ILLINOIS POWER COMPANY

U-0457
N88-82(04-13)-6
500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

April 13, 1982

Mr. James R. Miller, Chief
Standardization & Special Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miller:

Reference: Illinois Power letter 1/20/82, U-0403
G.E. Wuller, IP to James R. Miller, NRC,
regarding Degraded-Core Hydrogen Control

Clinton Power Station Unit 1
Docket No. 50-461

Subsequent to conversations between J.H. Shepard of IP and C.P. Tan and C.G. Tinkler of the NRC on March 30 and 31, 1982, please find the attached response to Question #6 of the series of questions associated with confirmatory issue #6, Containment Ultimate Strength Analyses. It is believed that this response will close out this issue.

Please let us hear if you have any questions on this material.

Sincerely,

G.E. Wuller

G.E. Wuller
Supervisor-Licensing
Nuclear Station Engineering

GEW/clh

cc: J.H. Williams, NRC Clinton Project Manager
H.H. Livermore, NRC Resident Inspector
W.R. Butler, NRC CSB
N.C. Chokski, NRC SEB
C.P. Tan, NRC SEB
C.G. Tinkler, NRC CSB
Illinois Dept. of Nuclear Safety

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Question #6

Even though an overall explosion in the containment is very unlikely because of the hydrogen control measures employed, localized hydrogen detonation is still possible and should be considered. Provide an evaluation of the effects of localized detonation on the containment structure and its penetrations.

Response

The Hydrogen Igniter System (HIS) is designed to prevent significant accumulation of detonable hydrogen mixtures. In order to prevent pocketing, large numbers of igniters are installed throughout the drywell and containment. These igniters burn hydrogen as it becomes flammable at hydrogen-air mixtures of 4-12%. This range of mixtures is well below the concentrations required for detonation.

Localized pocketing of hydrogen is minimized by the design of the HIS. This design ensures that igniters are located in such a manner as to prevent significant areas of unignited hydrogen. The design criteria states that the igniters are spaced 30 feet or less apart with redundant electrical power supplies. Even if only one igniter system is operable the maximum distance between igniters will not exceed 60 feet. All subcompartments contain at least two igniters each serviced by a separate division of power. There are approximately 90 igniters in the system which are equally divided between the two power sources. Igniters will be positioned in the wetwell approximately 19.5 feet above the normal high water level to keep them from being affected by the pool swells, yet close enough to the pool to assure immediate hydrogen burning.

Each of the two igniter system circuits is connected to a Class 1E power source. The igniters will be manually turned on if the reactor water level drops to the top of the active fuel. This ensures that HIS will be operating long before hydrogen could be released from a postulated degraded core condition.

Recent testing demonstrated adequate mixing of hydrogen in the containment and drywell. This is described in the EPRI/Ice Condenser test report titled, "Hydrogen Mixing and Distribution in Containment Atmospheres," December 1981, by J. J. Wilder (TVA), F. G. Hudson (Duke Power), and K. K. Shiu (American Electric Power). The report indicates that hydrogen mixes very well at the anticipated hydrogen flow rate. For example at 18 minutes after hydrogen release the maximum variation between the sampling points was only 2%. These tests clearly indicate that light gasses like hydrogen mix very well inside of volumes similar to reactor containments.