RELATED CORRESPONDENCE

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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Before the Atomic Safety and Licensing Board

OFFICE OF SECRETARY
DOCKETING & SERVICE

In the Matter of CLEVELAND ELECTRIC ILLUMINATING COMPANY, Et Al. (Perry Nuclear Power Plant, Units 1 and 2)	Docket Nos. 50-440 50-441 (Operating License)

OHIO CITIZENS FOR RESPONSIBLE ENERGY
FIFTH SET OF INTERROGATORIES TO APPLICANTS

Ohio Citizens for Responsible Energy ("OCRE") hereby propounds its fifth set of interrogatories to Applicants, pursuant to the Licensing Board's Memorandum and Order of July 28, 1981 (LBP-81-24, 14 NRC 175).

Issue #8

Statement of Purpose: The following interrogatories are designed to ascertain Applicants' plans for hydrogen control in the PNPP containment following a LOCA and the effectiveness of same.

5-1. What do Applicants consider to be the equivalent of a TMI-2 accident at Perry? Provide the probability of its occurrence and a thorough description of its consequences, including fuel failure modes, effect on containment integrity, and off-site doses to the public at 2, 5, 10, and 50 miles from PNPP.

5-2. Give the percent elemental composition of the Zircaloy fuel rod cladding used in Perry.

5-3. Give the following dimensions of the fuel rod cladding used in PNPP:

8209160534 820913
PDR ADOCK 05000440
G PDR

DS03

(a) mass

(b) volume

(c) surface area (outside and inside of cladding)

(d) length of fuel rods

(e) thickness of cladding

(f) diameter (outside) of cladding

5-4. Give the model, type, and manufacturer of the recombiners. Provide all manufacturer's data and specifications.

5-5. Section 6.2.5.2.3 of the FSAR states that the recombiners are "100% capacity." Explain what is meant by this.

5-6. At what range of H_2 concentrations (in volume-%) are the recombiners effective in reducing the H_2 concentration below flammable limits?

5-7. At what concentration of H_2 (volume-%) would the recombiners become an ignition hazard?

5-8. Would the recombiners be turned off if this concentration is reached? If not, why not?

5-9. Would the recombiners ever be turned off if the H_2 concentration exceeded a certain value? At what value?

5-10. Provide all details of the Perry distributed igniter system, including type and manufacturer of glow plugs, with all data and specifications, lifetime of the glow plugs, and whether they are qualified for the environment expected (post-LOCA), including suppression pool loads.

5-11. Are the igniters manually or automatically operated?

5-12. Produce all plant operating procedures/guidelines pertaining to the hydrogen control systems, including the analyzers, mixers, recombiners, igniters, and back-up purge.

5-13. What parts of the hydrogen control system would be used concurrently? E.g., would the mixers and recombiners be operated along with the igniters?

5-14. At what range of H_2 concentrations (volume-%) are the igniters effective in reducing the H_2 concentration below flammable limits?

5-15. At what concentration of H_2 would the igniters become an ignition hazard such that they could trigger an explosion which could threaten containment integrity?

5-16. Would the igniters be turned off if this concentration is reached? If not, why not?

5-17. Would the igniters ever be turned off if the H_2 concentration exceeded a certain value? At what value?

5-18. Describe the expected operational characteristics of the igniter system. What pressure and temperature transients will be experienced by the containment and the equipment therein? Is the controlled hydrogen ignition expected to be cyclic?

5-20. Is the equipment in the containment subject to such conditions qualified for repeated pressure pulses and temperature transients? Document all such qualification.

5-21. Would cyclic pressure pulses produced by the controlled hydrogen ignition damage any valves/components between the wetwell and drywell (e.g., vacuum breakers and H_2 mixing system), thereby allowing bypass of the suppression pool? Provide documented studies showing this would not happen.

5-22. Can individual glow plugs be controlled separately? Or are all energized simultaneously, with no individual control?

5-23. Provide documentation showing that all parts of the hydrogen control system meet GDC 41 to 10 CFR Part 50, pertaining to redundancy in components and power supply.

5-24. Demonstrate that the hydrogen control system meets GDC 42 to 10 CFR Part 50.

5-25. Demonstrate that the hydrogen control system and PNPP procedures will meet GDC 43 to 10 CFR Part 50.

5-26. How quickly could hydrogen generation cause an explosive mixture in the drywell and containment (answer for both) following:

(a) an accident Applicants consider to be the equivalent of a TMI-2 accident for Perry;

(b) what Applicants consider to be the worst-case accident in terms of H_2 generation for Perry;

(c) the following accident sequences as defined in NUREG/CR-1659 Volume 4 (RSS Methodology applied to Grand Gulf):

(1) AI

(2) AE

(3) AC

(4) SI

(5) SC

(6) SE

(7) T_1PQI

(8) T_1PQE

(9) $T_{23}PQI$

(10) $T_{23}PQE$

(11) T_1QW

(12) T_1QUV

(13) T_1C

(14) T_1QUW

(15) $T_{23}C$

(16) $T_{23}QW$

(17) $T_{23}QUW$

(18) $T_{23}QUV$

5-27. What do Applicants consider to be the worst-case accident in terms of H_2 generation at Perry? Provide the probability of its occurrence and a thorough description of its consequences, including fuel failure modes, effect on containment integrity, and off-site doses to the public at 2, 5, 10, and 50 miles from Perry.

5-28. Describe all sources of ignition within the drywell and containment. Include in this assessment <u>all</u> components of the H_2 control system.

5-29. Provide a diagram of the PNPP containment (including drywell) showing locations of the recombiners, glow plug igniters, mixer components, and analyzer sampler areas.

5-30. Does the analyzer have the ability to map the H_2 concentration in the containment, as recommended in NUREG/CR-1561, p. 134?

5-31. Does the analyzer meet the criteria of IEEE Standards

323, 334, and 344? Demonstrate this compliance.

5-32. FSAR Section 6.2.5.2.1 states that delaying the start of the H_2 analysis until 15-60 minutes following the LOCA will avoid exposing the analyzer to severe sample conditions. Are the analyzers designed to withstand such conditions? If not, why not? What assurance is there that the severe conditions will not persist beyond 15-60 minutes after the LOCA?

5-33. What judgements will be made by operators as to when in the 15-60 minute period following the LOCA to start the H_2 analysis? Upon what will these judgements be based?

5-34. Describe in detail how the samples are brought to the analyzers. Are any manual actions needed?

5-35. How long is the time period from initiation of the H_2 analysis to obtaining results?

5-36. Does the "grab sample" technique permit continuous monitoring of the containment atmosphere? If not, at what intervals are samples taken? How are these intervals decided upon?

5-37. Demonstrate that the Perry H_2 analyzer has met all 9 criteria listed on p. 195 of Volume 2 of NUREG/CR-2017.

5-38. Provide all manufacturer's data and specifications for the H_2 analyzer system.

5-39. How many repeat measurements are made of H_2 concentration before the operators will accept the results as valid?

5-40. Have Applicants considered any other types of analyzer (sampler-detector) systems, e.g., acoustic or fluidic oscillator detectors? If so, provide all conclusions as to why these systems are not used at Perry.

5-41. For containment H_2 concentrations above 4 volume-%, would the mixers accelerate combustion by providing a uniformly combustible atmosphere in the containment? If so, is the mixing system shut off when the H_2 concentration reaches a certain value? At what value?

5-42. Provide offsite radiation doses (whole body and thyroid) to the public at 2, 5, 10, and 50 miles from PNPP resulting from containment purge following each of the accidents listed in interrogatory 5-26.

5-43. Have Applicants considered other hydrogen control measures (e.g., containment inerting, post-accident inerting, halon suppressents in the containment atmosphere, use of sodium metavanadate ($NaVO_3$) in the coolant to inhibit H_2 production from the radiolysis of water) for Perry? List all measures which were considered and indicate why they were not chosen.

5-44. SECY-80-107A contains view-graphs presented by General Electric to the NRC which state that containment inerting, hydrogen ignition, recombiners, and purging are all impractical for significant rates of H_2 production. Do Applicants agree? If not, why not?

5-45. The NRC has stated that hydrogen control methods that do not involve burning provide protection for a wider spectrum of accidents than do those that involve burning. 46 FR 62282. Do Applicants agree? If not, why not?

5-46. NUREG/CR-1561 at 12 states that recombiners are inadequate for controlling hydrogen generated by metal-water reactions. Do Applicants agree? If not, why not?

5-47. Could the ignition of hydrogen by the glow plugs produce missiles that could damage the containment or any equipment therein? Provide documentation showing that this could not happen.

5-48. What methods do Applicants intend to use for the removal of the heat of combustion from containment when using the igniters and recombiners?

5-49. Have Applicants performed any analyses of the type which would be required by the proposed rule, "Interim Requirements Related to Hydrogen Control," 46 FR 62281, December 23, 1981? Produce all such analyses.

5-50. Describe the design of the high point vents required for the reactor coolant system by 10 CFR 50.44(c)(3)(iii). Provide diagrams, as appropriate. Into what area would the gases released by the vents enter and/or accumulate?

5-51. What is the ultimate strength of the Mark III containment? Of the drywell?

5-52. Has the assessment of containment strength considered both static and dynamic loads? List all assumptions made in this evaluation.

5-53. Has the assessment of containment strength considered containment penetrations as possible points of rupture? If not, why not?

5-54. Is the assessment of containment strength based on any experimental data? Produce all studies supporting the containment analysis.

5-55. Could overpressure from hydrogen production alone (no explosion) be sufficient to rupture the containment? Provide documentation showing that this could not happen.

5-56. Describe the pressure and temperature transients which would be experienced by the containment from the complete combustion of the following concentrations of hydrogen (vol-%, assume abundant oxygen):

(a) 4%

(b) 6%

(c) 9%

(d) 12%

(e) 18%

(f) 24%

(g) 33%

5-57. Are the results given above based on any experimental data or studies specific to either the Perry or the generic Mark III containment? Produce all such studies.

5-58. List any assumptions made in the preparation of such studies, e.g., regarding the quenching effects of steam/humidity or the effect of containment structures and equipment on flame fronts.

5-59. What is the capacity, in scfm, of the mixers?

5-60. Would blowdown through the suppression pool, either through the safety-relief valves or through overpressure in the drywell (e.g., large break in drywell) exceed the capacity of the mixers? Provide documentation that this would not happen.

5-61. Would direct leakage from the drywell to the containment (bypassing the suppression pool) exceed the capacity of the mixers? Provide documentation showing that this could not happen.

5-62. From what area in the containment do the recombiners take suction? Could direct drywell-to-containment leakage dissipate hydrogen outside this region? Provide documentation showing that this could not happen.

5-63. What pressure head does the mixer compressor create?

5-64. Would the drywell-to-containment differential pressure ever be great enough (e.g., after upper pool dump) that the mixer compressor head is insufficient to clear the upper suppression pool vents? Provide documentation showing that this could not happen.

5-65. Would the recombiner exhausts product "hot spots" which could adversely affect the containment or equipment therein? Provide documentation showing that this would not happen.

5-66. Are the analyzers capable of measuring hydrogen concentration in a steam atmosphere? Up to what volume-% steam?

5-67. Is there any interlock in the circuitry for starting the recombiners or igniters which requires that the containment spray be operating first?

5-68. Do Applicants intend to initiate H_2 control only after LOCAs and not transient accidents? If so, justify this in light of the fact that transient sequences are significant contributors to the risk of containment failure due to hydrogen explosions (see Table 5-4 of NUREG/CR-

1659, Volume 4).

5-69. List all documents relied upon in answering the above interrogatories, and list the persons responsible for the answers, along with their professional qualifications.

Respectfully submitted,

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CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing OHIO CITIZENS FOR RESPONSIBLE ENERGY FIFTH SET OF INTERROGATORIES TO APPLICANTS were served by deposit in the U.S. Mail, first class, postage prepaid, this 13th day of September 1982 to those on the service list below.

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