

# CERTIFIED

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3/1/79 MINUTES OF THE ACRS SUBCOMMITTEE MEETING ON BAILLY GENERATING STATION, NUCLEAR 1  
PORTAGE, IN  
JULY 9, 1979

ACRS-1655

The Bailly Generating Station, Nuclear 1 Subcommittee met on July 9, 1979, at the Portage Holiday Inn, 6200 Melton Road, Portage, Indiana. The main purpose of the meeting was to acquire technical information from the NRC Staff and the Permittee (Northern Indiana Public Service Company) regarding the Permittee's proposed piling program.

Notice of the meeting was published in the Federal Register on June 22, 1979. Copies of the notice, meeting participants, and schedule are included as Attachment 1, 2, and 3, respectively. A complete set of handouts and viewgraphs is kept in the ACRS Office, while a listing of these is included as Attachment 4. Requests were made by five members of the public to make oral statements, and four of these also presented their statements in writing (see Attachment 4).

#### EXECUTIVE SESSION (2:00 pm - 2:05 pm)

Dr. Lawroski, Subcommittee Chairman, convened the meeting at 2:00 pm, introduced the ACRS members and consultants who were present; indicated that R. Muller is the Designated Federal Employee; and that the meeting would be conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act. This meeting was held in response to a request from the Commission, dated June 8, 1979, requesting the Committee to review any resultant design change and safety aspects of shorter pilings.

The notice of the meeting indicated that members of the public may present only technical information, related to the design and function of the piles. He noted the presence of Mr. Rick Harris of U.S. Congressman Fithian's staff.

#### ACRS CONSULTANT REPORTS (2:05 pm - 2:10 pm)

(A site visit, not part of the Subcommittee or full Committee meeting, was conducted by NIPSCO for the two consultants before this meeting. NIPSCO also invited about 30 people of the press to this site visit. R. Muller and P. Tam of the ACRS Staff accompanied the two consultants.)

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Both Drs. Richart and Scott stated it was too early to make a report but that their concerns, if any, would emerge as the meeting progressed.

MEETING WITH NRC STAFF AND NIPSCO REPRESENTATIVES (2:10 pm - 4:15 pm)

Mr. M. D. Lynch

M. D. Lynch, NRC Licensing Project Manager for Bailly, stated that NIPSCO submitted a proposal (March 1978) to use shorter piles instead of using ones that would go all the way to bedrock. The Staff has not completed review of this proposal. He then gave a brief description of the licensing history of Bailly:

The Bailly application was submitted to the AEC in the summer of 1970, and a Staff Safety Evaluation Report (SER) was issued in February of 1972. It was recognized in the Preliminary Safety Analysis Report (PSAR) that the sand and compressible clay at the site were not suitable for foundation material. NIPSCO had proposed that foundation piles would be used to eliminate the problem of differential settlement. The piles would go to till, or to bedrock, depending on the outcome of post-CP tests. According to regulations at that time, the Applicant was not permitted to perform significant pre-CP construction activities. The Staff was aware of this requirement and thus stated in its SER two criteria namely, that the piles be "non-displacement" and "high capacity". In the hearings in 1972 and 1973, the Applicant stated that the final design of the piling would be established after construction activities began. A CP was issued in May, 1974. In December, 1976, NIPSCO indicated that they intended to jet their piles; but after the Staff observed the jetting of one, it stopped NIPSCO from any further such activities in favor of more conventional methods. In March, 1978, the Licensee submitted the proposal to use shorter piles. An indicator pile program was initiated and a total of three reports were submitted. Staff review of these reports is continuing.

Mr. R. Bohn

Mr. R. Bohn, Manager of the Nuclear Staff for NIPSCO, noted that five different pile types were mentioned in the PSAR but NIPSCO did not commit to any type, except to "principal architectural and engineering design criteria". These are: "Class I structures will be supported on pile foundations bearing on competent material," and "piles will resist downward, uplift, and lateral loads for all conditions of static and dynamic loading". Two coal-fired units (Units 7 and 8) on the same site are supported on concrete mats without piles. The maximum settlement observed is two inches. The nuclear unit would require pilings since its floor loading would be much greater than for the coal-fired units, and the seismic design is more rigid.

Mr. Bohn indicated that original attempts to drive piles through the surface layers were frustrated because of the very dense glacial lacustrine deposits. Several different methods were tried and it was decided that the most efficient method was to use a vibrating hammer in conjunction with a high-pressure jet of water to puncture through these dense materials and get down to the glacial till. However, after the Staff had observed the operation, they stopped it on grounds that jetting may damage the soil around the piles and render the piles unsatisfactory, including being potentially unstable during a seismic event. Subsequently, NIPSCO proposed to bed the piles in these very dense glacial lacustrine deposits instead of punching through them. An extensive indicator pile program was performed which showed that piles founded in the glacial lacustrine deposits would satisfy the engineering and architectural design criteria with an adequate factor of safety.

Dr. Scott asked if any settlement estimate was done for the reactor buildings if no piles are used. Mr. Kiefer replied that they never finalized any estimates; further, a nuclear reactor building would exert up to 10,000 psi pressure on the ground, compared to 3,000 psi by fossil fuel plants. Settlement characteristics between the two would be quite different.

Dr. Kerr asked why the Staff did not approve or disapprove NIPSCO's proposal to use jetting. Mr. Lynch said that the Staff, at the CP stage of licensing

a plant, addresses only the technical feasibility of a proposal. At the OL stage, the Staff would review the application in greater details. Therefore, the Staff merely "acquiesced" in the jetting proposal, but did disapprove it as more details were available.

Dr. Lawroski asked if Mr. Lynch was aware of other nuclear plants which used short pilings. Mr. Lynch said that he knew of only Fort Calhoun.

Mr. M. Kiefer

Mr. Kiefer of Dames and Moore described the soil structure of the site, indicating that the interbedded layer (of very dense sand and hard clay) would be the structure which would support the piles. This layer is on the order of 60 to 70 feet in thickness. Piles will be driven to this layer and 5-20 feet into it to some specified resistance. The tops of the piles will be tied together by a heavily reinforced concrete mat, ranging in thickness from 5 to 12 feet. The piles will be embedded three feet into the mat. In addition, very stiff shear walls would exist to dictate that the structures and their foundation will act as a rigid system. This will enable the structures to settle uniformly. Dr. Richart asked about the induced stresses as a result of forced uniform settling. A. K. Singh of Sargent and Lundy replied that in their design, they have recognized the fact that the structure would redistribute some of its loads due to settling.

Pile load tests were performed on test piles and the ultimate capacities ranged from 490 to 600 tons, indicating that large margins of safety are provided.

A series of studies were also performed to evaluate foundation behavior in terms of lateral and uplift loads induced by the design basis earthquake. It was found that the bending moment dissipates within the top 20 feet of the piles. Group lateral deflection would be less than 0.4 inch and is considered tolerable. Mr. Kieffer concluded that short piles may be installed by commonly-used techniques without jetting, and that piles seated in the interbedded deposits afford a large margin of safety under static and dynamic conditions.

Dr. Richart asked for details of the new load test procedure. Mr. Paulson of Sargent and Lundy described it as being in general accordance with ASTM D-1143. During the test, ten-ton loads are added to a pile at 2 1/2-minute intervals until a total of 400 tons is reached. The 400 tons will remain on the pile for 24 hours and load deflection measurements for this period will be taken. Then additional 10-ton increments will be added at 2 1/2-minute intervals until 600 tons is reached or until pile failure. The Staff, however, has not completed review of this procedure.

Mr. D. Koutsoftas

Mr. Koutsoftas of Dames and Moore addressed the "soft spots" densification program. "Soft spots" were made as a result of jetting activities and, to a lesser extent, extraction of test piles. The nature of these spots vary with depth: in the cohesionless (sand) layers, the material has been loosened, whereas in the interbedded layer, the disturbance is simply a hole left by pile extraction. The Licensee has proposed to densify these spots by driving 10 3/4-inch diameter closed-end pipes into the soil, spaced 3 - 3 1/2 ft. apart. These densification piles will be driven to penetrate below the depth influenced by preconstruction activities and to a resistance of 25 blows/inch. Secondary and even tertiary densification piles will be driven to resistances of 10 blows/inch. The program is intended to be flexible and the quantity of densification piles required for each "soft spot" will be determined as the operation proceeds.

Dr. Siess was concerned that the densification piles may not go deep enough and that production piles may be bedded in undensified material. Mr. Koutsoftas replied that load tests and borings may be performed to check the load capacities and locations of these piles.

Mr. Lynch summarized for the NRC Staff. He stated that the "soft spots" issue, and efforts to densify them, are major concerns. The Staff is still reviewing the factors of safety, the corrosion report, uplift of piles and tolerances on placement of piles.

STATEMENTS BY THE PUBLIC (4:15 pm - 4:40 pm)

A total of four members of the public requested, prior to the meeting, to make oral presentations. All four have also submitted written statements and these are kept in the ACRS Office files.

Mr. H. P. Read

Mr. Read is an architect by training and profession and was speaking as an interested citizen with design and construction experience and familiarity with the Bailly licensing history. He said that a "safe" structure is "safe" only as long as the assumptions made hold true. He noted the wide difference between theory and reality, and has himself experienced the results of the difficulty of soils analysts to accurately predict strata behavior, particularly the potential for liquefaction. He believed that during the licensing and intervention stage of Bailly, NIPSCO and the Atomic Safety and Licensing Board both made the representation that the piles would go all the way to bedrock. Construction began with the intention to drive piles to bedrock but the intention was changed after difficulty in pile driving was encountered.

He stated that during the intervention, while discussing seismicity contentions, the NRC Staff witness said that his review extended only to the integrity of the reactor building itself without spending effort to investigate differential movement between buildings and between a building and the piping which penetrates its foundations. There is thus a lack of analysis on the system as a whole for differential movements among buildings and structures. During an earthquake, for example, differential movement between the reactor building and the cooling tower may result in breakage of the cooling water piping.

The strata at the Bailly site is complex, as test borings show. Such complexity is exemplified by the variation in thickness by some 70 ft. of the lacustrine sand/clay deposit. Thus, according to Appendix A of 10 CFR Part 100, which provides that "Additional investigations and/or more conservative determinations ... may be required for sites located in areas having complex geology or in areas of high seismicity", the Subcommittee should recommend that the NRC require additional investigation and more conservatism in foundation design.

On seismicity of the region, he claimed that evidence of faults could easily be hidden by the sand, and that current mapping of faults ends at the water line. One is not sure of the distance between Bailly and a fault line. Thus, the distances assumed in the Operating Basis Earthquake analysis is of questionable validity.

He showed concern about the truthfulness of the information supplied by NIPSCO and the lack of diligence of the NRC Staff to verify Applicant-supplied information. He illustrated his opinion by stating that neither the Staff nor the Applicant could, in the evidentiary hearing, point out how population distribution around the site was determined and the population data was totally "fictitious." (Note: In a subsequent phone conversation with the Staff site analyst, E. Markee, on this allegation, I found that the licensee's population figures were obtained from the Bureau of Census. W. Nischan, currently retired from the Staff, did verify that the licensee's figures are in substantial agreement with the Bureau of Census data. P. Tam)

Mr. T. Weinberg, Co-Chairperson of Bailly Alliance

Mr. Weinberg acknowledged that he based his views on common sense. He pointed out that the Bethlehem Steel Plant next door has "terrible settling problems" and claimed that Bailly would have the same problems. His major concern was settling of the plant causing stress and rupture in pipes carrying water to and from the cooling tower. He and his Alliance wanted an evidentiary hearing on this matters.

Mr. G. Wilson, Local 6787

Mr. Wilson's Local represents 5800 production and maintenance workers at Bethlehem Steel's Burns Harbor Plant. Most of the steel plant lies within the LPZ of Bailly, and a number of buildings and structures have suffered settlement problems. (Note: Mr. Wilson claimed that these are on short pilings but D. Lynch, NRC Project Manager, has checked with Bethlehem Steel and concluded that these are actually built on spread footings over sand compacted to 75%.) Mr. Wilson was also concerned about emergency evacuation of the area resulting in loss of all employees of the steel plant, leading to severe physical damage to the plant. (Note: Emergency

Planning relating to Bethlehem Steel has been discussed by the Committee in its 147th meeting, July 13 and 14, 1972).

Mr. Olszanski, Local 1010

Mr. Olszanski spoke for his Local and District 31, Chicago and Northwest Indiana District of Steel workers. He expressed concern about evacuation as Mr. Wilson did, and indicated a general distrust of engineers. He wanted an evidentiary hearing to cross-examine the Licensee on his proposal, but admitted that he did not understand the technical matters presented.

Mr. T. Esgate

Dr. Lawroski asked if anyone else in the public would like to be heard. Mr. Esgate thus stated that NIPSCO has undermined the Bailly foundation by jetting, and that such should be cause for a new hearing.

EXECUTIVE SESSION (4:40 pm - 4:50 pm)

Dr. Richart showed continued concern for the "soft spots", especially the identification of their extent and characteristics. Dr. Siess asked the Staff to address the nature of the foundation at the steel plant and settlement problems in the full Committee meeting. Dr. Lawroski emphasized that the Staff and NIPSCO address the subject of soil softening and corrective measures.

Whereupon, at 4:55 pm, the Subcommittee meeting was adjourned.

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NOTE: A transcript of portions of the meeting is on file at the NRC Public Document Room at 1717 H Street, NW, Washington, DC or can be obtained from Ace-Federal Reporters, Inc., 444 North Capitol Street, Washington, DC 20001 (202-347-3700).