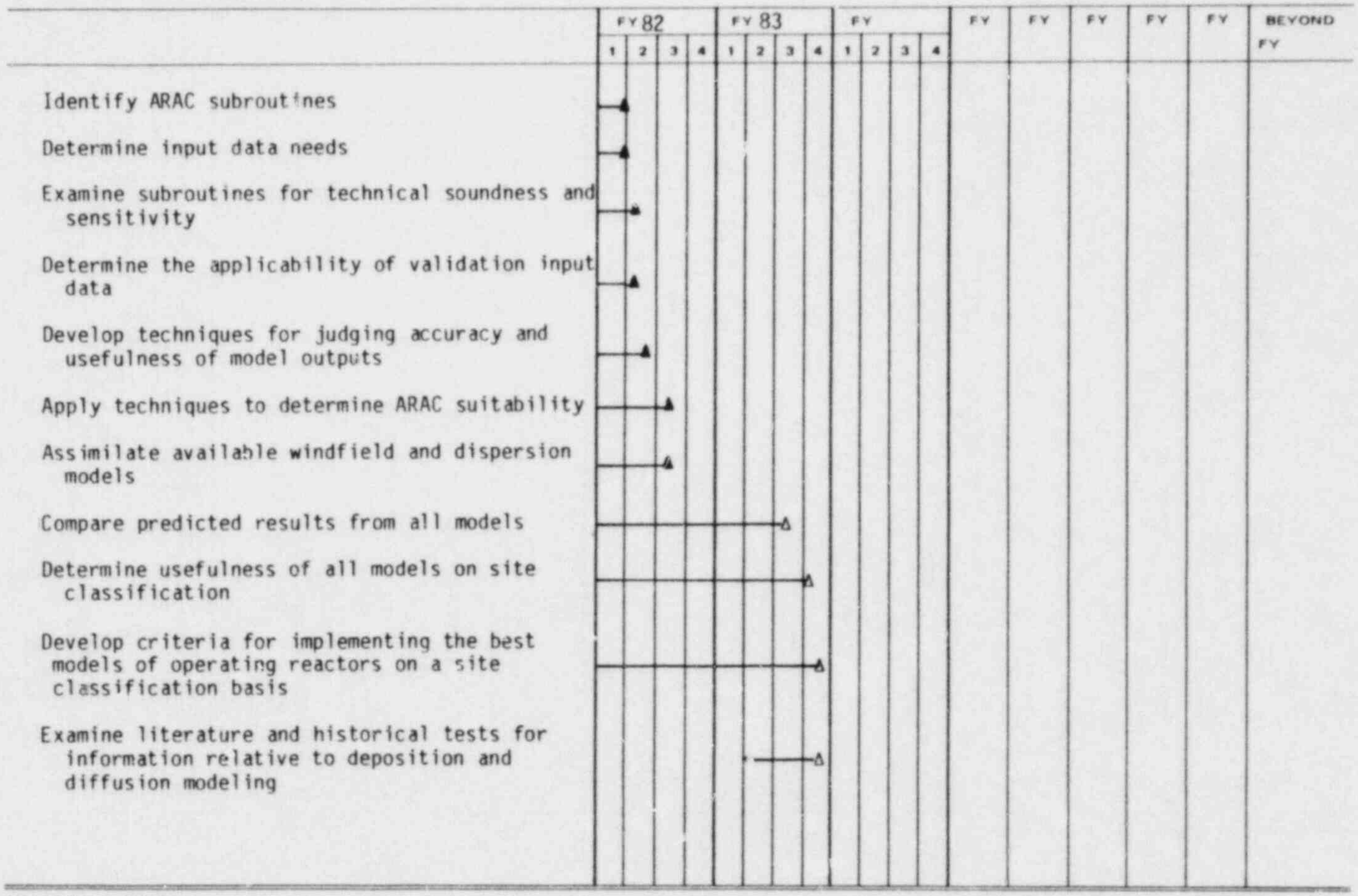
Comments: Variance: -31.6%

Variance due to delay in model evaluation task as requested by NRC. Variance has decreased by 14.0 since last quarter.

MILESTONE BAR CHART

TITLE: Evaluation of Atmospheric Dispersion Models

ACTIVITY NO: 60 19 12 01 (B0446)



COST/BUDGET REPORT

FIN No.: B0190

NRC Project Manager: Prichard/Cleary

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 01 3

NRC Act. No. 60 19 32 02

Program Director: Lotts/Chester

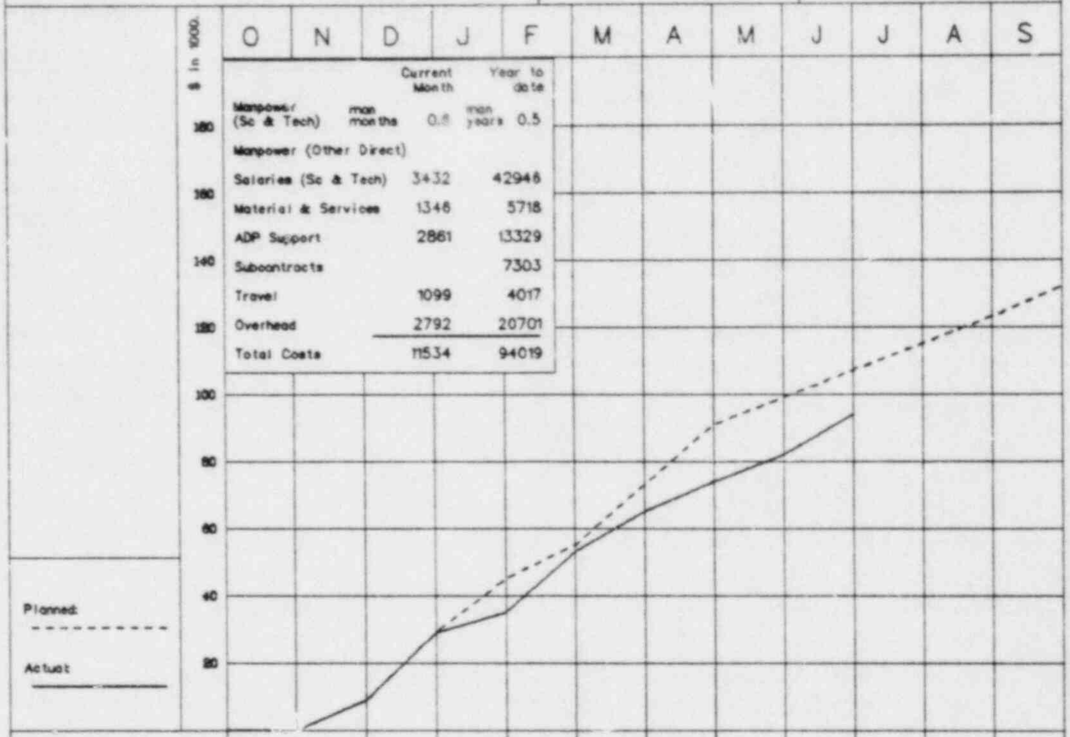
Program Title: Forecasting Electricity Demand by States

NRC Div.: RES/: HSWM

ORNL Div.: EN

Program Manager: R. B. Shelton

Principal Investigator: D. M. Hamblin



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.8	man years	0.5
Manpower (Other Direct)				
Salaries (Sc & Tech)		3432		42946
Material & Services		1346		5718
ADP Support		2861		13329
Subcontracts				7303
Travel		1099		4017
Overhead		2792		20701
Total Costs		11534		94019

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	9	20	16	10	18	18	8	8	8	8	9
Cumulative Planned	0	9	29	45	55	73	91	99	107	115	123	132
Monthly Actual	0	9	20	6	18	12	9	8	12			
Cumulative Actual	0	9	29	35	53	65	74	82	94			
Monthly Variance	0	0	0	−10	+8	−6	−9	0	+4			
Cumulative Variance	0	0	0	−10	−2	−8	−17	−17	−13			

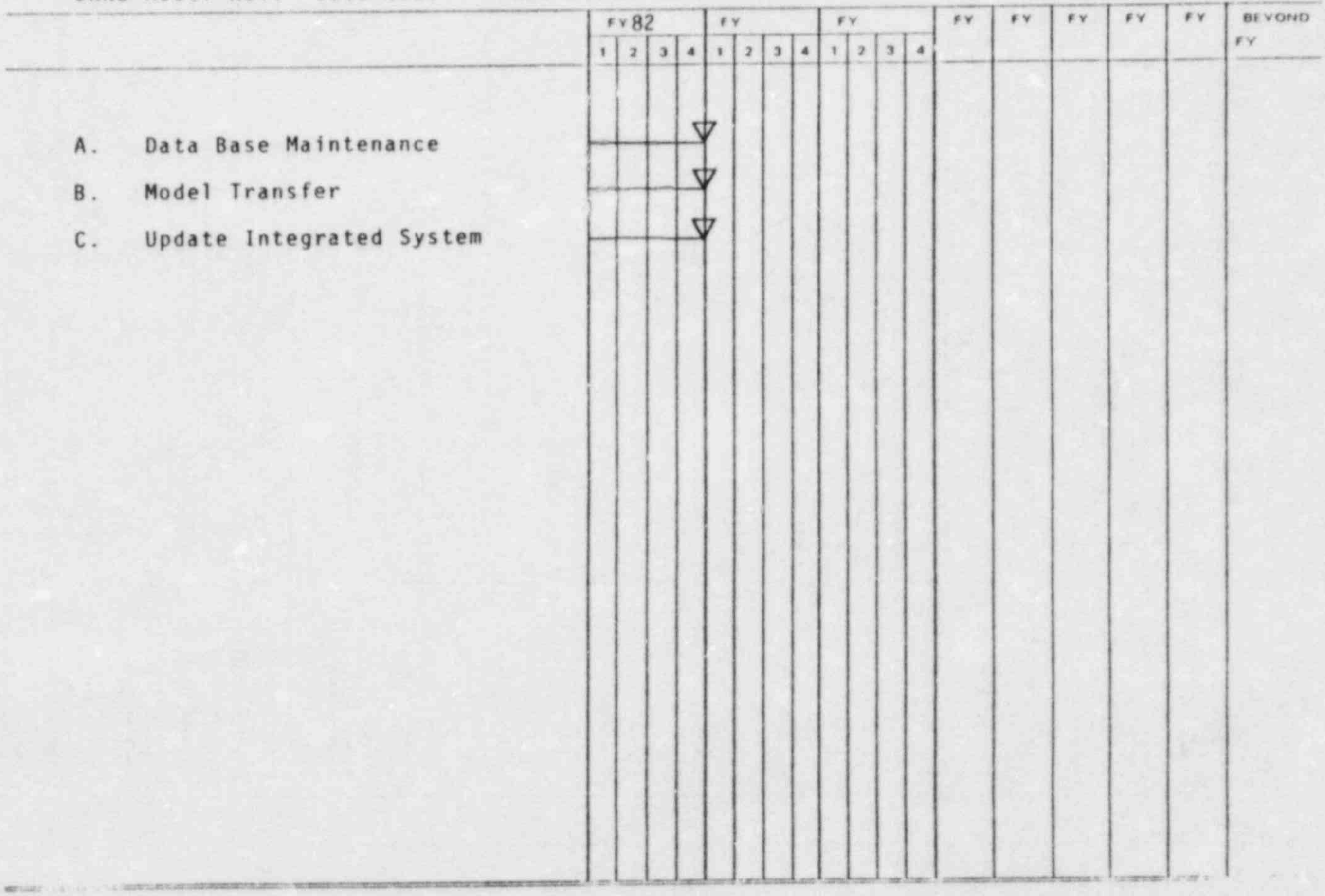
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	2	20	0	22	110
2	2	100	0	102	30
3	2	100	0	102	30
4					

Comments: Variance: −12.1%

Variance temporary. Will be on target next quarter.

MILESTONE BAR CHART

Title: Forecasting Electricity Demand by States
ORNL Acct. No.: 3345-6021 NRC Acct. No.: B0190



COST/BUDGET REPORT

FIN No.: B0475

NRC Project Manager: A. Brodsky

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 04 5

NRC Act. No.

Program Director: Lotts/Chester

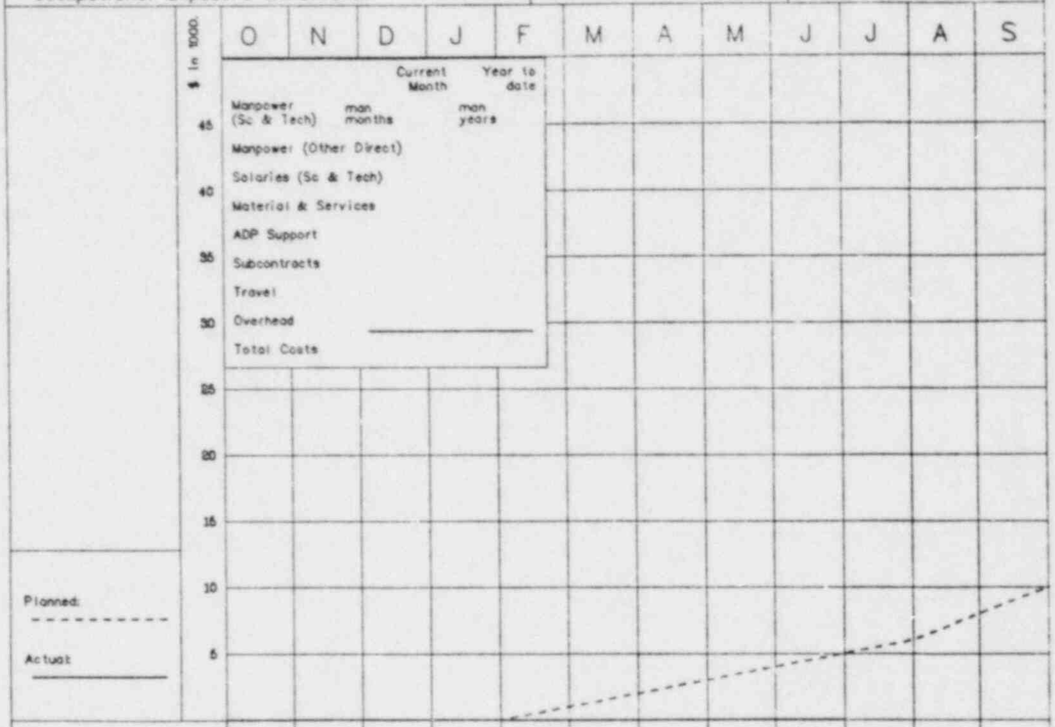
Program Title: Internal Dose for Specific Occupational Exposure Conditions

NRC Div.: RES/: HSWM

ORNL Div.: HASRD

Program Manager: K. F. Eckerman

Principal Investigator: K. F. Eckerman



	Current Month	Year to date
Manpower (Sc & Tech)	man months	man years
Manpower (Other Direct)		
Salaries (Sc & Tech)		
Material & Services		
ADP Support		
Subcontracts		
Travel		
Overhead		
Total Costs		

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	0	0	0	0	1	1	1	1	1	1	2	2
Cumulative Planned	0	0	0	0	1	2	3	4	5	6	8	10
Monthly Actual	0	0	0	0	0	0	0	0	0			
Cumulative Actual	0	0	0	0	0	0	0	0	0			
Monthly Variance	0	0	0	0	-1	-1	-1	-1	-1			
Cumulative Variance	0	0	0	0	-1	-2	-3	-4	-5			

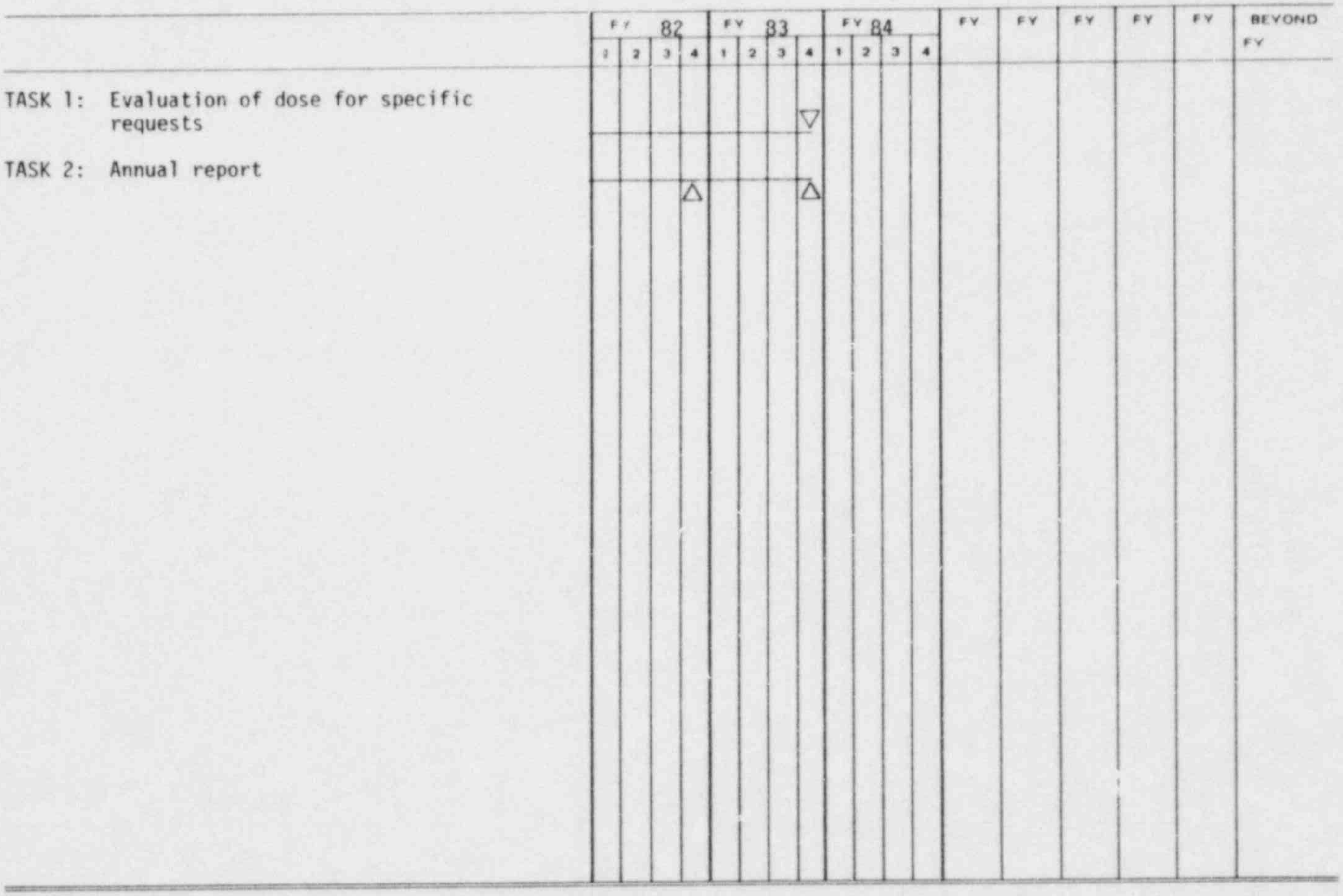
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	0
2	0	10	0	10	0
3	0	10	0	10	0
4					

Comments: Variance: -100.0%

No requests received yet for dose evaluations.

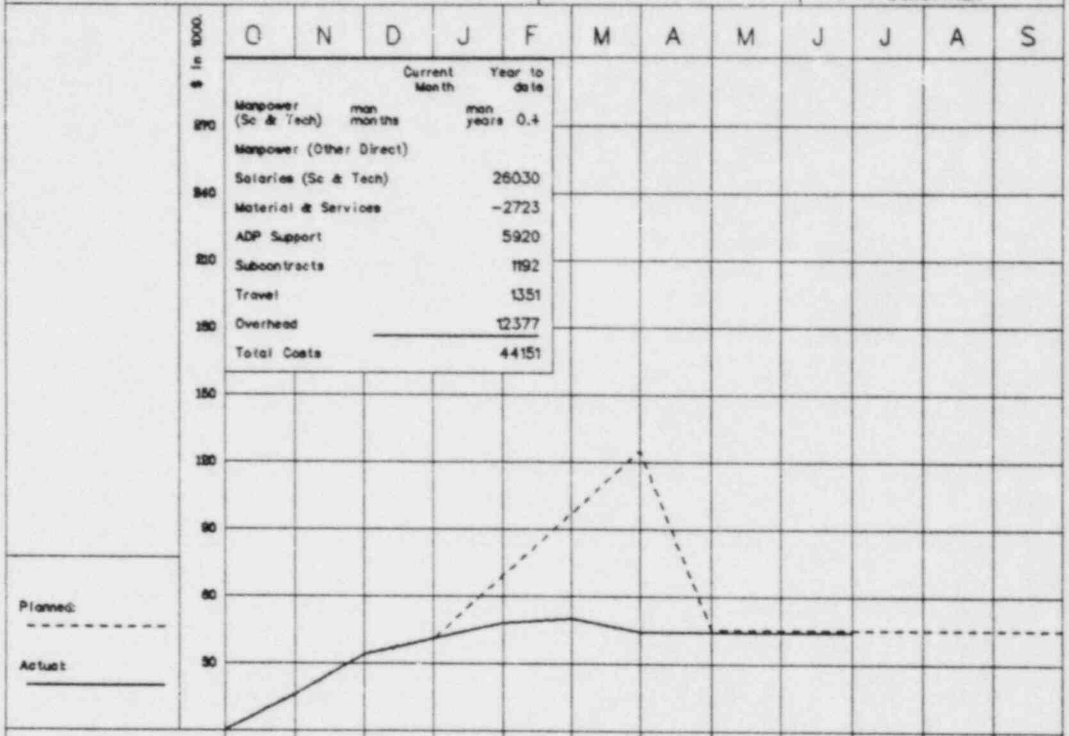
MILESTONE BAR CHART

Internal Dose for Specific Occupational Exposure Conditions (B0475)



COST/BUDGET REPORT

FIN No.: B0410			NRC Project Manager: J. D. Foulke
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 55 01 8	NRC Act. No. 60 19 30 01	Program Director: Lotts/Chester
Program Title: Methods in Dosimetry for Nuclear Regulations		NRC Div.: RES/: HSWM	Program Manager: K. F. Eckerman
		ORNL Div.: HSRD	Principal Investigator: K. F. Eckerman



		Current Month	Year to date
Manpower (Sc & Tech)	man months		man years 0.4
Manpower (Other Direct)			
Salaries (Sc & Tech)			26030
Material & Services			-2723
ADP Support			5920
Subcontracts			1192
Travel			1351
Overhead			12377
Total Costs			44151

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	16	18	7	28	28	28	-80	0	0	0	0	0
Cumulative Planned	16	34	41	69	97	125	45	45	45	45	45	45
Monthly Actual	16	18	7	7	2	-6	0	0	0			
Cumulative Actual	16	34	41	48	50	44	44	44	44			
Monthly Variance	0	0	0	-21	-26	-34	+80	0	0			
Cumulative Variance	0	0	0	-21	-47	-81	-1	-1	-1			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	45	0	0	45	250
2	45	0	0	45	0
3	45	0	0	45	0
4					

Comments: Variance: -2.2%

COST/BUDGET REPORT

FIN No.: B0418

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 01 9

NRC Act. No. 60 19 02 10

Program Title: Pathogenic Microorganisms in Closed Cycle Cooling Systems

NRC Div.: RES/: HSWM

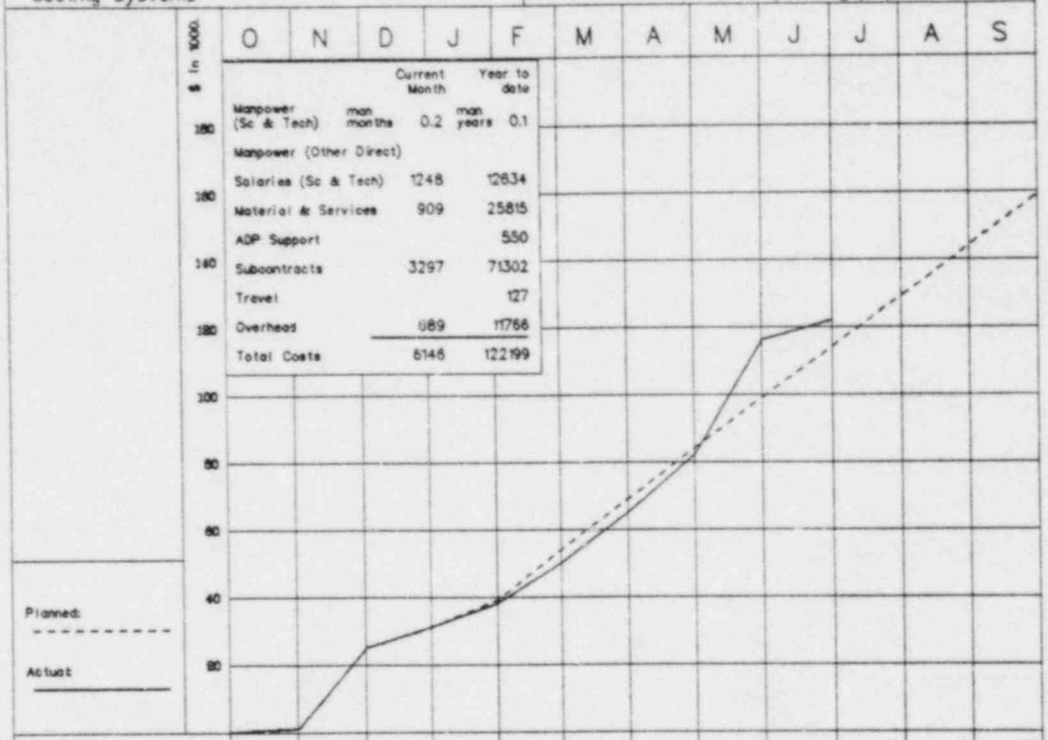
ORNL Div.: ESD

NRC Project Manager: J. Foulke

Program Director: Lotis/Chester

Program Manager: W. Van Winkle

Principal Investigator: Gough/Tyndall



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.2	man years	0.1
Manpower (Other Direct)				
Salaries (Sc & Tech)		1248		12634
Material & Services		909		25815
ADP Support				550
Subcontracts		3297		71302
Travel				127
Overhead		689		11768
Total Costs		6146		122199

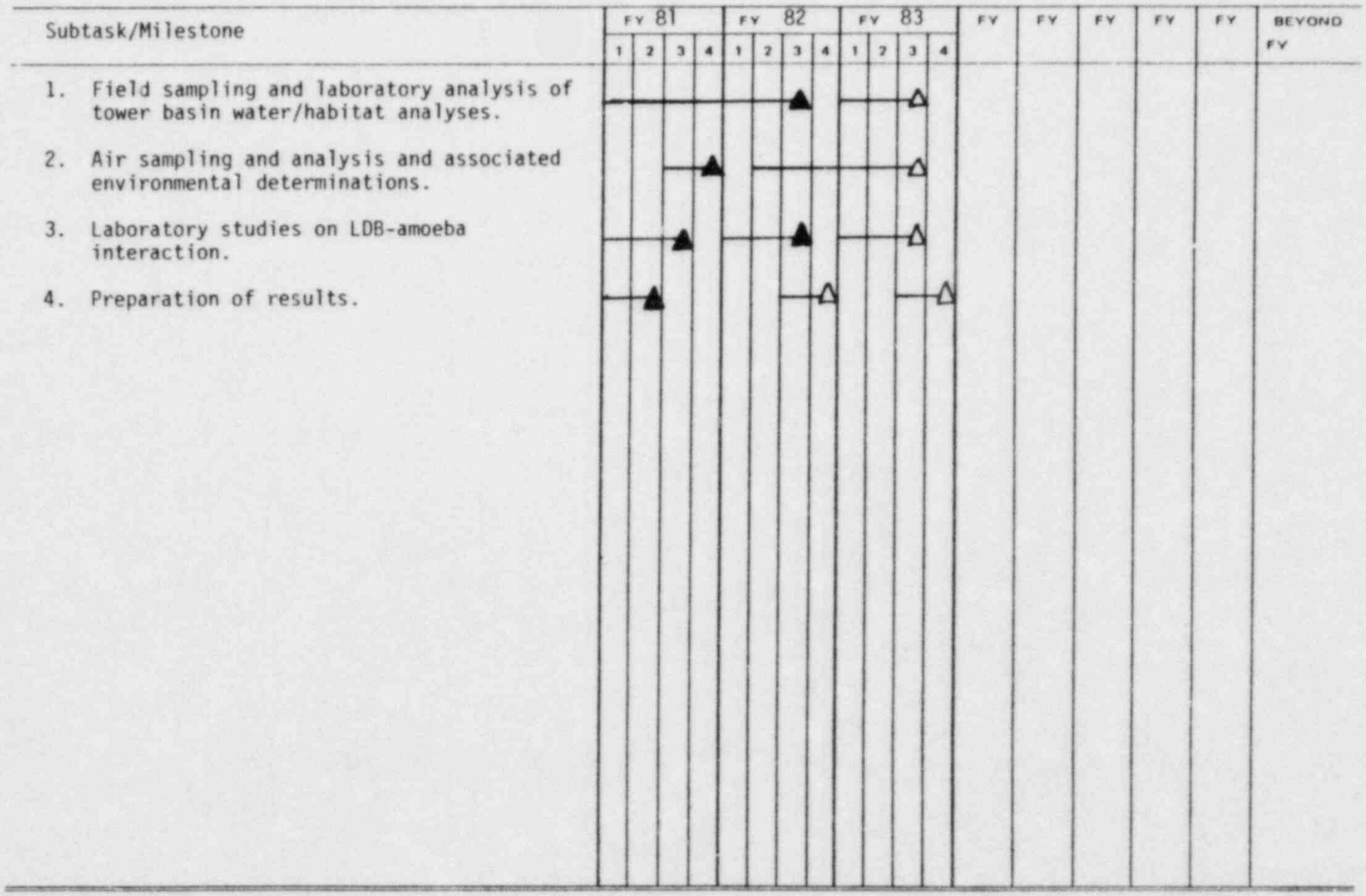
	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	1	24	6	8	15	15	15	15	15	15	15	15
Cumulative Planned	1	25	31	39	54	69	84	99	114	129	144	159
Monthly Actual	1	24	6	7	12	15	17	34	6			
Cumulative Actual	1	25	31	38	50	65	82	116	122			
Monthly Variance	0	0	0	−1	−3	0	+2	+19	−9			
Cumulative Variance	0	0	0	−1	−4	−4	−2	+17	+8			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	177	0	18	159	0
2	177	0	18	159	0
3	177	0	18	159	0
4					

Comments: Variance: +7.0%

MILESTONE BAR CHART

Pathogenic Microorganisms in Closed Cycle Cooling Systems



1. Field sampling and laboratory analysis of tower basin water/habitat analyses.
2. Air sampling and analysis and associated environmental determinations.
3. Laboratory studies on LDB-amoeba interaction.
4. Preparation of results.

COST/BUDGET REPORT

FIN No.: A9043

NRC Project Manager: R. Grill

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 54 32 2

NRC Act. No. 10 19 03 07 1

Program Director: Lotts/Chester

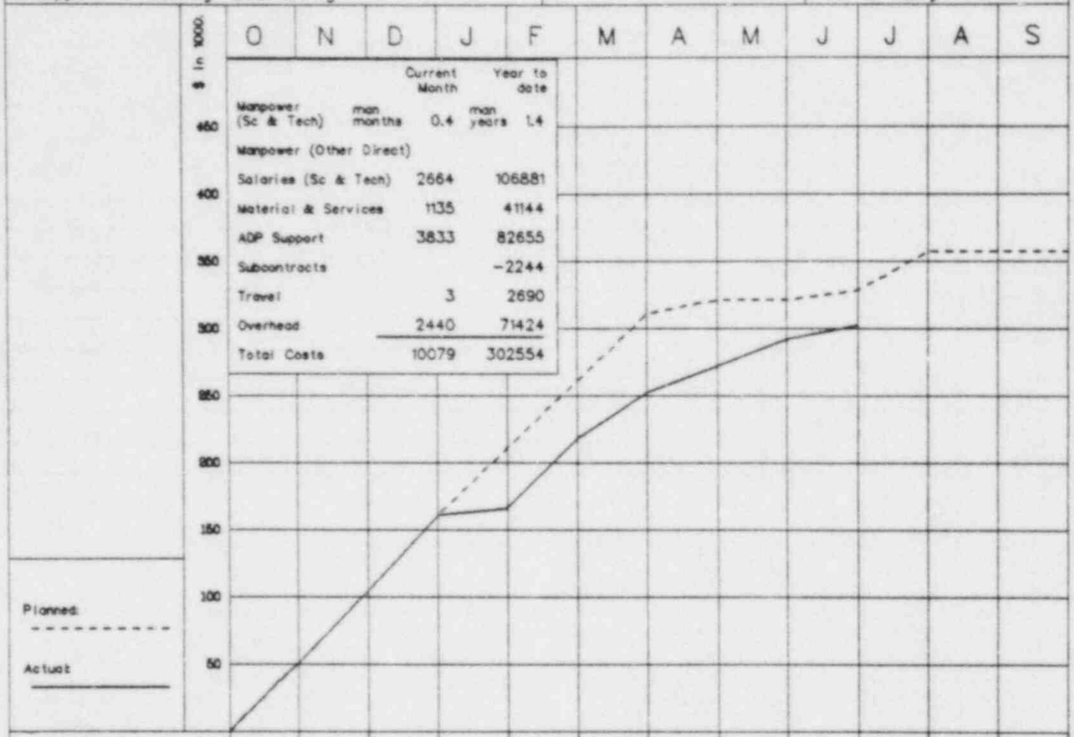
Program Title: Technical Assistance for NEPA Activities in Support of Siting Rulemaking

NRC Div.: RES/: HSWM

ORNL Div.: EN

Program Manager: H. E. Zittel

Principal Investigator: M. J. Kelly



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.4	man years	1.4
Manpower (Other Direct)				
Salaries (Sc & Tech)		2664		106881
Material & Services		1135		41144
ADP Support		3833		82655
Subcontracts				-2244
Travel		3		2690
Overhead		2440		71424
Total Costs		10079		302554

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	51	54	56	50	50	50	10	0	7	29	0	0
Cumulative Planned	51	105	161	211	261	311	321	321	328	357	357	357
Monthly Actual	51	54	56	5	52	34	20	20	10			
Cumulative Actual	51	105	161	166	218	252	272	292	302			
Monthly Variance	0	0	0	-45	+2	-16	+10	+20	+3			
Cumulative Variance	0	0	0	-45	-43	-59	-49	-29	-26			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	357	0	0	357	0
2	357	110	110	357	0
3	357	110	110	357	0
4					

Comments: Variance: -7.9%

MILESTONE BAR CHART

Title: Technical Assistance for NEPA Activities in Support of Siting Rulemaking
A9043

Siting Rule Support Documents:

1. Protective Actions as a Factor in Power Reactor Siting.

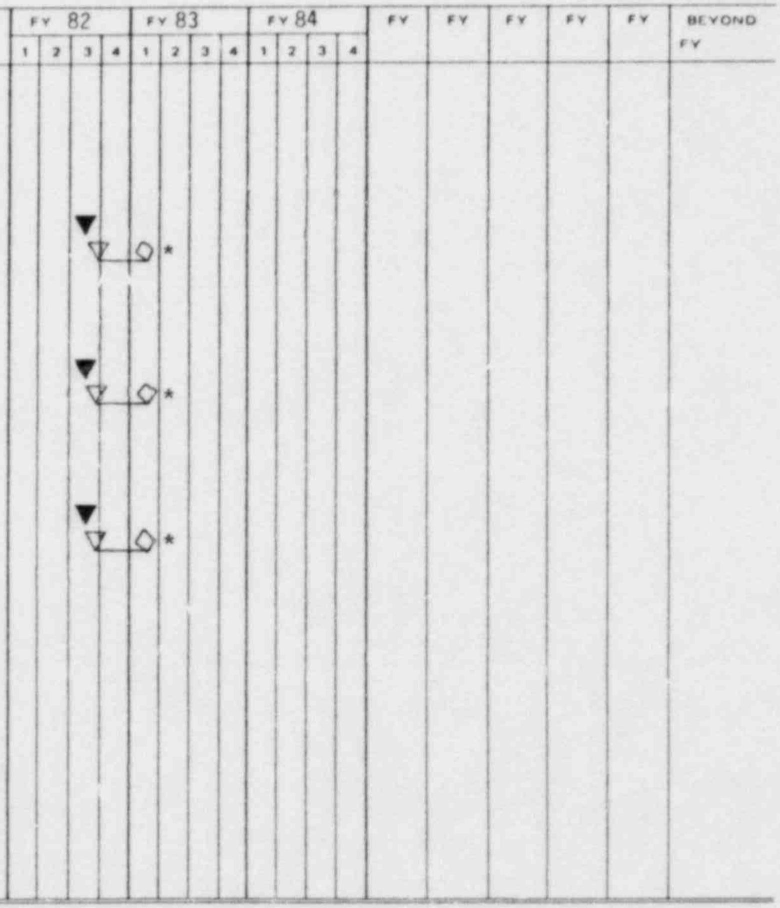
   a. Complete Draft.
   b. Issue Report.

2. Effect of Population Alternatives on Availability of Acceptable Sites.

   a. Complete Draft.
   b. Issue Report.

3. Evaluation of the Effects of Population Criteria

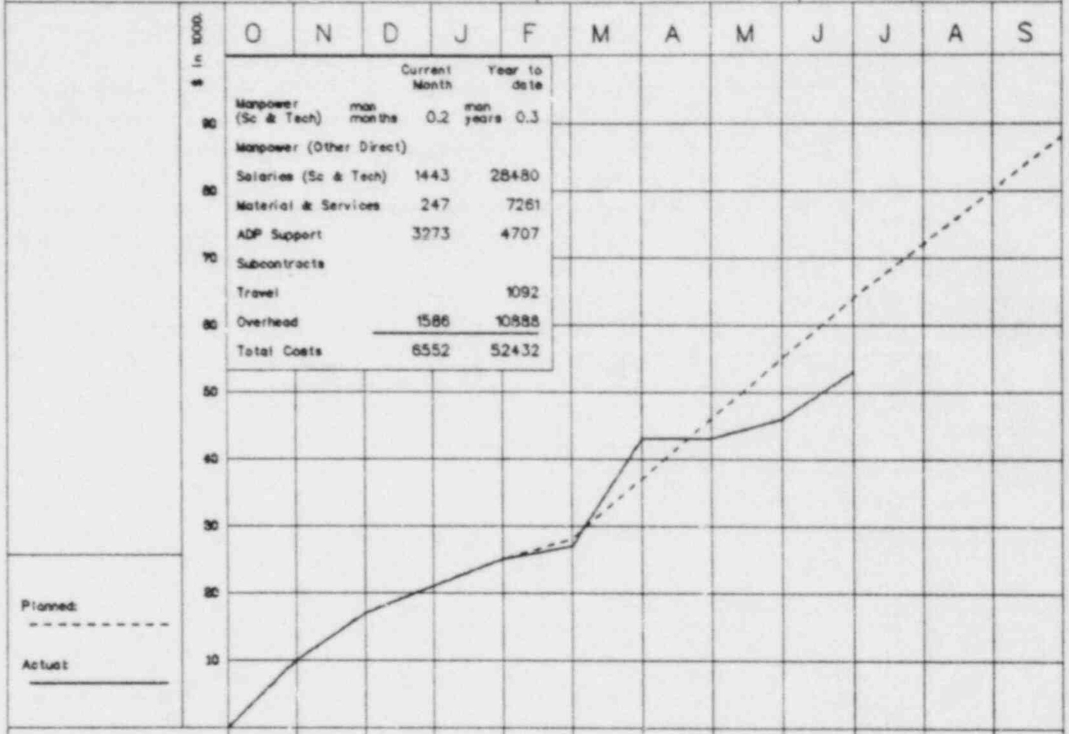
   a. Complete Draft.
   b. Issue Report.



*Reports delayed pending NRC review.

COST/BUDGET REPORT

FIN No.: B0472			**NRC Project Manager:** C. Prichard
Report For Period Ending: 06-31-82	**ORNL Act No.** 41 88 55 04 3	**NRC Act. No.**	**Program Director:** Lotts/Chester
Program Title: The Effects of Delays in Operation of the Capital Cost of Nuclear Power Plants		**NRC Div.: RES/:** HSWM **ORNL Div.:** EN	**Program Manager:** R. B. Shelton **Principal Investigator:** R. C. Tepel



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.2	man years	0.3
Manpower (Other Direct)				
Salaries (Sc & Tech)		1443		28480
Material & Services		247		7261
ADP Support		3273		4707
Subcontracts				
Travel				1092
Overhead		1586		10888
Total Costs		6552		52432

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	10	7	4	4	3	9	9	9	9	8	8	8
Cumulative Planned	10	17	21	25	28	37	46	55	64	72	80	88
Monthly Actual	10	7	4	4	2	16	0	3	7			
Cumulative Actual	10	17	21	25	27	43	43	46	53			
Monthly Variance	0	0	0	0	−1	+7	−9	−6	−2			
Cumulative Variance	0	0	0	0	−1	+6	−3	−9	−11			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	28	0	0	28	0
2	28	60	0	88	0
3	28	60	0	88	0
4					

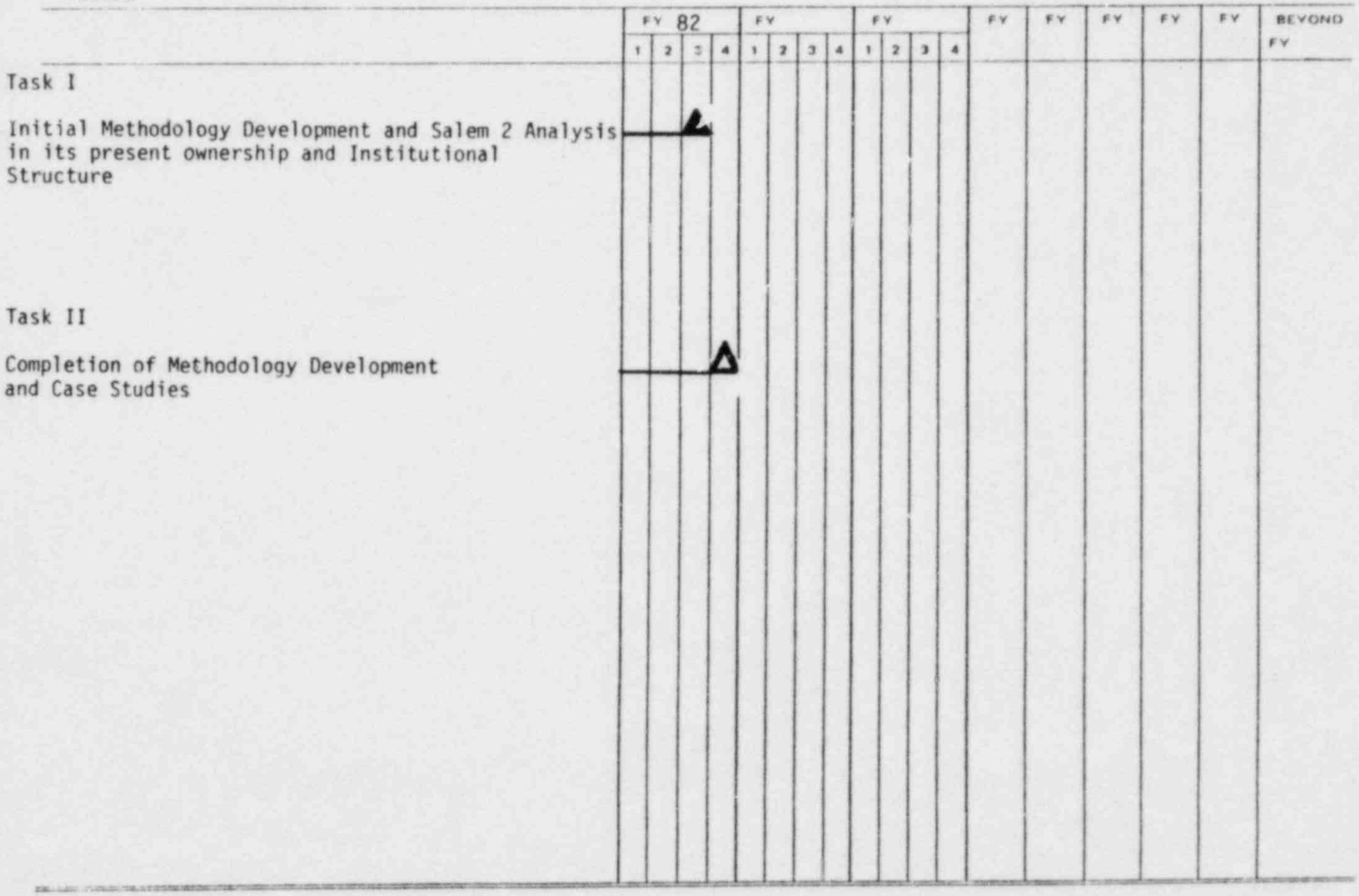
Comments: Variance: −17.2%

Variance due to delay in obtaining needed data from utilities, will be made up next quarter.

MILESTONE BAR CHART

IMPACTS IN DELAYING THE OPERATION OF A NUCLEAR POWER PLANT

B0472



COST/BUDGET REPORT

FIN No.: B0406

NRC Project Manager: P. Reed

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 01 5

NRC Act. No. 60 19 02 10

Program Director: Lotts/Chester

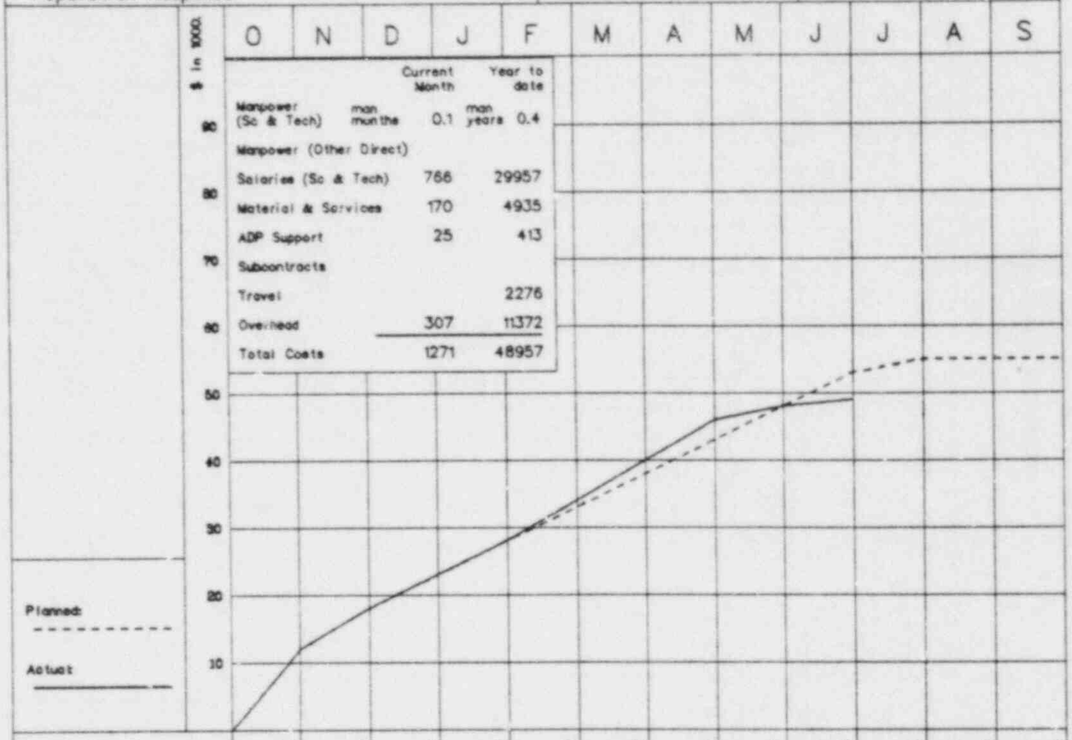
Program Title: Threadfin Shad Impingement: Population Response

NRC Div.: RES/: HSWM

ORNL Div.: ESD

Program Manager: S. G. Hildebrand

Principal Investigator: P. Kanciruk



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.1	man years	0.4
Manpower (Other Direct)				
Salaries (Sc & Tech)		766		29957
Material & Services		170		4935
ADP Support		25		413
Subcontracts				
Travel				2276
Overhead		307		11372
Total Costs		1271		48957

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	12	6	5	5	5	5	5	5	5	2	0	0
Cumulative Planned	12	18	23	28	33	38	43	48	53	55	55	55
Monthly Actual	12	6	5	5	6	6	6	2	1			
Cumulative Actual	12	18	23	28	34	40	46	48	49			
Monthly Variance	0	0	0	0	+1	+1	+1	-3	-4			
Cumulative Variance	0	0	0	0	+1	+2	+3	0	-4			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	55	0	0	55	0
2	55	0	0	55	0
3	55	0	0	55	0
4					

Comments: Variance: -7.5%

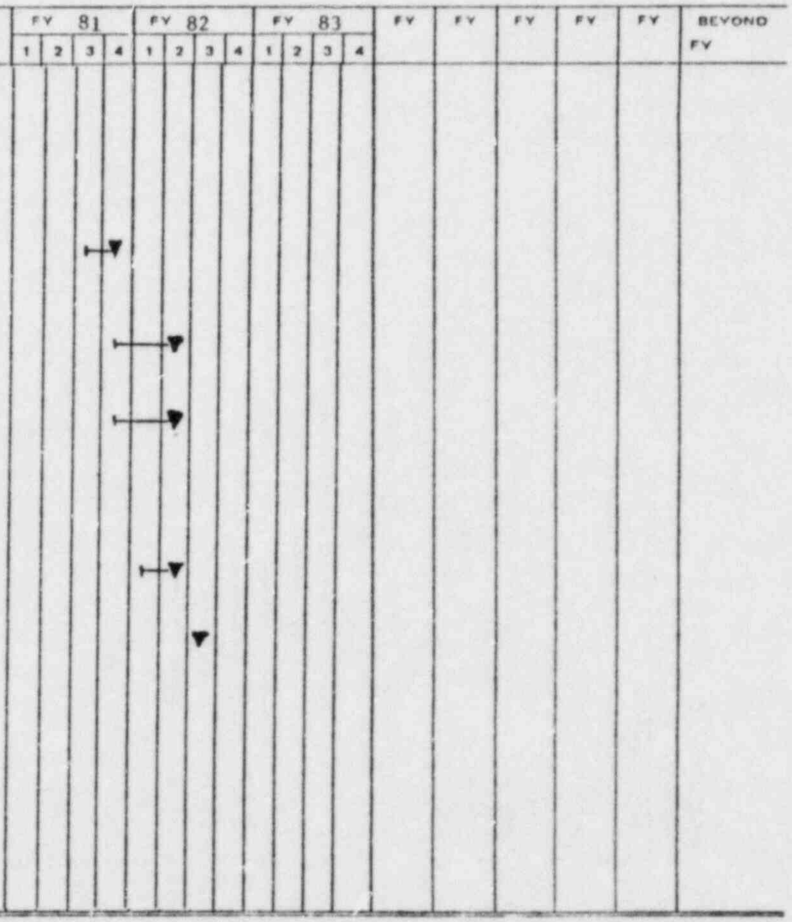
MILESTONE BAR CHART

Threadfin Shad Impingement: Population Response
B0406
NRC Activity No. 60 19 02 10

Task (Subtask H)

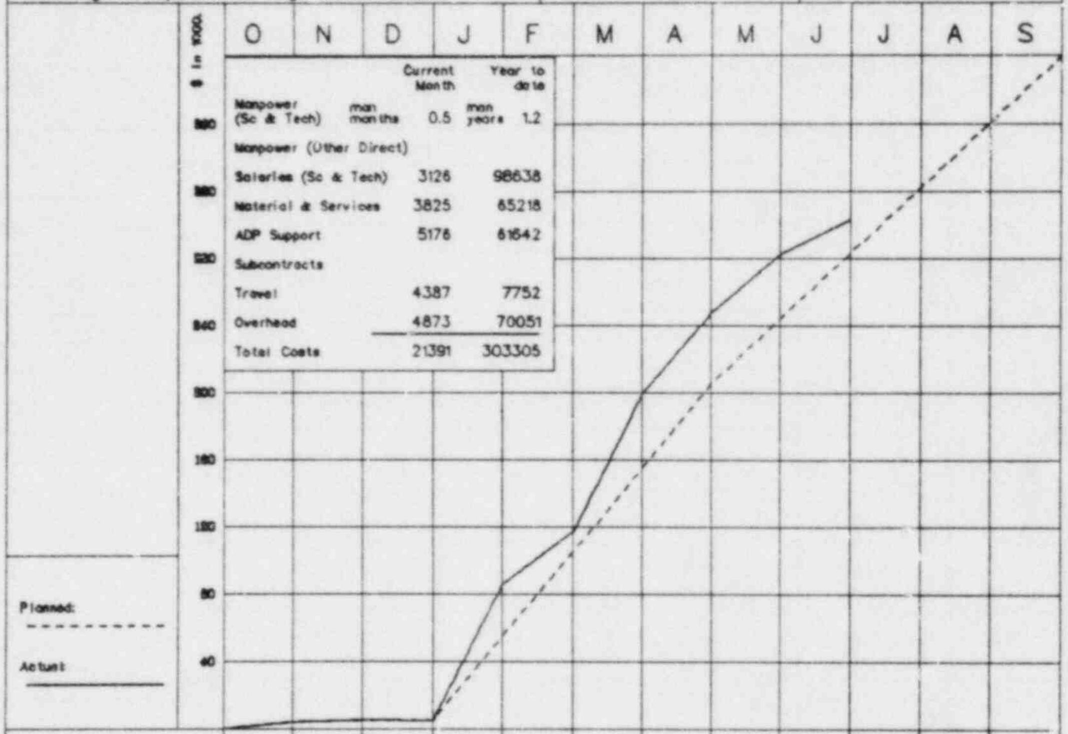
Determine potential of downscan sonar as a technique for assessing nuclear energy related impacts on fisheries.

1. Acquire downscan sonar literature:
   USA
   Foreign
2. Evaluate existing systems from literature
3. Contact key persons (site visits where necessary) developing and utilizing downscan sonar to ascertain recent advances and to define field strengths and weaknesses.
4. Draft report prepared and distributed for review.
5. Final report to NRC.



COST/BUDGET REPORT

FIN No.: A9041			NRC Project Manager: J. Randall
Report For Period Ending: 06-31-82	ORNL Act No. 41 88 54 32 0	NRC Act. No. 10 19 03 03 3	Program Director: Lotts/Chester
Program Title: Uncertainties in Assessment of Long-Term Collective Dose and Health Effects from Geologic Disposal of High-Level Waste		NRC Div.: RES/: HSWM ORNL Div.: HSR	Program Manager: D. C. Kocher Principal Investigator: D. C. Kocher



		Current Month		Year to date
Manpower (Sc & Tech)	man months	0.5	man years	1.2
Manpower (Other Direct)				
Salaries (Sc & Tech)		3126		98638
Material & Services		3825		65218
ADP Support		5178		61642
Subcontracts				
Travel		4387		7752
Overhead		4873		70051
Total Costs		21391		303305

Monthly Planned	4	1	0	50	50	50	50	39	39	39	39	3
Cumulative Planned	4	5	5	55	105	155	205	244	283	322	361	400
Monthly Actual	4	1	0	80	32	82	48	35	21			
Cumulative Actual	4	5	5	85	117	199	247	282	303			
Monthly Variance	0	0	0	+30	−18	+32	−2	−4	−18			
Cumulative Variance	0	0	0	+30	+12	+44	+42	+38	+20			

Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	0	0	0	0	400
2	0	400	0	400	0
3	0	400	0	400	0
4					

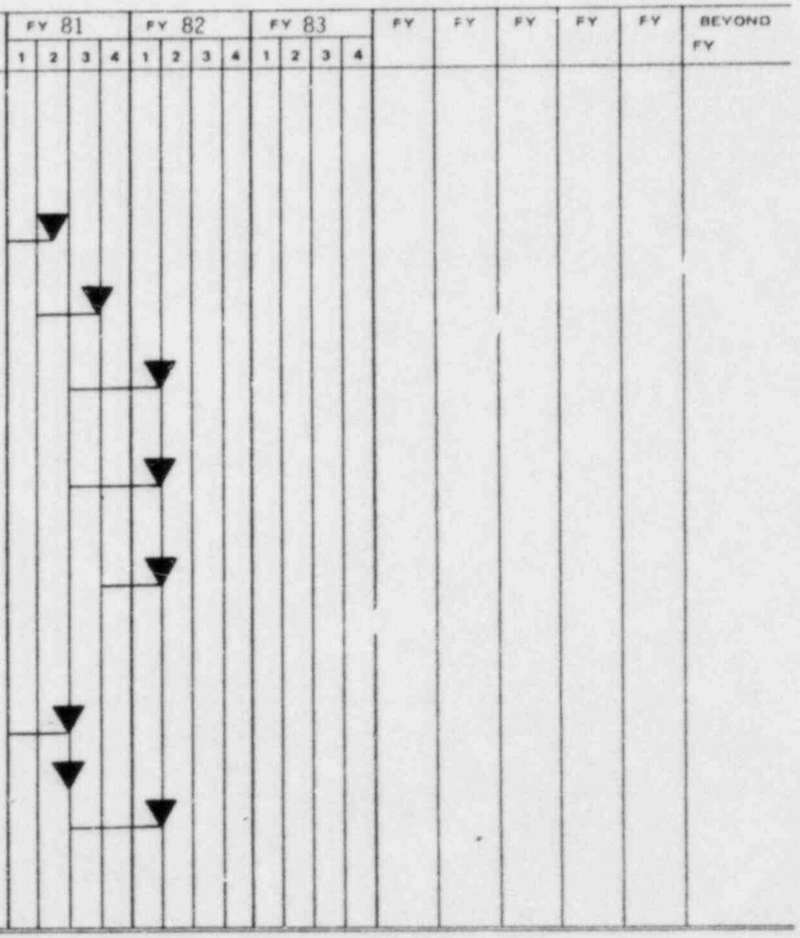
Comments: Variance: +7.1%

MILESTONE BAR CHART

TITLE: Uncertainties in Assessment of Long-Term Collective Dose and Health Effects from Geologic Disposal of High-Level Waste

ACTIVITY NO.: 10 19 03 03 3 A9041

12. SUBTASK/MILESTONE SCHEDULE



Task 1. Assessment of Uncertainties Associated with Geologic Disposal of High-Level Waste

a. Perform literature review to identify important processes and parameters for estimating uncertainties

b. Prepare ORNL/NUREG/TM progress report describing results of Task 1.a.

c. Analysis of uncertainties in groundwater transport from repository to biosphere

d. Analysis of uncertainties in long-term collective dose and health effects from transport through biosphere to man

e. Prepare ORNL/NUREG report on analyses of uncertainties performed in Tasks 1.c. and 1.d.

Task 2. Symposium on Geologic Waste Disposal

a. Plan symposium on uncertainties associated with regulation of geologic disposal of high-level waste

b. Host symposium

c. Publish symposium proceedings

MILESTONE BAR CHART

TITLE: Uncertainties in Assessment of Long-Term Collective Dose and Health Effects from Geologic Disposal of High-Level Waste

ACTIVITY NO.: 10 19 03 03 3 A9041

12. SUBTASK/MILESTONE SCHEDULE

Task 3. Review currently available information regarding uncertainties in the geosciences relevant to licensing of HLW repositories, and assess the value of 10 CFR 60 in reducing or compensating for those uncertainties

a. Review earth sciences literature on factors affecting uncertainty in doing repository assessments

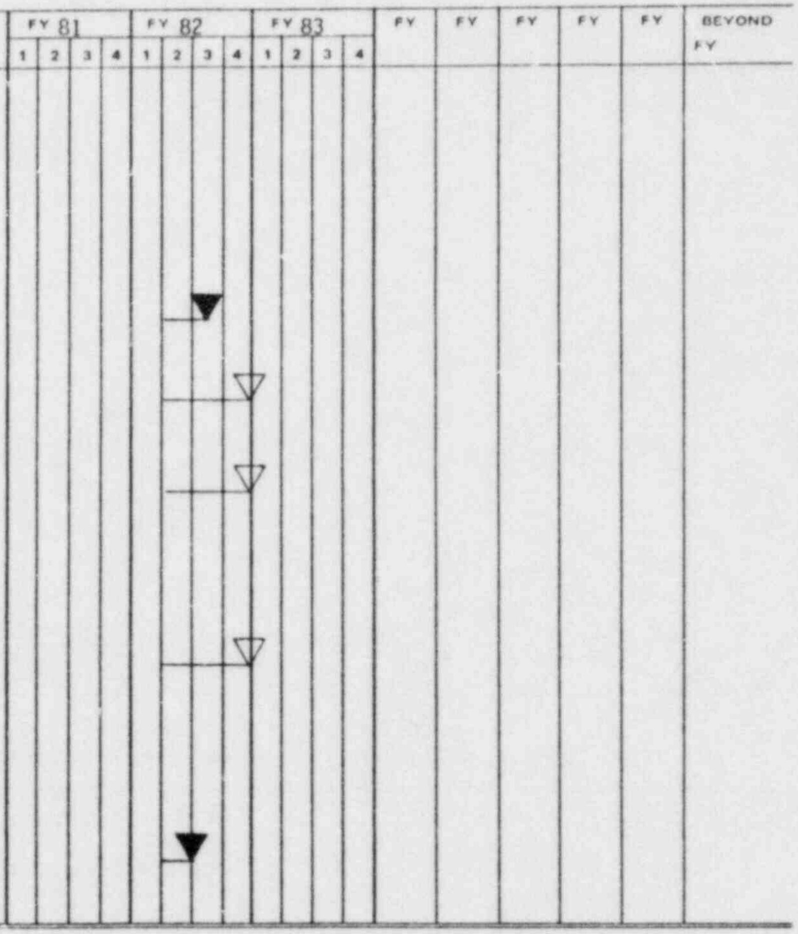
b. Evaluate the importance of the uncertainties identified in Task 3.a.

c. Assess the effectiveness of 10 CFR 60 in reducing or compensating for uncertainties identified in Task 3.b.

Task 4. Using the results of Task 3 and other pertinent information, assess the value of past geologic records as indicators of future site evolution, emphasizing the effect of such evolution on repository performance

Task 5. Provide technical assistance for preparing contingency HLW radiological criteria

a. Peview past radiological standards set by NRC, EPA, and ICRP for waste management



UCN-14127 (3 9-80)

MILESTONE BAR CHART

TITLE: Uncertainties in Assessment of Long-Term Collective Dose and Health Effects from Geologic Disposal of High-Level Waste

ACTIVITY NO.: 10 19 03 03 3 A9041

12. SUBTASK/MILESTONE SCHEDULE

Task 5. (continued)

b. Review NRC's evaluation of the EPA HLW radiological standard

c. Summarize similarities and differences in approaches taken by NRC, EPA, and ICRP in setting radiological standards for radioactive waste disposal

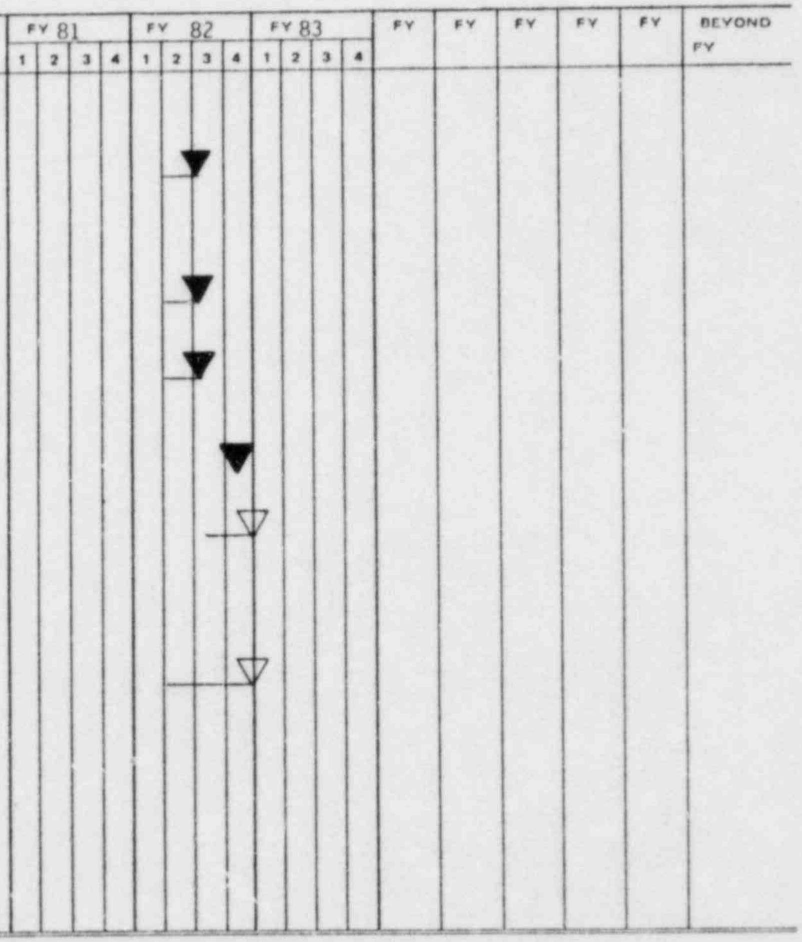
d. Assess advantages and disadvantages of the approaches summarized in Task 5.c.

e. Meet with NRC personnel to plan remaining work on preparing contingency HLW radiological criteria

f. Prepare the contingency HLW radiological criteria

Task 6. Short-Term Technical Assistance

a. At request of NRC, provide general technical assistance on waste management matters relating to Tasks 1-5



COST/BUDGET REPORT

FIN No.: B0462

NRC Project Manager: G. Birchard

Report For Period Ending: 06-31-82

ORNL Act No. 41 88 55 04 0

NRC Act. No. 60 19 02 20

Program Director: Lotts/Chester

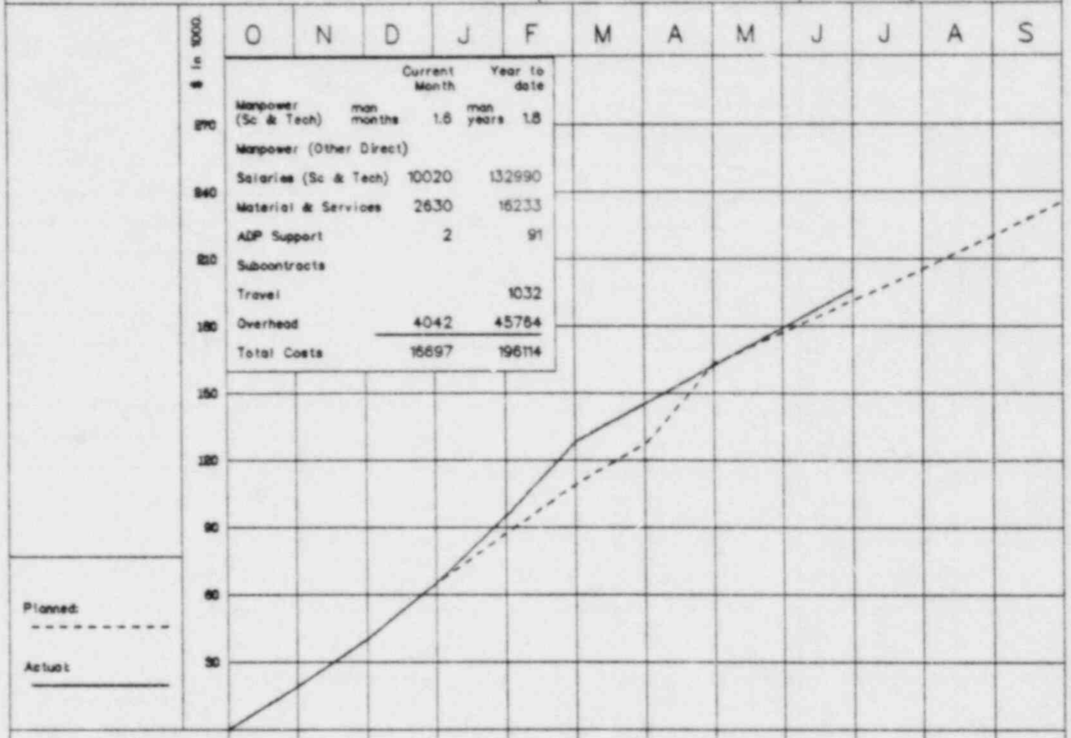
Program Title: Valence Effects on Adsorption

NRC Div.: RES/: HSWM

ORNL Div.: CH

Program Manager: R. E. Meyer

Principal Investigator: R. E. Meyer



		Current Month		Year to date
Manpower (Sc & Tech)	man months	1.6	man years	1.8
Manpower (Other Direct)				
Salaries (Sc & Tech)		10020		132990
Material & Services		2630		16233
ADP Support		2		91
Subcontracts				
Travel				1032
Overhead		4042		45784
Total Costs		16697		196114

	O	N	D	J	F	M	A	M	J	J	A	S
Monthly Planned	19	21	25	22	22	18	36	14	14	14	15	15
Cumulative Planned	19	40	65	87	109	127	163	177	191	205	220	235
Monthly Actual	19	21	25	30	33	17	17	17	17			
Cumulative Actual	19	40	65	95	128	145	162	179	196			
Monthly Variance	0	0	0	+8	+11	−1	−19	+3	+3			
Cumulative Variance	0	0	0	+8	+19	+18	−1	+2	+5			

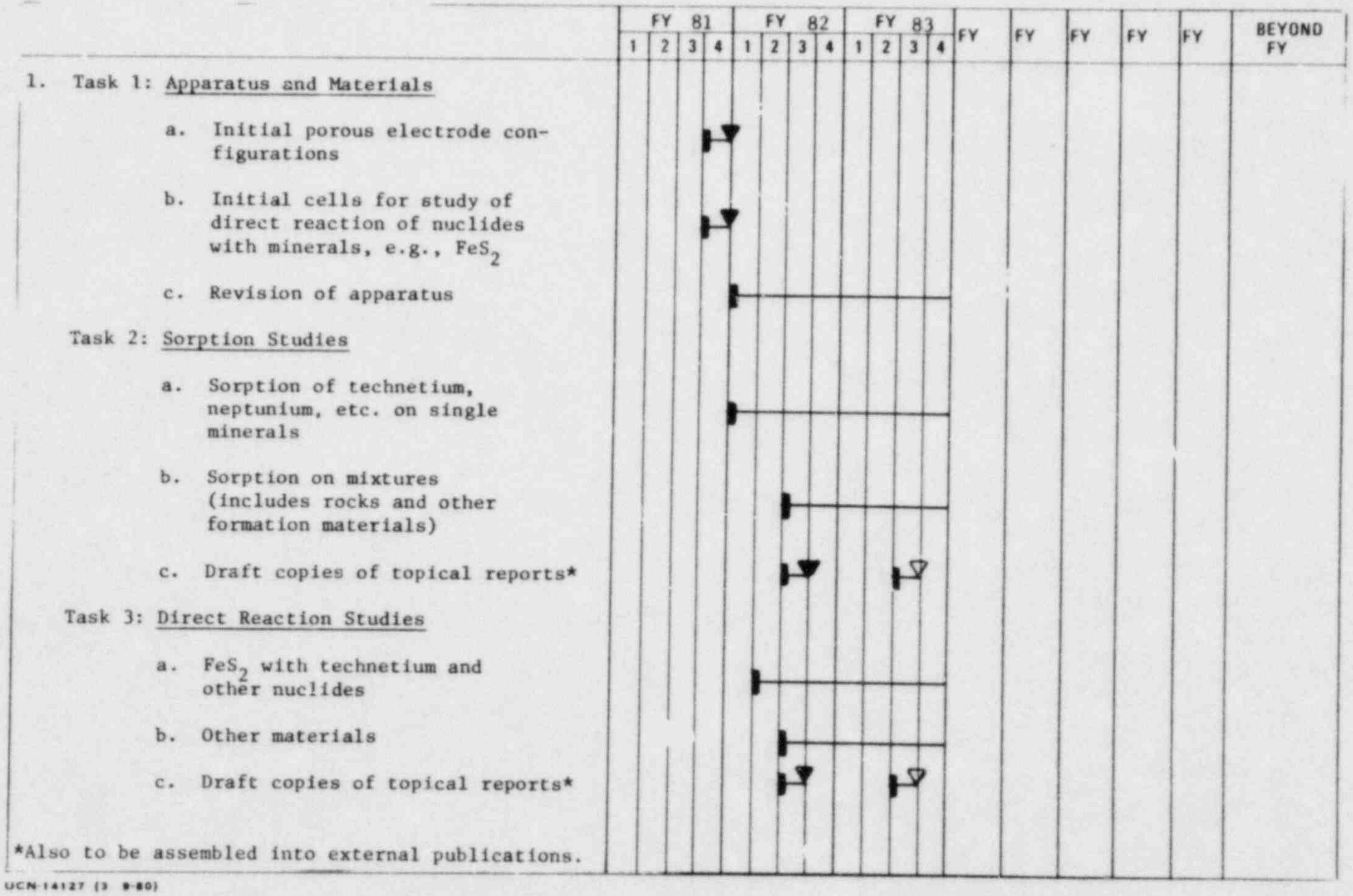
Quarter	carry over 10/01/81	FY 82 Funding	carry over 9/30/82	Financial Plan	Expected Changes
1	35	0	0	35	200
2	35	200	0	235	0
3	35	200	0	235	0
4					

Comments: Variance: +2.6%

MILESTONE BAR CHART

TITLE: Valence Effects on Adsorption

Fin. No: B0462



1. Task 1: <u>Apparatus and Materials</u>
   - a. Initial porous electrode configurations
   - b. Initial cells for study of direct reaction of nuclides with minerals, e.g., FeS_2
   - c. Revision of apparatus

   Task 2: <u>Sorption Studies</u>
   - a. Sorption of technetium, neptunium, etc. on single minerals
   - b. Sorption on mixtures (includes rocks and other formation materials)
   - c. Draft copies of topical reports*

   Task 3: <u>Direct Reaction Studies</u>
   - a. FeS_2 with technetium and other nuclides
   - b. Other materials
   - c. Draft copies of topical reports*

*Also to be assembled into external publications.

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