

SAFETY EVALUATION REGARDING THE  
PROCEDURES GENERATION PACKAGE FOR  
DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2

1. INTRODUCTION

The "TMI Action Plan" (NUREG-0660 and NUREG-0737) required licensees of operating reactors to reanalyze transients and accidents and to upgrade emergency operating procedures (EOPs) (Item I.C.1). The plan also required the NRC staff to develop a long-term plan that integrated and expanded efforts in the writing reviewing, and monitoring of plant procedures (Item I.C.9). NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," describes the use of a "Procedures Generation Package" (PGP) to prepare EOPs. A PGP is required by Generic Letter 82-33, Supplement 1 to NUREG-0737, "Requirements for Emergency Response Capability." The generic letter requires each licensee to submit a PGP, which includes:

- (i) Plant-specific technical guidelines
- (ii) A writer's guide
- (iii) A description of the program to be used for the validation of EOPs
- (iv) A description of the training program for the upgraded EOPs.

This report is the review of the Indiana and Michigan Electric Company (I&MEC) submittal describing the development and implementation of EOPs for the Donald C. Cook Nuclear Plant Units 1 and 2 (DCCNP).

The review was conducted to determine the adequacy of the I&MEC program for preparing, implementing, and maintaining upgraded EOPs for DCCNP. This review was based on NUREG-0800, Subsection 13.5.2, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." Section 2 of this report briefly discusses the I&MEC submittal, the NRC staff review, and the acceptability of the submittal. Section 3 contains the staff's conclusions.

The staff determined that the procedure generation program for DCCNP has several items that must be satisfactorily addressed before the PGP is acceptable. I&MEC should address these items in a revision to the PGP. The revision of the PGP, and subsequently of the EOPs, should not affect the schedule for the use of the EOPs. The revision should be made in accordance with the DCCNP administrative procedures and 10 CFR 50.59. The revision/justification should not be submitted to NRR, but should be available at the plant site for NRC review.

2. EVALUATION AND FINDINGS

In a letter dated September 28, 1984, from M. P. Alexich (I&MEC) to Harold R. Denton (NRC), I&MEC submitted its PGP for DCCNP. The PGP contained the following sections:

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- o Plant-specific Technical Guidelines
- o Writer's Guide
- o Verification/Validation
- o Training

The NRC staff conducted a review of the DCCNP PGP, and identified its findings in a Draft Safety Evaluation Report (DSER) which was forwarded to I&MEC in a letter dated September 12, 1985, from S. A. Varga to John Dolan (I&MEC). I&MEC responded to the DSER items with a letter from M. P. Alexich to Harold R. Denton, dated May 16, 1986, which included a revised DCCNP PGP that incorporated changes to address the identified items. The NRC staff review of the revised DCCNP PGP is documented in the following subsections. The verification and validation program comments are combined in one subsection.

A. Plant Specific Technical Guidelines (P-STG)

The P-STG program description was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. A review was conducted of the process by which the generic Westinghouse Emergency Response Guidelines (ERGs) are used as a basis for writing the DCCNP EOPs, including modifications that are made to ERG steps to account for the differences between the reference plant and the DCCNP design. I&MEC identified the following source documents for use in generating EOPs for DCCNP:

- o Westinghouse generic ERGs, Rev. 1 and background documents
- o DCCNP Specific Technical Guidelines
- o DCCNP Writer's Guide for EOPs
- o Technical Specifications
- o Setpoints
- o Engineering Flow Diagrams
- o System Descriptions
- o Existing EOPs
- o Calculated Mathematical Values used in EOPs
- o Background information Manual

Based upon the staff's review of the revised plant-specific technical guidelines program description, the NRC staff finds that the DCCNP plant-specific technical guidelines program should accomplish the objectives stated in NUREG-0899 and should provide adequate guidance for translating the ERGs into DCCNP EOPs.

B. Writer's Guide

The writer's guide was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The DCCNP writer's guide provides administrative and technical guidance on the preparation of EOPs. It contains guidelines for EOP organization, contents, format, and writing style. The staff identified the following concerns with regard to the licensee responses to the issues raised in the previous DSER:

1. DSER Item 2. The following concerns should be addressed in Section 7:
  - a. Action steps should be structured to be consistent with the roles and responsibilities of operators.
  - b. Action steps should be structured to avoid unintentional duplication of tasks.
2. DSER Item 3. The writer's guide should include instructions for writing the various types of action steps:
  - a. Section 3.3.3 should be expanded to describe when the RNO column will be used as opposed to when the logic terms OR will be used.
  - b. Section 3.3.3 should contain a commitment to present a preferred solution when more than one solution is presented.
  - c. Section 3.3.3 should describe when a list of other alternatives should or should not be provided in addition to a given solution.
  - d. Section 3.3.4 should include a definition of concurrent steps.
  - e. A fourth-level instruction step has been added to Section 3.3. The writer's guide should define the four levels of steps, discuss how four levels of indented steps can be used successfully in the narrow two-column format, and provide an example that includes actual procedure text at all four levels in the two-column format.
  - f. Section 8.2 should be revised to state that steps and substeps should not be split across pages.
  - g. It is not clear whether or not operators should finish each EOP step before proceeding to the next. Section 3.3.4 states that steps are to be performed in the order given unless otherwise stated. An exception is made for "lengthy" steps, which can be performed concurrently unless the operator is instructed not to do so. Section 4.2 states that all steps are assumed to be performed in sequence unless stated otherwise in a preceding note. It then states that actions in a step do not have to be completed prior to continuing to the next step unless this condition is stated clearly in that step or substep. Additional steps may be completed in sequence before the completion of a lengthy step. Section 4.2.1 states that the operator will move down the left-hand column of each

step as the expected response is obtained. However, if the step is lengthy, the next step may be performed concurrently. Section 4.2.2 states that if a contingency action must be completed prior to continuing, that contingency instruction must appear explicitly in the right-hand column step or substep in all capital letters. These sections are contradictory. The writer's guide should resolve this contradiction by requiring procedures to be written with either the assumption that all steps will be performed in sequence unless otherwise states, or with the assumption that all steps may be performed concurrently unless otherwise stated. The method for indicating exceptions to rule should be described. Also, if the length of the step is to be the criterion for allowing concurrent execution of steps, a "lengthy step" should be defined. Examples should be provided.

3. DSER Item 4. The guidance in the writer's guide regarding referencing and branching should be revised with regard to the following:
  - a. Section 4.2.5 should define the terms "extensive" and "short" since these are the criteria for deciding if the necessary steps are to be included in the text of the procedure or if transitions or references are to be used. Examples should be provided.
  - b. Section 4.2.5 should define the uses of the terms "refer to," "implement," and "per." To minimize confusion in referencing, the use of only one term is preferred.
4. DSER Item 5. Section 4.2.6 should be revised to describe the format to be used in presenting location information in the text, and an example should be provided.
5. DSER Item 8. Section 8 should be revised to specify font, type size, pitch, and line-spacing requirements. Examples should be included.
6. DSER Item 9. The writer's guide should describe the heading to be used for the "Instruction Steps" section of the procedure.
7. DSER Item 10. The discussion of logic statements in the writer's guide should be revised in regard to the following:
  - a. Section 4.2.3 should be expanded to address the format and style of logic statements, and examples of the correct use of all logic statements should be provided.
  - b. Examples of combinations of logic statements that should be avoided should be included in the writer's guide.

- c. Section 4.2.3 states that the use of AND and OR within the same action should be avoided. There are occasions when it is necessary to use AND and OR in the same sentence. Section 4.2.3 should provide guidance and an example of acceptable usage of AND and OR together. AND and OR should also be underlined in this section.
  - d. Figure 5 incorrectly uses the logic term IF in the left-hand column. Figure 9 also uses the logic term IF incorrectly. Step 36 in Figure 5 and Steps 1, 3, 4, and 5 in Figure 9 should all be rewritten as IF . . . THEN statements; for example. Step 5 of Figure 9 should read, "IF CST level decreases to less than 13%, THEN switch to alternate AFW supplе."
  - e. The logic term AND is used between two bullet items in the left column of Figure 5. It is not clear why it is necessary to use AND in this manner, and this use of AND is not discussed in the writer's guide. AND should either be deleted from this example or the writer's guide should be revised to discuss this use of AND. This use of bullets should also be discussed in the writer's guide.
  - f. In Figure 9, Step 2.b, the logic term OR is formatted as "-OR-" and should be revised to conform to Section 4.2.3.
8. DSER Item 13. Section 2.4 should specify that the facility designation will appear in a given place on each page, and any relevant examples should be made consistent.
  9. DSER Item 16. Section 6.3 should include specific criteria to prevent the overuse of capitalization for emphasis in action steps. Also, text written in all capitals is more difficult to read than text written in mixed case.

Regarding the new or revised material of the writer's guide, the staff identified the following concerns:

10. The discussion of notes and cautions in the writer's guide should be revised with regard to the following:
  - a. Sections 4.2.4 and 6.3 state that the text of cautions will be presented in capitalized, italic letters. The overuse of capitalization detracts from emphasis. Text written in all capitals is more difficult to read than text written in mixed case. Italics can also be difficult to read. Sections 4.2.4 and 6.3 should state that the word "CAUTION" will be in capitals and the information in the body of the caution will be in mixed case. An example should be provided.

- b. Section 4.2.4 states that the text of notes will be "presented as normal upper/lower case copy, except where certain abbreviations, acronyms, or terms requiring special attention are required." The writer's guide should describe the instances or terms that require special attention, and should describe what is to be done in each case.
  - c. The example of a note at the bottom of Section 3.3.1 shows the text in italics, making this note look like a caution. The example should be corrected to agree with the text of Section 4.2.4.
- 11. Section 2.3 specifies the revision information to be included on the cover sheet. This section should be expanded to require that review and approval signatures will also be included on the cover page.
  - 12. Figure 3 contains the abbreviation "Hz," which is not in Table 3. The acronyms "Amps," "CPS," and "Hz" are used in Figure 3, but do not appear in Table 3. Figure 5 contains the acronym "DG" and its plural, "DGs," while Table 3 uses "D/G". Figure 10 uses the acronyms "DPM", "CPS", and "SAT", none of which are in Table 3. The abbreviations used in figures and in the text of the PGP should be revised to agree with Table 3.
  - 13. Figure 3 should be revised to conform to the text of the writer's guide.
    - a. Step B.1.a is not indented according to the illustration in Section 3.3.
    - b. The table that appears to belong within Step B.1.a is not formatted to follow the requirements for tables in Section 4.2.9 and does not match the example tables in Figure 7.
  - 14. Figure 4 should be further revised to provide the example of a summary of entry conditions with the procedure/step as described in Section 4.1.
  - 15. Figure does not conform to the writer's guide.
    - a. The use of "-END-" should be described in the writer's guide.
    - b. Substep 36.a is formatted with a dash between the parameter and expected response. This use of a dash should be discussed in the writer's guide.
    - c. All of the words in steps 36 and 37, in disagreement with the writer's guide, are initially capitalized.

- d. Step 36 and its associated substeps are written incorrectly. The higher level step (Step 36) does not properly summarize all actions that are specifically described in the substeps (Steps 36.a and 36.b). Figure 5 should be revised so that Step 36 contains all actions included in the associated substeps ( "IF necessary, THEN stop DGs"). Similarly, Step 36.b should explain the conditions under which the generators should be stopped ( "IF off-site power is available, THEN stop unloaded DG AND place in standby").
16. Figure 7 contains two items that should be revised.
    - a. Step 29 does not conform to the writer's guide because all of the words prior to substep 29.a are capitalized.
    - b. The "INCREASING" column in the table of Step 29.a refers the operator to instructions in Step 29.b. Step 29.b refers the operator back to Step 29.a. This loop of instructions should be revised to provide operators with usable information.
  17. Figure 9 contains a number of items that should be revised to conform text of the writer's guide.
    - a. The "Go To" statement of Section 1 is not initially capitalized as required by Section 4.2.5.
    - b. The word "either" in Section 1 of Figure 9 is capitalized and underlined. This usage is not described in the text of the writer's guide.
    - c. Steps 1 and 2 contain substeps formatted with a dash between sentence fragments. This unsafe is not described in the writer's guide.
    - d. In Section 1, the criteria for the listed parameters are fully capitalized. In Section 2, the listed parameters are fully capitalized. The writer's guide does not discuss either usage of capitalization.
  18. The order in which the procedure elements "Supplement" and "Attachment" are presented in Table 2 should be reversed to agree with the organization required by Section 3.1.
  19. Section 6.5 should state that numerical values for adverse containment conditions will always include the phrase "for adverse containment" within the parentheses and specify any requirements for capitalization. Additionally, the two adverse containment value examples are not consistent with each other in the use of capitalization.

20. Section 6.5 states that "any numerical value that is less than 1 or greater than -1 should be presented with a 0 preceding the decimal point." The text should be changed to state that ". . . less than 1 and greater than -1 . . ."
21. Section 9 includes new information for reproduction of graphical figures, but should additionally address reproduction of color CSFSTs.
22. The following additional problems regarding cautions and notes were identified:
  - a. Section 4.2.4 should state that each caution and note will be wholly contained in a single page.
  - b. Section 4.2.4 should state that each caution or note statement will contain one and only one topic.
23. The following problems regarding logic terms were noted:
  - a. IF should be added to the list of logic terms in the first line of Section 4.2.3.
  - b. Section 4.2.3 states that OR will always be used in the inclusive sense. If priorities cannot be established among equally acceptable alternatives then it becomes necessary to use the exclusive OR. Section 4.2.3 should discuss the exclusive OR, and give examples of both uses or OR.
  - c. Section 3.3 specifies the use of bullets in two different ways that could lead to operator confusion. It states "if the order of substep performance is not important, the substeps are designated by bullets (°). If the logical OR is used, both choices must be designated by bullets. In the first instance, all steps identified with bullets must be performed by operators. In the second instance, operators must perform one of the steps indicated by the bullets, but not both. Section 3.3 should indicate that bullets will be used in only one of these situations, and examples should be revised accordingly.
  - d. Section 4.2.3 should state that the logic term THEN will not be used at the end of an action step to instruct the operator to perform another action within the same step.
  - e. Section 4.2.3 should specify that the logic term NOT may not be used alone.

24. The writer's guide should be expanded to include a list of words to be avoided.
25. Sections 4.2.1, 4.2.2, and 6.2 indicate that the left-hand column will be written in sentence fragments. Complete sentences are more precise and easily understood. The writer's guide should state that all sentences will be complete. Examples should be revised accordingly.
26. The following problems regarding action steps were noted:
  - a. Section 6 should state that EOPs will be written using shorts, simple sentences.
  - b. Section 4.2 should state that each procedure step should contain only one action.
  - c. Section 4.2 should state that each procedure step should contain only one action.
  - d. Section 3.3 should include the definition and format of the following types of action steps: nonsequential steps, recurrent steps, time-dependent steps, and diagnostic steps. Examples should be provided. See NUREG-0899, Section 5.7, for further information.
27. Section 4.2.2 states that different designators will be used in the two columns when multiple substeps that do not correspond to the left-hand column are used in the right-hand column. Section 4.2.2 should explain what the right-hand column designators should be for each of the levels of substeps. An example that includes all levels of substeps in both columns should be provided.
28. The following problems related to acronyms and abbreviations were noted:
  - a. Section 6.6 should specify that only acronyms and abbreviations that inexperienced operators will recognize without reference to a glossary will be listed in Table 3.
  - b. Section 6.6 states that "abbreviations and acronyms should be limited to those used by operators." Section 6.6 should state that only abbreviations and acronyms listed in Table 3 will be used in EOPs.

- c. Section 6.6 should specify that only one abbreviation or acronym will stand for single expression, and Table 3 should be revised accordingly.
29. Section 5 states that "color-coding and/or line-pattern-coding shall be used from each branch point to its terminus." To ensure consistency in formatting, Section 5 should specify the preferred form of coding. If coding redundancy is preferred, the "/or" should be deleted from the statement.

With adequate resolution of the above items, the DCCNP writer's guide should accomplish the objectives stated in NUREG-0899 and should provide adequate guidance for translating the technical guidelines into EOPs that will be usable, accurate, complete, readable, convenient to use, and acceptable to control room operators.

#### C. Verification and Validation Program

The description of the verification and validation program was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The Verification/Validation Program for DCCNP identifies the following six objectives: the EOPs are technically correct; the EOPs are written correctly; the EOPs are usable; there is a correspondence between the EOPs and the control room/plant hardware; there is a high level of assurance that the EOPs will work; and the language and level of information in the EOPs is compatible with the minimum number, qualification, training, and experience of the operating staff.

The staff identified the following concerns:

1. DSER Item 1. Section 4 states that "whenever possible, department engineers with human factors background will participate as team members for the table top review and control room walk-through." The verification and validation program description should be revised to specify that the human factors experts will be involved in all phases of the verification and validation processes, including simulator exercises. The verification and validation program description should also specify the criteria for selection of team members, and the roles and responsibilities of each individual.
2. DSER Items 3, 4, and 5. The discussion of the criteria that will be used to select scenarios to be run during the validation process should be revised in the following manner:

- a. In Section 2, the description of the criteria that will be used to select the scenarios to be run during the validation process should state that sequential and concurrent failures are to be included, and the list of scenarios should be revised to include such scenarios.
  - b. Section 2 states that, since a generic validation has been made of Westinghouse ERGs, only a selected set of plant-specific EOPs will be exercised on the SNUPPS simulator. Reliance upon the generic validation of Westinghouse ERGs is not adequate. The DCCNP EOP set should be exercised on the simulator to the maximum extent possible as a part of the validation process.
  - c. The validation program should be revised to state that simulator exercises are the primary validation methods. A review of the capabilities and the limitations of the simulator will then identify what can and cannot be validated on the simulator. For the parts of the EOPs that cannot be validated on the simulator, the validation program should describe the criteria for selecting any additional validation, such as control room, plant, or mock-up walk-throughs.
3. Because the planned validation and verification takes place on a generic simulator rather than a plant reference simulator, the verification and validation program descriptions should be expanded to describe how differences between the simulator and the plant will be accounted for.
  4. The verification and validation program descriptions should be revised to describe how those EOPs that cannot be exercised on the simulator will be validated.
  5. The validation program should state that when the plant reference simulator becomes available, the full complement of EOPs will be revalidated on the plant reference simulator.

With adequate resolution of the above items, the DCCNP verification and validation program should accomplish the objectives stated in NUREG-0899 and should provide assurance that the EOPs adequately incorporate the guidance of the writer's guide and the technical guidelines and will guide the operator in mitigating emergency conditions.

#### D. Training Program

The revised description of the operator training program on the DCCNP upgraded EOPs was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The DCCNP training program consists of classroom

lectures, simulator training on the Westinghouse SNUPPS simulator, and control room walk-throughs to account for differences between the generic simulator and DCCNPs control rooms. Trainee performance is verified through written examinations and simulator evaluations.

The staff identified the following concerns:

1. DSER Item 1. Because the training program will be used when operators are trained on future revisions to EOPs, the training program should describe how the operators will be trained on those revisions prior to assuming the shift. Section 5.0, "Continuing Training," should be expanded to address this issue, including any distinctions in how major versus minor revisions are to be handled.
2. DSER Item 1 and 3. Although the training program states that walk-throughs will be used to supplement operator training on the generic simulator, the training program description should be expanded to discuss the following items:
  - a. The training program should address the extent that the EOPs will be covered by all operators, particularly if walk-throughs will be used to train aspects of EOPs not taught in the simulator.
  - b. The training program should be expanded to indicate that a wide variety of scenarios will be used to fully exercise the EOPs during the walk-throughs.
  - c. The training program should be expanded to discuss the planned operator roles during the walk-throughs.
  - d. The training program should indicate that operators will be trained in walk-throughs as a team and that each operator will be trained in the role that he would be expected to take in an actual emergency.
3. DSER Item 2. Though Section 3.1 states that simulator training scenarios will include "multiple failures and casualties which require the use of an many EOPs, ESs, ECAs, and FRx [as] are practical," it should also indicate that concurrent and sequential failures will be included and that the EOPs will be exercised as fully as possible on the simulator.
4. The training program description should specify that, at the conclusion of training, trainees will meet the following objectives:

- a. Understand the philosophy behind the EOPs. (i.e., trainees will understand the EOPs' structure and the approach to transient and accident mitigation, including control of safety functions; accident evaluation and diagnosis; and the achievement of safe, stable, or shutdown conditions.)
- b. Understand the mitigation strategy and technical bases of the EOPs. (i.e., trainees will understand the function and use of plant systems, subsystems, and components in mitigating transients and accidents.)
- c. Have a working knowledge of technical content of the EOPs. (i.e., trainees must understand and know how to perform each step in all EOPs to achieve EOP objectives.)
- d. Be capable of executing the EOPs under operations conditions both as individuals and as teams. (i.e., trainees must be able to carry out an EOP successfully during transients and accidents.)

### 3. CONCLUSIONS

The staff concludes that, the PGP submitted by Indiana & Michigan Electric Company for D.C. Cook in letters from Indiana & Michigan Electric Company to the NRC, dated September 28, 1984 and May 16, 1986 should be revised to address the programmatic improvements outlined in Section 2 of this report. The PGP revision should not be submitted to the NRC. For items the licensee deems inappropriate or no longer applicable for inclusion in its PGP, it should develop and maintain documented justification in an auditable form. All revisions to the PGP should be reflected in plant EOPs within a reasonable period of time, e.g., the next planned revision of the EOPs.

