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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
DUKE POWER COMPANY, et al.)
(Catawba Nuclear Station,)
Units 1 and 2))

Docket Nos. 50-413
50-414

SUPPLEMENT TO
PALMETTO ALLIANCE
PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW
IN THE FORM OF A PARTIAL INITIAL DECISION

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SUPPLEMENT TO PALMETTO ALLIANCE
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This Supplement to our Findings of Fact and Conclusions of Law in the Form of a Partial Initial Decision addresses five discrete technical issues which were specified in our Memorandum and Order (Confirming Closing of the Record and Schedule for Filing Proposed Findings) of December 30, 1983. There, we ruled on a motion by Palmetto Alliance to hold the record open for receipt of further evidence with respect to a number of issues, referred to generally as the "in camera issues", raised by four former Catawba workers who had presented safety concerns to the Board, in large part in camera. For a detailed description of the procedural history of these matters and the full scope of issues raised by these witnesses, see our principal Findings of Fact and Conclusions of Law, in particular Part III E, pp. 270, et. seq. Suffice it to say, here, that this Supplement addresses issues raised by three board witnesses, Mr. Harry Langley, a former welding Quality Control inspector, who presented public testimony; Mr. Howard Samuel Nunn, Jr., a former welder, who initially appeared in camera, but subsequently requested that his testimony be considered public, Palmetto Exhibit Exh. 140, Nunn, p. 1, Tr. 11,927-28; and the third witness, whose testimony remains in camera, whom we shall identify herein as "Witness 3." In light of our perception as to the safety significance of the

particular issue, the NRC staff's proposals for further investigation, and our obligation to complete this portion of the proceeding by Applicants' anticipated fuel load date, we carried over for hearing and decision the following matters:

1. Laminations;
2. Foreman override;
3. Tig Wire;
4. X-rays; and
5. Honeycombing.

After a few introductory observations, we will address each of these issues in turn.

1 We wish to emphasize, as we have observed in our principal decision on the subject of Quality Assurance at the Catawba Nuclear Station, that we decide these issues in light of the unique procedural posture in which they were presented. As we concluded there, each source of evidence of quality assurance failures at Catawba represented a "window" whose particular dimensions bear heavily on the weight and significance to be attached to the evidence which they reveal. The so-called "in camera" witnesses bring to us a very special view of quality assurance at Catawba which we have noted in weighing the evidence regarding their concerns.

2 Of particular importance in this regard is the limited scope of evidence which we have been able to consider on the issues we are able to decide. As we noted in our principal decision, the four in camera witnesses (three of whom present evidence on the issues before us now) came forward independent of the parties,

either at the Board's invitation (in the case of the three actually original in camera witnesses) or after these hearings commenced when the existence of this forum became known (in the case of Mr. Langley). Thus, we tailored already planned and scheduled proceedings in a fashion to permit consideration of these witnesses' concerns with attendant necessary time and scope limitations. In doing so, we made these Catawba workers Board Witnesses and tailored both the presentation of evidence by them and the parties regarding them accordingly. Having heard their safety concerns, and having narrowed the scope of those concerns, (in response to motions to strike by Applicants and the Staff), to issues which we considered both particularly significant and manageable in light of the procedural exigencies facing us, we were principally interested in responses to these concerns by Applicants and the NRC Staff. We believe this proper since the in camera witnesses' allegations are largely adverse to the positions advanced by both the Applicants and the Staff and, conversely, generally support the position of Palmetto Alliance as to the existence of significant quality assurance failures at Catawba. It is in this light, therefore, that we proceed, principally, to weigh the adequacy of those responses.

3 In large part, we conclude that the record with respect to these in camera issues corroborates and sustains our principal conclusion that pervasive quality assurance failures have been shown at Catawba and that Applicants are unable to meet their burden of proof that there is reasonable assurance that Catawba will operate without endangering the public health and safety.

In short, the weight of the evidence on these discrete in camera issues buttresses our decision to deny the operating licenses sought by Applicants.

I. LAMINATIONS

4 Former Catawba QC Welding Inspector, Harry Langley, and Welder Howard Samuel Nunn, Jr., each independently expresses concerns regarding the existence of extensive uncorrected laminar discontinuities in the Catawba containment vessel shell plate and penetration sleeves.

5 Mr. Langley, who was employed at Catawba as a Welder and Quality Control Inspector in the Welding area during 1977 and 78, Langley, Tr. 6832, observed difficulties in "chasing" out laminations found in the Unit II containment wall in the process of inspecting repairs to a gouge on the second level near the knuckle plates at stiffeners 18 and 19. Langley, Tr. 6844-45. Mr. Langley also experienced "trouble" with Mr. Larry Davison, then the Senior QC Engineer at the site, who discouraged him from initiating a non-conforming item (NCI) report to document the laminations and corrective actions. Id. Mr. Langley identified the area of lamination:

It was on the second level, right up after you come up to the knuckle plate. Where the bottom of the reactor turns, it comes up on a vertical. There was somebody who had gouged into the metal and when we started checking, we found lamination in the metal....the gouge had to be repaired, but while we were checking it and cleaning the place and getting it ready to be repaired, we found lamination....to the right of the airlock. It was right down below the airlock, on the right side of it.

Langley, Tr. 6860.

6 Mr. Langley brought the defects to the attention of his supervisor, Mr. Beau Ross, who instructed him to document the laminations. Davison discouraged him from writing up an NCI on the defects. Langley, Tr. 6882.

7 The existence of extensive laminar defects in the Catawba containment steel plate was independently corroborated by the experience of former Catawba welder, Sam Nunn, in performing repairs in the Spring of 1981 on a safety related containment penetration where over thirty laminar defects were detected on the weld prep surface of a large diameter vendor supplied containment penetration. Nunn, Tr. 153-170. "Some were as long as an inch and an inch and a half and some were as short as one-eighth of an inch....to me, this was in fact just a rotten piece of pipe. Were it my plant, and of course it is not my plant and not my say so, but I would have taken that piece of pipe out of there." Nunn, Tr. 158. Instead, Nunn was directed to simply weld over the laminar indications on the exposed weld prep surface, again and again until the laminar discontinuities were covered up. Id. at p. 160. Nunn also knew of the laminar defects in containment plates found during grinding, as seen by QC inspector Langley, "that there were literally not inches but feet of lamination that had been found in the metal itself." Id. at p. 155. Sam Nunn is worried:

I worried then and I worry to this day about how much metal is in this containment wall that is laminated and perhaps could somewhere along the way cause a safety problem.

Nunn, Tr. 166.

8 Applicants and the NRC staff each move to strike Mr. Nunn's concern regarding laminations. Tr. 414-415 and 424-427, respectively. There, the Staff committed itself to its ultimate conclusion on this subject: that Applicants' procedure for repairing such laminar defects, CP-88, is a proper procedure and was followed in these cases. Ironically, the Board Chairman commented on the staff's position and expressed the essence of our conclusion on this matter:

Judge Kelly: He seemed to think this was a use of defective material in a safety related part of the plant, and surely the use of defective material is a poor QA practice.

Tr. 427.

9 To the extent we are able to reach any sound conclusion on the record before us on the issue of laminations, we believe all evidence points in that direction, i.e., that the use of such steels with extensive laminar indications is reflective of, at the least, a "poor QA practice."

10 There appears to be no dispute that laminations in steel plate, such as was used here in fabrication of the containment shell and in the large cylindrical penetrations made from such plate, are caused by the incorporation of non-metallic inclusions, such as air, gas bubbles, or other foreign materials, into the plate while in a molten state which is then rolled into a flattened plane in the milling process. Applicant's Exhibit Exh. 110, Ruth p. 5.

Applicants take the position that the existence of laminae indications in the steel plate itself is of "no safety significance" except as they exist on the plate edge in the weld preparation zone, Tr. 11965, where, upon detection, they were removed by a process of grinding back and sealing of the laminae edge discontinuities through the use of construction procedure CP-88 in full compliance with the ASME code. Applicant's Exhibit 110, Cavender, Ruth, Llewellyn and Schropshire, pp. 6-7.

11 True to its pre-inspection prediction of November 28, 1983, Tr. 427, the NRC Staff agreed:

When this condition appeared, the licensee identified it and took appropriate steps to correct the condition, thereby complying with code requirements.

Staff Exh. 22, p. 3.

12 We find such glib assurances less than comforting and are left to wonder why extensive laminae defects occurred in this steel in the first instance; and whether, indeed, such defects have been fully identified and corrected. We cannot dismiss the concerns of Messrs. Langley and Nunn so lightly. Applicants and staff have failed to remove our doubts on this issue.

13 While observing that the principal loadings on the containment shell result in "membrane stresses" which are parallel to the plane of laminations, thus unaffected by existence of laminae discontinuities, McConaghy, Tr. 11958-61, applicants concede that where through thickness stresses exist such as where the "crane wall has to go through the containment bottom liner....a tensile load which would tend to open laminations in that plate, would be a concern...." McConaghy,

Tr. 11966-67. There the plates receive extensive ultrasonic (UT) examination to assure the absence of objectionable laminar discontinuities. Id. Such through thickness stresses tending to separate laminar defects would be induced by the attachment of dead weight loads to the vertical containment plate as well, even the Staff concedes. Tr. 12076.

14 Mr. Nunn was apparently informed that Applicants' prescribed procedure for repair of laminar indications was identified as construction procedure CP-88. When he informed the Authorized Nuclear Inspector (ANI) of this practice in the course of obtaining approval for a specific lamination repair, the ANI man, according to Nunn:

Hit the ceiling. He started pacing up and down the office and he said, 'I can't believe this.' He said, 'I didn't even know that CP-88 existed.' He said, 'Do you mean to tell me that that has actually been used on the containment wall down there?' I said, 'Well, I didn't see it used myself, but I understand that is what the procedure was created for, was to eliminate these laminations as they showed up.' He said, 'That doesn't eliminate a damn thing.' He says, 'All that does is cover over something.' He said, 'The problem is still there.' He said, 'As far as I am concerned, this directly effects the safety of this plant.'

Nunn, Tr. 163.

15 Ultimately, the repairs were authorized and made after repeated efforts to "chase" yet undetected laminar defects. Sixteen pages of process control documentation reflect the seven months worth of work on the single containment penetration to bellows Weld No. 2 NI 15-1 on which Mr. Nunn worked. Staff Exh. 24. The weld in question received QC approval at original fit up and final visual; but was rejected upon x-ray identification of

lack of fusion. Id. Thirty or more laminae indication were only detected after Sam Nunn suggested use of a liquid penetrant (PT) test not normally employed on such carbon steel work. Nunn, Tr. 157. The fact that such diligence as is reflected in the history of this single weld ultimately solved the problem to Duke's satisfaction provides us little comfort as to the generic implications of this problem. One is left to wonder about the laminations which remain undetected in other penetrations and containment plates in the Catawba facility. We note, strikingly, that the construction procedure, CP-88, which Applicants offer up as solving the problem, is not even mentioned in the voluminous paperwork reflecting the repair of the penetration weld identified by Mr. Nunn.

16 Curiously, we note that the cover sheet of CP-88, received in evidence as Palmetto Alliance Exh. 134-A, indicates an annual review for the years 1976 through 1978. The next revision is not indicated until 1983, during which year revisions five and six are noted. Revision five of 7/13/83 is accompanied by the following:

Note: this procedure is being reinstated from deletion. There are no changes.

Id., p. 2.

17 Applicants assert that CP-88 was deleted from the procedures manual only during the period January through June 1983, and that during this period, such repairwork would have been performed identically by generating specific instructions on a form F9-B in each case. Llewellyn, Tr. 11,983-86. Such testimony leaves only

to wonder why, then, such a form F9-B was employed in the spring of 1981 for the repair of Mr. Nunn's containment penetration sleeve if CP-88 was in fact in use.

18 This Board is simply not in a position to reach sound conclusions as to the safety significance of the laminer defects identified in this record, the effectiveness of Applicant's procedures for the identification and repair of such defects, or the effectiveness of implementation of such procedures themselves. Several observations, in passing, should indicate a basis for our special uneasiness. Applicants' Mr. Llewellyn, himself, indicates that the heat affected zone (HAZ) adjacent to the weldment, which is the point of greatest vulnerability to through thickness stresses, might well exceed the three-eighths inch limit of lamination repair in the case of the three-quarter inch containment plate. Llewellyn, Tr. 12027. We note, further, that the American Welding Society's structural welding code establishes limits of acceptability of laminer discontinuities a finite percentage of plate area in excess of which such discontinuities shall prompt rejection, replacement or repair of the indications. AWS Structural Welding Code Section 3.2. Palmetto offered the expert testimony of Quality Control Engineer E. Earl Kent on this subject. While we rejected Mr. Kent's proffer, principally on grounds of scheduling, we note in passing, without reliance, that Palmetto's Offer of Proof with respect to Mr. Kent's testimony supports the conclusion that presence of laminer indications in such components as the containment plate and penetrations poses, in his opinion, safety

significance. He would have urged that the penetration identified by Mr. Nunn as containing extensive laminar discontinuities be scrapped and not repaired. E. Earl Kent, Offer of Proof. We are simply unable to conclude with any confidence that the presence of laminar discontinuities as described poses no safety significance.

19 The adequacy of Applicants' handling of these repairs remains in some doubt. We learned that only after Mr. Nunn's allegations, made on the eve of his termination by Applicants, did Applicants identify and document an improperly performed weld repair made almost two years earlier on the vendor supplied penetration. Applicants originated NCI No. 17511 to finally document this defect and require that the weld be cut out and reworked under proper procedures. Palmetto Alliance Exh. 135. Finally, we reject Applicant's incredible assertion that its "rigid vendor audit and surveillance program" provide adequate assurance as to the quality of such vendor supplied components as the containment shell plates and penetrations which have been the focus of these issues. Duke's own QA vendor documentation reflects the identification of a "large number of non-conformity reports" from Newport News Industrial Corporation reflecting the poor quality of weld preparation on the containment liner plate destined for the Catawba Nuclear Station. As a result of this March 19, 1976 report, Duke committed to performing a "100% final inspection on all material being shipped from Newport News" and to surveillance on items there in fabrication. Palmetto Alliance Exh. 136. Ironically, those commitments ring doubly hollow in

light of the record before us. Not only do the experiences of Messrs. Nunn and Langley evidence failure to heed this early warning and the difficult task of correcting the problems once found; but, the concerns of Welding Inspector Richard W. Irby demonstrate persuasively that Applicants' failures are indeed pervasive.

20 In July of 1980, Mr. Irby initiated NCI No. 9092 to document excessive surface pitting of Catawba containment plates manufactured by Newport News Industrial. A year and a half later, Mr. Irby complained again of Applicants' failure to effectively deal with these problems. Irby's concern was evaluated as File No. K-2 of the Catawba Welding Inspector Technical Task Force. Final Report of the Task Force Effort to Evaluate Technical Concerns of Catawba Welding Inspectors, Volume II. Applicant's mishandling of this NCI and the root failure to properly identify these manufacturing deficiencies in the Newport News supplied plate in the first instance presents a picture of error compounded upon error, which leaves us with grave doubts as to the condition of the containment plates in question. Duke's Technical Task Force concluded almost two years after Inspector Irby identified the defects:

The technical adequacy of the plate is still undetermined. Since the pitting is so extensive, repair methods may be ruled out as impractical. The defects are on both sides of the plate. This problem will probably need reanalysis to determine adequacy of plate thickness and surface defects. Design Engineering didn't give this problem proper and expeditious attention for an item of such consequence. If this problem had been quickly addressed, the plate could have been easily shipped back to the vendor. QA receiving inspection procedure P-1....appears inadequate since the defects went unnoticed during

receiving inspection. The handling of procedure Q-1 is also technically inadequate. This item has been installed violating paragraph 4.3 which states that a nonconformed item will not be permanently installed.

Id.

Welding Inspector Irby raises troubling questions about this matter:

Why did this issue have to be found? Why an overextended time frame (16 months) with a questionable resolution 7/31/80 - 12/2/81? Why so much correspondence and explanation and no one addresses the problem? Why did the proper initiative in the search and solution not be put forth at the introduction of NCI 9092? Why and how were all decisions made without someone in authority physically making an examination of the plate in question? Why NCI could not have been resolved immediately or soon after introduction; during the time of erection while many plates were still on the ground? Knowing these questions cannot be answered; what I want to point out is the pass-it-around write-something-about-it and say-it-is-okay attitude. This needs to be checked.

Irby, Offer of Proof, Attachment A.

21 We are only left to ask the same questions concerning the identification and correction of these extensive lamina defects which are identified in these same containment plates supplied by Newport News. The concerns raised by Messrs. Nunn and Langley, considering fully the responses by Applicants and the NRC Staff, buttress our conclusions that pervasive quality assurance problems remain at the Catawba facility.

II. FOREMAN OVERRIDES

22 Former Catawba Welding Inspector Sam Nunn raised a number of specific instances, which he characterized as "Foreman Overrides," where in his opinion the interests of quality workmanship have been sacrificed to cost and scheduling pressures at the direction of craft supervision:

We have been told before - you know - quality, not quantity. We (have) been told safety first, but that is not always the case.

Nunn, Tr. 184.

23 Sam Nunn raised some six specific instances involving himself and his foreman, Larry Rudasill, fitter foreman, Ed McKenzie, and fellow welders, D. A. "Buck" Henry, Malcolm Young, and Danny Ray. Nunn, Tr. 181-86, 193-95, 204, 254-58, 267-68, 283-87, 289-90.

24 In our Memorandum and Order of December 30, 1983, we held this subject over for consideration at the hearing sessions of January 30-31, including receipt of staff views, primarily because there was insufficient time available to consider this subject during the December hearing. Our view then, which we confirm now, is that Mr. Nunn's evidence on this subject is largely corroborative of the extensive evidence of "foreman override" presented by Catawba welding inspectors in this record. Consideration of Applicants' responses and the information gained by the Staff through the process of interviewing a number of welding craftsmen at Catawba further strengthens our findings that pressure by supervision to approve work which may not meet prescribed criteria is a pervasive problem at the Catawba site.

25 On the general quality assurance record - prior to receipt of evidence on the in camera witnesses' concerns - we heard considerable evidence reflecting the sacrifice of quality to cost and schedule pressures. This subject is dealt with extensively in our principal findings under the heading, "Harrassment, Intimidation and Intentional Circumvention of the Quality Assurance Program by QA Management: 'Non-technical Concerns'." Further, among the "technical concerns" of Catawba welding inspectors were a number of specific incidents reflecting QC inspectors signing their acceptance for work at the direction of their supervision which the inspectors did not believe to be acceptable. The NRC Staff identified these technical concerns as File Nos. D-22, D-24, D-30, P-1, Q-1 and K-58 (I-1). Van Doorn pre-filed testimony at pp. 29-30, and Attachments 18, 19, 20, 21, 22 and 23. Like Mr. Nunn's concerns and the incidents of supervisory pressure reflected in the "Harrassment and Intimidation" portion of our Findings, we conclude that these "technical concerns" likewise demonstrate improper "foreman override."

26 The Applicants presented a panel of twelve witnesses including the foremen and welding craftsmen identified by Mr. Nunn. While all presented glowing assurances that quality is never sacrificed to the interest of cost, schedule or quantity, Tr. 12,259, we find it implausible to expect any other response from these witnesses under the circumstances, and are left unpersuaded by the overwhelming evidence to the contrary which permeates this record.

27 We note particularly that as to the specific instances cited by Mr. Nunn, the testimony of the Applicants' panelists largely supports Nunn's factual statements while adding the predictable interpretive gloss which we would expect to hear under the circumstances in which this evidence is presented. We think it is striking that when questioned by Mr. Nunn himself, who was permitted to serve as a technical questioner for intervener Palmetto Alliance, his fellow welders largely acknowledged the incidents which he had identified, despite the presence on their panel of their supervision allegedly implicated in the "foreman override" incidents including Welding Superintendent W. E. Rogers, Welding General Foreman J. R. Wilson, Welding Supervisor H. R. Barker, Pipe Supervisor Ed McKenzie, and Welding Supervisor Larry Rudasill. For example, under questioning by his former colleague Mr. Nunn, welder Henry acknowledged that he had been required to retest after his foreman instructed him to weld improperly with a rod that was too heavy for the equipment he had in use. Henry, Tr. 12,244. Similarly, Malcolm Young acknowledged that he was also required to retest in order to maintain his certification. Id. Significantly, Danny Ray also acknowledged the incident alleged by Sam Nunn involving pressure from Foreman Rudasill. Not unexpectedly, welder Ray characterized his foreman's efforts as "to encourage me to improve," as contrasted with improper pressure. Ray, Tr. 12,246.

28 We consider Mr. Nunn's experience with Foreman Ed McKenzie particularly instructive since Ed McKenzie and his predilection for improperly pressuring craftsmen to perform faulty work is

well established on this record. Welder Sam Nunn independently corroborates the already considerable evidence indicting Ed McKenzie for numerous instances of "foreman override":

It seems like I got into a quantity rather than quality type situation there. I just wanted to mention that a whole lot of that goes on, and there have been times that the paperwork should have come back down first before a step was taken on a pipe, or making some fittings and the foreman jumped over this. Ed McKenzie, I don't know if you have ever heard of him, he is one of the fitter foremen up there. He was pretty bad to do this. Like you would have, say, ten one-foot by one-foot by two-inch schedule 80 pieces of stainless steel, and they would be going into 90s. And you know that these were going in your line somewhere, but you had to wait until you got the schematic or whatever they called that down there before you legally could weld on it. Well, he would have his crew already having us fab them up. I didn't fab them up. If I didn't have the piece of paperwork there to show me, I would not fab it up. But I do know some welders who have....we are supposed to wait until we have a piece of paper which says how much weld and where to put it and where the line is going to go. And if a QC or a QA inspector walks by and says, 'What are you working on,' you had better be able to go over there and show him that piece of paper. If you are not, you can be written up.

Nunn, Tr. pp. 193-194.

29 Neither Mr. McKenzie nor Mr. Rudasill recalled the incident described nor did Applicants' "review of the documents" provide evidence of Mr. Nunn's allegation. McKenzie and Rudasill, Tr. 12,247-49. Nor would we expect it to. Mr. Nunn's experience effectively corroborates the allegations of Welding Inspector Boyce Cauthen as to how "Ed McKenzie gets his work done." Cauthen, Pre-filed testimony, Attachment A, "Lack of Support from QA." In his own principal testimony, the recently reformed Mr. McKenzie virtually conceded his wide ranging past misdeeds, McKenzie, Tr. 8714, et. seq.; for example, his "bullying" of

craftsmen, Tr. 8720, failure to properly gap socket welds, Tr. 8733, and serious violations of Duke's Procedure Q-1 for controlling nonconforming items, Tr. 8735. Mr. Nunn's perspective simply confirms the extensiveness of Mr. McKenzie's misconduct.

30 In light of our Principal Findings, Paragraphs Nos. 584 through 589, the NRC staff's woefully inadequate response to the "foreman override" issue, here, nonetheless, confirms the general experience of craftsmen with supervisory pressure. Despite the NRC staff's disingenuous characterization of this pressure as "a personality problem." Staff Exh. 26 at p. 5. We can only urge the staff to hereafter redouble its efforts to pursue such legitimate leads on the serious subject of harrassment and intimidation of craft by supervision as are suggested by the factual disclosures of a number of welders interviewed, particularly including the glaring and specific factual allegations of harrassment and pressure to perform faulty work presented by "Welder B." Staff Exh. 27, Summary of Investigative Interviews, pp. 5-7.

31 We conclude that the evidence presented by Mr. Nunn during the in camera portion of this case, coupled with the responses by Applicants and the NRC Staff confirm and corroborate our principal conclusions as to the existence of pervasive harrassment, intimidation and pressure to approve faulty work at the Catawba facility.

III. TIG WIRE

32 Former Catawba welder, Sam Nunn, raised troubling questions regarding the existence of defective welding filler material employed at Catawba in safety related work, the failure by Duke's QA procedures to identify these defective rods, and instructions to him and other welders by supervision to continue using the defective material even after the problem has been brought to management's attention by Nunn and other welders. Nunn, Tr. 176-80, 203-04, 207, 247-53. Mr. Nunn described his experience with a particular batch of defective tungsten inert gas welding material (tig wire) which contained inclusions of foreign matter and also problems with 3/32 stick rods (coated electrodes) with defective flux. As Mr. Nunn explains:

We had the tig wire and it would appear to sparkle like a Fourth of July sparkler that a kid buys. You will be running along and it will sparkle and flake and get all over the tungsten and you have to stop and take a look at the filth, and the filth is there, and there are pinholes and porosity. Carbon tig wire comes with a carbon coating on it as a protective device, just a protective coat of copper coating to keep it from rusting. We started sanding it off, and in a piece this long you may have an area that long like a seam where it will be rolled over and down in that seam there is just filth, just trash. Filth....I think this was Page wire, but all of the fellows on Larry Rudasill's crew - - and this would have been - - would have been around the spring of 1981 - - were having trouble with the one-eighth inch wire....and we clipped off a little piece of the bad wire, and I was delegated the person to go up and present it to the foreman and tell him what was going on.

Nunn, Tr. 176-177.

33 Mr. Nunn took samples of the bad tig wire from the other members of his crew and carried it to his supervision. He showed them the filth inclusions and his supervision agreed to take the

problem "up the hill" to take the matter up with Welding General Foreman Billy Smith. Shortly thereafter, Nunn received this response:

....word came back to me that I was paid to weld and to weld with what I was given to weld with, that that wire had been sent to the test shop, a couple of tests had been run with it. There wasn't a thing wrong with it, and for us to just go ahead and work with what we were given to work with, and the wire continued to be bad until that lot of wire was used up; and when the next lot of wire was purchased, we didn't have that problem any more.

Nunn, Tr. 179.

34 Nunn also relates problems with 3/32 stick rods which had a defective split flux causing problems with workmanship. Id.

35 Applicants and the NRC staff responses to these concerns by Mr. Nunn do not seriously question the existence of the problems he identifies with the bad tig wire and the defective coated electrodes. We are extremely concerned with the obvious lack of adequate explanation for the existence of this problem in the first instance by Applicants, the failure to take corrective action, and the lackadaisical attitude and failure to exercise adequate follow-up by the NRC Staff.

Applicants assert that the bad tig wire of which Mr. Nunn complained was tested and found acceptable although, incredibly, they maintain no written records to document the tests or test results, nor did they retain any samples of the questioned tig wire. Llewellyn, Tr. 807. This omission is wholly unexplainable and reflects a clear violation of 10 CFR 50, Appendix B, Criterion XVII, "Quality Assurance Records," which requires that sufficient records be maintained to furnish evidence of such activities effecting quality as tests results and material analyses. Such records are required to be identifiable and retrievable. The absence of documentation of these tests, and Applicants' cavalier disclaimer of any duty to maintain such documentation evidences in our judgment that Mr. Nunn's description of events is indeed accurate. NRC Staff identified the bad tig wire in question as produced from HT# 97405. They reviewed records of fourteen selected welds employing this tig filler material and confirmed that "the joints where this material was used exhibited some evidence of porosity and/or slag," which the Staff then characterized as "no more than what normally appears in welds of this size and type." Staff Exh. 26, pp. 5-7. The Staff further interviewed a number of welders who confirmed that they had found the condition described and used the same material. The Staff, however, concluded that no such defective material was actually used in safety related welds since they assumed that the welders discarded any defective pieces upon discovery. Id. In its review of the fourteen welds in which PT# 97405 filler material was employed, the Staff did

identify through review of the radiographic film an apparent lack of penetration on weld LCF-029-07 an eighteen inch weld in the auxiliary feed water system. "This matter was identified as Unresolved Item 413/84-03-02, Apparent Lack of Penetration Indication, Weld No. LCF-029-07," which is to be further investigated by Applicants for inclusion in a future inspection report. Id.

37 Amazingly, the NRC Staff included within its review of the fourteen welds the very weld which was the subject of Mr. Nunn's extensive repair effort and led him to identify the presence of extensive laminer indications. The Staff identified this weld as "safety injection penetration sleeves, 2NI-15-01." With no apparent recognition that this evidence confirms Mr. Nunn's belief that the bad tig wire actually caused bad welds, the Staff comments:

Root of original joint welded in part with HT# 97405 filler metal, rejected for lack of fusion. Rewelded and repaired three times prior to acceptance - HT# 97405 not used for repairs.

Id. at p. 6.

38 Applicants, with the apparent endorsement by the NRC Staff, take comfort in the testing of filler material, including the batch of tig wire in question, by the vendor itself prior to supplying it to the Applicants for use. Roy, Tr. 772-77. The Staff glowingly observes that "the material was received, inspected....and released by QA on February 20, 1980." They observe that the Certificate of Compliance on file reflected that "chemical analysis and mechanical properties met minimum Code

requirements...." Staff Exh. 26 at p. 5. Applicants assure us that any bad welds which could have resulted because of the defective filler material would have been detected by subsequent tests, inspections and audits. Llewellyn, Rogers, and Rudasill, Pre-filed p. 7; Cavander, Rogers and Llewellyn, Pre-filed at p. 9.

39 Given the record in this proceeding of pervasive quality assurance failures, not the least of which is failure to effectively identify and take corrective action for the defective filler material here in question, we have little confidence that bad workmanship caused by use of defective material will inevitably be caught and itself corrected. We are particularly disturbed that a conscientious employee such as Mr. Nunn has met with such little support by his supervision at Duke Power Company in his efforts to see that the job is done right and that the Catawba facility is, indeed, safely built.

IV. X-RAYS

40 A critical device to verify the adequacy of safety related welds is the use of radiography (x-rays or RT) to identify rejectable defects. Radiographic examination is required of all safety grade A and B pipe welds and the adequacy of this inspection technique to detect objectionable indications is crucial to the assurance that bad welding caused by such things as deficient technique, or use of bad filler material such as the tig wire described by Mr. Nunn, does not lead to the incorporation of bad welding in crucial applications in the

Catawba facility. Mr. Nunn raises serious and troubling concerns about the adequacy of radiography to perform just this crucial verification function. We come away from this issue, having heard Mr. Nunn's allegations, Applicants' and the NRC Staff's responses, with serious doubts of our own as to the adequacy of radiography at Catawba. If Applicants had not held out radiography as the virtually fool-proof, ultimate measure of weld quality, perhaps our expectations for its level of perfection would not be so high. However, we find its shortcomings particularly disturbing in light of the extensive reliance placed by Applicants upon the results of radiographic inspections to establish the acceptability of welds, including in many cases those rejected by welding inspectors upon visual examination. Welder Sam Nunn describes just such an incident:

....One of Henry's better welders was Pridemore. I was standing beside No. 2 RBS one day and Pridemore came in and he was just raising holy dickens. He said, 'Well, I made it about a year and a half ago and they just called it bad.' I said, 'You made it a year and a half ago?' He said, 'Yes, x-ray had already bought it and sent it to QC and QA and it was locked away in the vault.' Somewhere along the way they decided and when I say they, Duke Power management, technical support or somebody, decided to add a valve into this line. So, they make a cut and Cowboy, John Bryant, and if I am not mistaken, he was the inspector that looked up in there. Now, he may not have been the inspector, but that was the word that got to me. He looked up inside there and could see the weld that was maybe two feet down from him that had already x-rayed 100% good and saw a drop-through, saw unconsumed filler material and saw a bunch of things inside on the root pass that would have absolutely made it rejectable....And I said, 'Well, how is it possible that it x-rayed good to start with?' But, of course, I already had my own opinion. The X-Ray Department is not really doing their job out there, not reading the film accurately. Well, this

weld was in fact red-tagged by Cowboy or one of the inspectors, and Mike was charged with so many inches of bad weld on his record. That weld had to be redone.

Nunn, Tr. 174-75.

41 Sam Nunn explains that often in the course of his frequent duties as a repair welder cutting into previously made welds, looking for identified defects to repair, he would find serious, large rejectable defects "six inches away, or eight inches away from where they have called it," as indicated on the x-ray tracings. Nunn, Tr. 173. Nunn also found that after repairing the originally identified defects, new defects would be identified by x-ray on previously accepted portions of the weld.

But then I go ahead and dig this area out that I find is bad and reweld it and it comes back the next time that it is good and then all of a sudden up there on the top corner that had been called good the first time, now suddenly there is a one-inch defect....this leaves me to wonder how many were good that were called bad, but more importantly, how many were bad that had been called good.

Id.

42 Mr. Nunn's experience as a repair welder "chasing ghosts", Nunn, Tr. 253, as he called the problematic task of identifying and correcting deficiencies which x-rayed acceptable initially, but showed up as flaws on subsequent shots, raises serious concerns in our mind as to the effectiveness of radiography to perform the critical verification function assigned to it by Applicants in their overall Quality Assurance program. Applicants do not seriously question Mr. Nunn's truthfulness or the veracity of his testimony as to the inaccuracy of radiography in identifying and locating rejectable welding defects. They

suggest, however, that the locational errors described by Mr. Nunn are likely explained by his misalignment of the plastic tracer made from the x-ray film and employed by the repair welder to locate the defects identified by the radiographic film reader. Cavender, Barnes and Llewellyn, Pre-filed testimony pp. 6-7. They further suggest that it is Mr. Nunn's lack of experience which explains his difficulty in locating defects, pointing to Nunn's testimony at Tr. 915 and 936. We can only conclude, however, that if an experienced welder assigned the responsibilities of repairing critical safety grade pipe welds, as was Mr. Nunn, is having these difficulties - for whatever reason - in utilizing x-ray inspection results to correct weld defects, the implications for the quality of construction at Catawba remains serious. However, we find Duke's explanations, which assume Mr. Nunn's lack of qualifications, unpersuasive in light of his obvious expertise unchallenged by Applicants. Frankly, we are unable to assign a clear explanation for this phenomenon identified by Mr. Nunn. Suffice it to say that our conviction as to the existence of these deficiencies in radiography adds further to our doubt as to the safety of construction of the Catawba facility.

43 The NRC Staff's inspection response to these allegations concerning inadequate radiography does little to assuage our serious doubts. Inexplicably, they conclude that the alleged pervasive lack of confidence in radiography could not be substantiated although most of the welders they interviewed confirmed instances where subsequent radiographic examination of

weld repairs showed indications not identified on the previous overlay. Staff Exh. 26 at p. 8. The Staff suggests that such inaccuracies could be attributed in part to "technique, angle of exposure, type of indication and its location/orientation." Such speculation does little to contribute to identifying the root cause of this apparent problem, and only leaves us to wonder why the Staff has not more seriously pursued a solution. Id.

44 Most troubling, is the significance of these conclusions in contributing to our further understanding of the pervasive quality assurance failures identified by the Catawba welding inspectors which we have considered in our principal Findings.

45 Time and again, there, we find radiography and Mr. Cavander, the Level III QC Inspector who is their primary authority in employing the RT technique, used not as additional checks on faulty workmanship to prevent its undetected use in a safety related application; but, instead, as a weapon to overrule the rejection decisions already made by welding inspectors to approve questionable workmanship. Viewed in this light, radiography at Catawba is not simply a tool of questionable accuracy, but it is a means of abusing the Quality Assurance Program at Catawba.

46 The same welding inspector identified by Mr. Nunn as most likely involved in the Pridemore incident, John "Cowboy" Bryant, identifies in his technical concerns a number of instances where radiography has been used as a weapon against welding inspectors who have rejected questionable work and where Mr. Cavender, the Level III Inspector, was used to override inspector decisions. In John Bryant's Technical Concern File no. D-15 (Also, Welding

Inspector Supervisor Beau Ross' Concern R-62), Cavender concluded that a visible crack identified running through a weld and into the piping base material was instead a "handling mark." Efforts to chase the gouge confirmed the existence of a sub-surface crack requiring that the piece of pipe be scrapped. See, Findings 329 through 341. Cavender played a similar role in evaluating as acceptable Bryant's Technical Concern File NO. D-22. Findings 367 through 371.

47 Welding Inspector John Bryant's Technical Concern File No. D-27 reflects a specific instance where he visually identified a rejectable condition which was overruled by Cavender's interpretation of the x-ray of the weld. Bryant had identified a defective root condition on the next adjacent weld which became accessible after the first weld was cut out. According to Bryant's testimony, "two of the QA technical services people looked at this weld with me; and they both agreed that it was unacceptable." Bryant, Tr. 6143. Each inspection technique, visual and NDE, including radiography, has its own acceptance criteria and inspection procedures. It is highly improper to employ radiography, as here, to overrule the inspection results produced by the visual technique. See, Findings Nos. 399 through 404.

48 Finally, in Technical Concern File No. D-30, Bryant identifies a rejectable violation of minimum wall thickness standards caused by excessive remote grinding of the root side of a pipe weld. Although the weld repair passed a radiographic inspection, subsequent ultrasonic (UT) examination confirmed

Bryant's visual inspection results. See, Findings 405 through 414. We conclude that significant doubt exists as to the adequacy of radiography to accurately identify rejectable weld defects, as well as potential abuse of radiography as a tool to improperly support acceptance of nonconforming workmanship.

NOTE

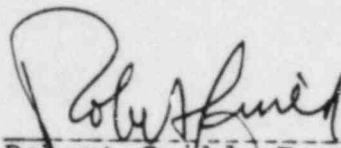
The following section of these proposed findings on the subject of "Honeycombing" in concrete contains material presented in camera and subject to Protective Order. This portion is being deleted from the copies of this document in general circulation.

CONCLUSION

54 Based on the evidence presented by the in camera witnesses, much of which is now on the public record, and in light of the responses by the Applicants and the NRC Staff, we confirm the conclusions reached in our principal findings: that pervasive failures exist in Applicants' Quality Assurance program at the Catawba Nuclear Station such that we are unable to conclude that reasonable assurance exists that the facility can be operated without endangering the public health and safety.

55 This evidence of quality assurance failures as seen through the "window" of the issues raised by these Board Witnesses buttress our decision to deny Applicants' requested operating licenses for the Catawba Nuclear Station, Units 1 and 2.

Respectfully Submitted,



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March 7, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
DUKE POWER COMPANY, <u>et al.</u>)	Docket Nos. 50-413
)	50-414
(Catawba Nuclear Station,)	
Units 1 and 2))	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Supplement to Palmetto Alliance Proposed Findings of Fact in the Form of Partial Initial Decision" in the above captioned matter has been served upon the following by deposit in the United States mail this 6th day of March, 1984.

<p>* James L. Kelley, Chairman Atomic Safety and Licensing ** Board Panel U. S. Nuclear Regulatory Commission Washington, D.C. 20555</p> <p>* Dr. Paul W. Purdom 235 Columbia Drive ** Decatur, Georgia 30030</p> <p>* Dr. Richard F. Foster P. O. Box 4263 ** Sunriver, Oregon 97702</p> <p>Chairman Atomic Safety and Licensing Board Panel U. S. Nuclear Regulatory Commission Washington, D.C. 20555</p>	<p>* George E. Johnson, Esq. ** Office of the Executive Legal Director U. S. Nuclear Regulatory Commission Washington, D.C. 20555</p> <p>* Albert V. Carr, Jr., Esq. Duke Power Company P. O. Box 33189 Charlotte, North Carolina 28242</p> <p>* Richard P. Wilson, Esq. ** Assistant Attorney General State of South Carolina P. O. Box 11549 Columbia, South Carolina 29211</p> <p>Chairman Atomic Safety and Licensing Appeal Board U. S. Nuclear Regulatory Commission Washington, D.C. 20555</p>
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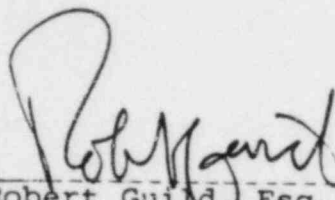
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** Due to confidentiality, only these parties were served with a portion dealing with the in camera witness no. 3.