UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Sept 27, 1983

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Glenn O. Bright
Dr. James H. Carpenter
James L. Kelley, Chairman

In the Matter of CAROLINA POWER AND LIGHT CO. et al. (Shearon Harris Nuclear Power Plant, Units 1 and 2)	Dockets 50-400 OL 50-401 OL ASLBP No. 82-468-01 OL

Wells Eddleman's Response to Motion for Summary Disposition on Eddleman 75 (Clams)

Contention 75 says that biofouling by Corbicula or other organisms could block the Harris condensers and access to its ultimate heat sink. Applicants, ignoring my responses to their discovery, say this can't happen. But it can. NRC Inspection & Enforcement Information Notice IN 81-21, dated July 21, 1981 (accession No. 8103304O2), at page 3, says (after describing the massive failure of the RHR system at another CP&L plant, Brunswick, due to biofouling, p.2) that "Under conditions of an inoperable RHR system, heat rejection to the ultimate heat sink is typically through the main condenser or through the spent fuel pool coolers. This latter path consists of the spent fuel pool pumps and heat exhhanger with the reactor building closed cooling water system as an intermediate system which transfers the heat to the service water system via a single pass heat exchanger. These two means (i.e. main condenser or spent fuel pool) are not considered to be reliable long term system alignments under accident conditions."

That is, given biofouling of the RHR system, either the main condenser or the service water system is required to maintain access to the ultimate heat sink, and neither of these means is considered reliable. Note that both the service water system and the RHR were biofouled at CP&L's Brunswick plant (IN 81-21 at 2).

CP&L claims extensively (alleged"facts" 4 through 8 re summary disposition on Eddleman 75, 9/1/83) that they can and will detect and eliminate Corbicula as a biofouling organism at Harris. This, however, is not very credible given the information contained in item 7 of the NRC's October-December 1981 Report to Congress on Abnormal Occurrences (hereinafter, "81 Report"). At page 2 it describes biofouling of the service water system and RHR at Brunswick and in other heat exchangers in that nuclear plant. It notes that "Three RHR heat exchangers (both of those on Unit 1 and one on Unit 2) ... were inoperable" (ibid). At page 7, under "Cause or Causes", it says:

> "At Brunswick, the chlorination program, which was part of the program to control the growth of marine organisms, was stopped for approximately 14 months dues to potential operational problems and environmental effects. Although the operational and administrative controls at ... Brunswick were inadequate to detect early signs of the problem, the plants were shut down when the technical specification limits could nc longer be met."

This is the matter about which Applicants are resisting discovery. Their failure to chlorinate is quite significant, as it caused the Brunswick problem, which was a serious safety problem. The 81 Report continues:

> "As previously discussed, the incident at Brunswick had the most safety significance of the incidents described in this report. Unit 1, which was shutdown on April 17, 1981, ... experienced a total loss of the residual heat removal system on April 25, 1981. * * * the similar heat exchangers on the operating Unit 2 were examined. ... the Baffle plate was found displaced for RHR heat exchanger 2B. ...".

The 81 Report explains the problem in more detail on pages 4 et seq. It says, "During normal operation, particularly if an adequate control program is not being followed, fouling organisms can grow in large diameter piping if the flow velocity is low." This implies that biofouling can occur even if an adequate control program is followed. Thus, even if true, Applicants' alleged "facts" 4 through 8 are irrelevant. In addition, the failure to chlorinate at Brunswick for some 14 months casts doubt on Applicants' ability to fully carry out their promises to prevent biofouling. Each of "facts" 4 through 8 is a promise: each uses the word "will" and is supported only by the opinion of a CP&L employee. The Staff DES at 5-20 does not deal with these matters except to note that chlorination of the service water system should not harm other living things outside the plant (presumably including other Corbicula and other potential biofouling organisms).

Leaving for now the other issues (e.g. Corbicula is NOT the only potential biofouling organism for Harris -- see Eddleman discovery responses to Applicants on contention 75; Corbicula veligers (larvae) can easily get through a 1/16 inch screen and enter the plant; these veligers are produced in huge numbers), let's return to the 81 report's safety analysis of such biofouling, which it says can occur even with an adequate control program (p.4).

At pp 4-5, it continues: "b. Fouling organisms also thrive in stagnant runs of piping in operating systems or in piping systems which have been inactive for long periods of time." There is no evidence that one cleanup run a month will remove Corbicula from Applicants' service water piping or emergency intakes. L.B. Goss et al (CP&L discovery document 000004, p.141) state that "any dead spaces where velocities are decreased allow for attachment and growth of clams within the tunnel to a size which can block condensers." A velocity of 2.1 meters per second is needed to prevent

clam attachment, they say. (ibid). With a once-monthly pump test, the dead space which will occur is the whole ESWS intake and auxiliary cooling intake, for virtually the whole month.

The 81 report goes on to show how Corbicula can cause or contribute to loss of heat sink during accidents :

"Seismically diked emergency ponds utilized by some power plants as the ultimate heat sink could also support the growth of Asiatic clams. If makeup to the pond is from a waterbody in which the Asiatic clams are known to be present, then it is likely that the clams will be found in the ultimate heat sink and possibly in the service water supply header leading to the plant from the ultimate heat sink" (p.5) Applicants and Staff both agree this is possible at Harris. See Staff 6-24-83 interrogatory response, at 96, interrogatories 26 and 27. Note this response was filed AFTER the DES issued. Applicants' VIII.5.83 responses to interrogatory 75-8(a) and (b) at page 9. Note also the response to 75-8-e-iii: with Corbicula in the reservoir, Applicants can't assure it won't get into the plant. As shown above, and further below, their protection plan is inadequate to prevent entry and growth of Corbicula; and as noted above they may not carry out their plan: They failed to at Brunswick, see IN 81-21 and 81 Report.

The 81 Report then d cribes (pp 5-6) degradation of heat sink, noting that"dead clams may be more of a problem than live organisms, since they are more easily swept along by the flow." TVA (CP&L discovery document 00000[illegible]5... at 140) has had severe problems with dead clams in condensers at Browns Ferry. "The fouling was so extensive that condensers had to be dismantled and cleaned with brushes" (ibid). Even if the heat sink doesn't degrade in performance due to dead clams, even a small percentage of dead clams"could overburden automatic backwash service water strainers." 81 Report at 5, bottom.

The 81 report notes on page 6 that in normal operation, the building up "of fouling organisms or corrosion products may not noticeably degrade system performance", but during a seismic event, debris could be broken loose; this could also happen due to pipe flexure, simultaneously degrading both redundant trains of the emergency cooling system. Pump failures due to buildup of fouling organisms are also discussed. It concludes (pp 6-7)

> "The safety concern identified by these events is the possible degradation of the heat transfer capabilities of redundant safety systems to the point where system function is lost. Preventive measures and methods of detecting gradual degradation have been inadequate in certain areas to preclude the occurrence. The above postulated events involve a common cause failure mode that can affect redundant systems. Aquatic organisms, mud silt, and corrosion products have been the main source of flow blockage in the ~~x~~ coolant piping system and associated heat exchangers where events have occurred."

The above establishes that Corbicula can cause serious safety problems at Harris, including ones where the main condenser or ESWS is required to establish access to the plant ultimate heat sink, thus disposing of the issues raised in CP&L's Loflin affidavit. (see e.g. 81 Report under 81-7 at 1st page)

It remains to show why Applicants' proposed control measures are not adequate. Note, though, that the 81 report, pp 8-9, assigns only "varying degrees of effectiveness" to the sorts of measures Applicants propose in their Hogarth affidavit.

Isom, . . . (CP&L discovery document 000004, copies provided herewith for Board, Staff, and NRC Docketing & Service) notes that veligers reaching the cooling tower basin (aeration basin) "are apparently protected from the chlorination procedure by the aeration process." This directly contradicts Hogarth's item 11 (p. 4 of his affidavit). Isom notes that plants that maintain 0.5 ppm chlorination "at pump intakes experience no problems with Asiatic clams or other biological nuisance organisms." But CP&L does not commit to this. They only propose this concentration at the heat exchanger outlet

(Hogarth, item 11, p.4). The error of his item 12 has been noted above, citing Goss et al at 141 (CP&L discovery document 000005, copy also provided for Board, Staff and NRC Docketing and Service). Hogarth's argument about the intake depths (item 13, p.5) ignores entrainment, particularly of Corbicula veligers (larvae) in the ESWS intakes. Hogarth also asserts that a 1/16" mesh will preclude any passage (of Corbicula larvae, it can be inferred from his previous sentence), but Goss says (p.141) that "Use of straining alone eventually results in the need for manual cleaning of the (service water) system components". Corbicula veligers are much smaller than a 1/16" radius.

Hogarth does not describe what flow and pressure tests CP&L will do. The 81 report is clear that flow must be measured on both sides of a pump during pump tests to detect biofouling. (item .e, p.6) If CP&L fails to commit to this obvious requirement, what trust can be given to their vague and general suggestions? Again, I cite their 14 month failure to chlorinate at Brunswick as evidence that they don't even keep their commitments in all cases, so there is still an issue on this point. It doesn't need a discovery response to substantiate it -- it's right in the 81 report at page 7.

Hogarth, item 15 at page 6, says that tests "are designed to monitor plant service water systems for any flow reductions",but does not state what degree of flow reduction can be detected. As noted above, in normal operation the degree of flow reduction may be minimal, thus difficult to detect (81 report at 4).

Other organisms can cause biofouling at Harris (see Eddleman responses to Applicants' discovery on this; see also 81 Report at9; IN 81-21 at 3). Applicants ignore this, but the above contradict their alleged fact no.2)

Severe blockage of condensers by Corbicula is noted by Goss. (p.140, document 000005). Corbicula in the cooling tower basins

can be getting into the condensers without going through the areas CP&L will effectively be able to chlorinate. CP&L in its affidavits makes no mention of chlorinating in the condenser or outlets of the cooling tower basin, from which water recirculates to the condensers.

CP&L's "fact" 10 admits, by using the word "therefore", that it depends on the above alleged "facts", all of which except #1 and #3 are contradicted above by known facts. Thus there are genuine issues of fact re Eddleman 75 in this proceeding and Applicants' Motion for summary disposition of this contention should be denied. (Fact #1 merely states the contention's thrust in general terms; Fact #3 is that Corbicula isn't in the Harris lakes yet; but all parties agree they can readily get into them. Thus, these last two facts don't help Applicants at all.)

Wells Eddleman

NOTE: IN 81-21 and the 81 Report were only recently located by me; the above discussion of them may be viewed as a supplement to discovery on Eddleman 75 and copies of these documents, are being sent to Applicants as well as to the Staff, Board, and Docketing and Service, with this Response.

I affirm the above is true, 9.27.83 Wells Eddleman

Wells Eddleman

STATEMENT OF FACTS AS TO WHICH THERE
ARE ISSUES TO BE HEARD ON EDDLEMAN 75

1. Asiatic clams and other organisms (as identified in discovery responses by Eddleman, 7-29?-83) can infest the Harris plant, and foul pumps, pipes, heat exchangers and the condenser.

2. No combination of measures is guaranteed to prevent growth of such organisms in the Harris plant.

3. Corbicula veligers (larvae) can enter the plant and reach the cooling tower pools where they will be secure against normal chlorination since the aeration above them removes chlorine.

4. Corbicula will get into the Harris reservoir and auxiliary reservoir eventually.

5. Screening won't keep Corbicula veligers out of the Harris plant.

6/ Intakes from the auxiliary lake will be places Corbicula can flourish. One monthly flush won't remove them as they attach to the surfaces of pipes (Goss, p.141, CP&L document 000005).

7. CP&L is not guaranteed to chlorinate at Harris because they didn't for 14 months at Brunswick.

8. Chlorination will not keep Corbicula out of the Harris condensers if they are in the cooling tower basins. Even if killed by it on the way to the condenser, they'll become debris.

9. CP&L's in-plant monitoring is inadequate to detect buildup of Corbicula or debris or other organisms, and inadequately specified.

10. Biofouling of the RHR from Corbicula is possible at Harris. so is biofoulind ogf the service water system, ESWS, and main condenser.

11. When the RHR is biofould, the main condenser or ESWS is needed to shut down the Harris plant, but neither is reliable to maintain long term shutdown, and both can be infested with Corbicula or debris.

12. Lack of adequate cooling, for reasons as described above, can cause severe accidents at Harris or any nuclear plant so designed.

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