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**MICHIGAN'S PROGRESS**

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NRC INSPECTION REPORT 90010; SUBMITTAL OF ADDITIONAL INFORMATION RELATED TO THE  
CIRCUIT AND RACEWAY SCHEDULE ENHANCEMENT PROJECT

NRC Inspection Report 90010 provided the results of inspection activities associated with the Palisades Configuration Control Project (CCP) and requested additional information regarding the program we have undertaken to improve the completeness and accuracy of information contained in our electrical circuit and raceway databases. This submittal was discussed with Mr D Butler of your staff on July 17, 1990, and was found to be an acceptable method for transmitting the information requested in NRC Inspection Report 90010.

#### Background

NRC Inspection 90010 reviewed efforts initiated by Consumers Power Company to resolve previously identified issues associated with the physical routing and separation of electrical cable and raceway at Palisades. These issues were identified by Consumers Power Company as a result of CCP activities and involved several examples of installed electrical cable and raceway that did not conform to the Final Safety Analysis Report (FSAR) criteria for routing channelized electrical circuits. At the time of the inspection we had already initiated development of a project to enhance the completeness and accuracy of design information contained in our electrical circuit and raceway databases, under the Cable and Raceway Schedule (CRS) Enhancement Program, and had instituted an effort to formalize our electrical cable and raceway separation requirements.

The CRS Enhancement Program has been incorporated into the defined CCP work scope under CCP Task 2.2B, and is encompassed under the overall Electrical Cable and Raceway Separation Issue Resolution Plan that CCP has undertaken to resolve electrical separation issues. The CRS Enhancement Program is an example of expanded CCP work scope that evolved from issues that were identified by the CCP. It is not untypical for CCP work scope to originate in this manner, using findings from previous CCP work as a guide to provide additional focus. In addition to the

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CCP responsibilities assigned under the Electrical Cable and Raceway Separation Issue Resolution Plan, CCP has also been tasked with other responsibilities related to electrical design issues: identification of electrical system design bases, correction of panel wiring diagrams, and update of tools used during design of electrical modifications.

#### Cable Separation Design Criteria

The design criteria which were originally used at Palisades to provide physical independence between redundant electrical circuits were submitted to the AEC on May 28, 1969. This submittal contained, in part, our response to a request for information regarding the criteria and associated bases used at Palisades during initial design and installation of electrical circuits. The guidelines that are currently used during design of electrical cables and raceways are essentially unchanged from those of the original design period and are reflected in FSAR Section 8.5.3.1. FSAR Section 8.5.3.1 states that circuits belonging to safety-related power distribution channels, reactor protection system channels, engineered safeguards channels or other safety-related system channels will be run in separate raceway systems, and that "physical separation (distance) is considered to be the most reliable method of providing circuit separation and isolation".

In practice the design criteria for physical separation and independence of electrical circuits are primarily satisfied by routing electrical cables in channelized cable raceways, and by maintaining a separation distance between these channelized raceways. This method of providing physical separation between redundant electrical circuits meets the intent of currently accepted standards and guidelines and has been reviewed and determined to be acceptable. Palisades was designed prior to issuance of Regulatory Guide 1.75 "Physical Independence of Electrical Systems", the Atomic Energy Commission (AEC) General Design Criteria for physical independence of electrical circuits, or the associated IEEE standards (IEEE 279, IEEE 384).

#### Circuit Separation and Channelization Anomalies

We have identified several examples where either the physical separation or channelization of installed electrical cables does not satisfy our design criteria. The actual number of electrical cable separation and channelization discrepancies identified so far represents only a very small percentage (less than one percent) of the several thousand electrical cables that we have evaluated. As a result of these cable routing anomalies we have undertaken a programmatic effort to identify and resolve those physical separation and channelization discrepancies that may exist, and we have taken steps to prevent promulgation of similar discrepancies in the future. We have also taken actions to address the physical separation and channelization deficiencies which have been identified to date.

The electrical circuit channelization and separation deficiencies which have been

evaluated at this time, while not conforming to FSAR criteria in all respects, have not resulted in identification of a safety-significant condition involving a loss of electrical or protection system independence; nor have they been identified to include deviations from the electrical cable separation requirements of 10CFR50, Appendix R. For those cases where a complete evaluation has not been possible due to incomplete circuit routing information, compensatory measures have been taken, as deemed appropriate, to minimize the effects of a postulated cable fault on affected circuits. An example of a compensatory measure which has been taken in several cases is the establishment of roving fire watches.

#### Causal Factors and Corrective Measures

The physical separation and channelization deficiencies that we have identified appear to result from two separate factors: 1) non-uniform interpretation and implementation of the design criteria for channelizing and routing electrical circuits among design engineers, and 2) unavailability of a single, complete and reliable source of design documentation for electrical circuit routing and channelization. Corrective measures for these causal factors will be provided through the Electrical Cable and Raceway Separation Issue Resolution Plan. A summary and implementation schedule for these actions follows:

1. The design and licensing basis for channelization and physical separation of electrical circuits has been reconstituted and consolidated in a single document, the "Electrical Separation Design Criteria and Licensing Basis".
2. Guidance has been developed in Administrative Procedure 9.35, "Circuit and Raceway Schedule", for control and entry of design information in the Cable and Raceway Schedule database.
3. Cable routing requirements and practices have been incorporated into the following Engineering Manual Guidelines: EM-22-04, "Channel Separation - Cable Routing Instructions"; and EM-22-05, "Cable Sizing Guideline - Ampacity".
4. Cable routing requirements and practices are in the process of being incorporated into the following Engineering Manual Guidelines: EM-22-03, "Fire Protection - Cable Route Verification"; EM-22-06, "Cable Routing - EEQ Requirements"; and EM-22-07, "Cable Separation Guidance". Completion of this action is currently expected prior to December 31, 1990.
5. A physical review of installed cable raceways will be performed in order to identify installations that do not meet design requirements. Completion of this action is currently expected prior to September 30, 1991.
6. Design information relative to the channelization and physical

routing of electrical circuits and raceways will be enhanced. This action will include validation and completion of information contained in the CRS database and is currently expected to be complete prior to September 30, 1992.

7. Electrical cable separation and channelization anomalies identified during our review of physical raceway installations will be evaluated and appropriately dispositioned. The schedule for resolution of these items is dependent on the number and type of items identified during the review.

### Conclusion

The channelization and separation discrepancies which have been identified and evaluated at this time have not resulted in identification of a safety-significant condition involving a loss of electrical or protection system independence. Palisades has taken an aggressive position in its response to the identified electrical cable routing and channelization discrepancies through the Electrical Cable and Raceway Separation Issue Resolution Plan. This plan addresses the causal factors for these conditions and proposes actions to prevent reoccurrence. The key provisions of this plan include; 1) publication of clear procedural guidance relative to cable routing design criteria, 2) availability of reliable circuit design information, 3) field review of installed raceways, and 4) evaluation and resolution of identified cable routing and channelization discrepancies. As we have done in the past, we will evaluate potential cable routing and separation discrepancies for safety-significance and operability impact when they are identified and compensatory and corrective measures will be pursued, as necessary.



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