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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF GENERAL COUNSEL
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Before the Atomic Safety and Licensing Appeal Board

In the Matter of)

THE CLEVELAND ELECTRIC)
ILLUMINATING COMPANY, ET AL.)

Docket Nos. 50-440 *OL*
50-441

(Perry Nuclear Power Plant,)
Units 1 and 2))

APPLICANTS' ANSWER TO OCRE MOTION TO
REOPEN THE RECORD AND TO SUBMIT A NEW CONTENTION

Shaw, Pittman, Potts & Trowbridge

Jay E. Silberg, P.C.
Harry H. Glasspiegel
Paul M. Bangser

Counsel for Applicants

1800 M Street, N.W.
Washington, D.C. 20036
(202) 822-1000

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PDR ADOCK 05000440
G PDR

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I. INTRODUCTION

By motion dated February 3, 1986, Intervenor Ohio Citizens for Responsible Energy ("OCRE") asks the Appeal Board to reopen the record in this proceeding to admit the following late-filed contention:

Applicants have not demonstrated that the seismic design of the Perry Nuclear Plant is adequate in light of observed local seismicity.

Motion To Reopen The Record And To Submit A New Contention (February 3, 1986) ("Motion") at 1. OCRE seeks admission of this new contention based on an earthquake that occurred on January 31, 1986, in the vicinity of the Perry Nuclear Power Plant. Citing "only preliminary information," and "news accounts" from the day after the earthquake (see Motion at 1-2,

Attachment), OCRE asserts: (1) "preliminary information . . . strongly indicates that, at a minimum, the FSAR analysis of site area seismicity needs to be redone" (Motion at 1); and (2) the SSE [Safe Shutdown Earthquake]^{1/} and OBE [Operating Basis Earthquake]^{2/} should be more severe than presently postulated, and the seismic capability of safety-related structures, systems, and components at Perry should be upgraded accordingly" (Motion at 2).

For the reasons set forth below, OCRE's motion is without basis and should be denied.

^{1/} An SSE is the seismic event "which produces the maximum vibratory ground motion for which certain structures, systems, and components are designed to remain functional," i.e., those structures, systems, and components necessary to assure the integrity of the reactor coolant pressure boundary, to bring the plant to a safe shutdown condition, and to prevent or mitigate accidents that could result in excessive offsite radiation exposures. See "Seismic and Geologic Siting Criteria for Nuclear Power Plants," 10 C.F.R. Part 100, App. A., §§ III(c), V(a)(1).

^{2/} An OBE is "that earthquake which, considering the regional and local geology and seismology and specific characteristics of local subsurface material, could reasonably be expected to affect the plant site during a plant's operating lifetime." Nuclear facilities must be designed and built to function through the OBE without creating undue risk to the public health and safety. See id. at §§ III(d), V(a)(2).

II. ARGUMENT

A. The Standards for Reopening the Record To Admit Late-Filed Contentions Impose A Heavy Burden on OCRE

The Commission has very recently restated the standards that apply to motions such as OCRE's:

The standards for reopening a closed record require consideration of three factors: (1) whether the motion to reopen is timely; (2) whether the information raises a significant safety (or environmental) concern; and (3) whether the information might have led the Licensing Board to reach a different result.

Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3), CLI-86-1, 23 N.R.C. ____, slip op. at 3 (January 30, 1986). "The burden of satisfying the reopening requirements is a heavy one." Id. at 3 (citing Kansas Gas and Electric Co. (Wolf Creek Generating Station, Unit No. 1), ALAB-462, 7 N.R.C. 320, 328 (1978) and Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), ALAB-359, 4 N.R.C. 619, 620-21 (1976)).

As reaffirmed by the Commission: "[B]are allegations or simple submission of new contentions' are not enough to meet these standards." Waterford, CLI-86-1, slip op. at 4 (quoting Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-81-5, 13 N.R.C. 361, 363 (1981)).

"At a minimum . . . the new material in support of a motion to reopen must be set forth with a degree of particularity in excess of the basis and specificity requirements contained in 10 C.F.R. 2.714(b) for admissible contentions. Such supporting information must be more than mere

allegations; it must be tantamount to evidence . . . [and] possess the attributes set forth in 10 C.F.R. 2.743(c) defining admissible evidence for adjudicatory proceedings. Specifically, the new evidence supporting the motion must be 'relevant, material, and reliable.'"

Waterford CLI-86-1, slip op. at 4 (quoting Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-775, 19 N.R.C. 1361, 1366-67, aff'd sub nom. San Luis Obispo Mothers for Peace v. NRC, 751 F.2d 1287 (D.C. Cir. 1984), vacated in part and reh'g en banc granted on other grounds, 760 F.2d 1320 (1985) (footnote omitted)). Accordingly, the burden is on the movant to establish prior to reopening that the standards for reopening are met, and "it is not enough merely to express a willingness to provide unspecified, additional information . . . at some unknown date in the future." Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), CLI-85-7, 21 N.R.C. 1104, 1106 (1985) (quoting Louisiana Power & Light Co. (Waterford Steam Electric Station, Unit 3), ALAB-753, 18 N.R.C. 1321, 1324 (1983)).

In addition to meeting these standards, OCRE's motion to reopen, which raises a previously uncontested issue, must also satisfy the Commission's standards for admission of late-filed contentions, set forth in 10 C.F.R. § 2.714(a)(1). Waterford, CLI-86-1, slip op. at 6 n.3.

For the reasons stated below, OCRE's motion fails to satisfy either the standards applicable to motions to reopen

closed records, or the standards that govern motions for late-filed contentions.

B. Although Timely, OCRE's Contention Fails to Raise a Significant Safety Concern

OCRE's motion, which is based on the January 31, 1986 Ohio earthquake, was filed shortly after the earthquake occurred. Thus, Applicants do not contest the timeliness of the motion. The most important factor to consider, however, is whether a motion to reopen raises a significant safety issue. Philadelphia Electric Co. (Limerick Generating Station, Units 1 and 2), ALAB-828, 23 N.R.C. ____, slip op. at 6 (January 16, 1986). Even a cursory reading of the Motion is enough to show that OCRE has not met its responsibility to demonstrate a significant safety issue, nor has it put forth "supporting information . . . tantamount to evidence,"^{3/} as are required of a proponent of a motion to reopen. Indeed, the only information OCRE offers to support its assertions regarding the earthquake and its impact on the Perry Plant is a newspaper story, containing admittedly "preliminary information," printed the day after the earthquake. Motion at 1-2, Attachment. The Commission has recently stressed that "hearsay based on a newspaper article does not constitute the kind of evidence that can

^{3/} See supra pp. 3-4 (CLI-86-1 quoting ALAB-775).

support a reopening motion." Waterford, CLI-86-1, slip op. at 5 n.2.

In contrast to OCRE's failure to supply any substantial supporting information, Applicants attach to this Answer the affidavits of six experts^{4/} who have conducted thorough reviews and analyses of the earthquake and its impact on the Perry Plant structures and design. As discussed below, the affidavits demonstrate conclusively that the earthquake: (1) did not adversely affect the plant structures, systems or components; (2) was within the design capability of the Perry Plant; and (3) does not change the conclusions regarding the Perry site geology, seismology or seismic design. Thus, in contrast to OCRE's unsworn, unauthoritative "preliminary information," Applicants have put forth probative, reliable, sworn statements of its General Supervisor of Operations and of recognized seismological, geological, instrumentation, and civil/structural experts to show the absence of any safety concern -- let alone significant safety concern -- that might justify the reopening of the Perry record.

^{4/} See Affidavit of Robert A. Stratman ("Stratman") (Attachment 1); Affidavit of Richard J. Holt ("Holt") (Attachment 2); Affidavit of Paul D. Engdahl ("Engdahl") (Attachment 3); Affidavit of Kalman Lee Benuska ("Benuska") (Attachment 4); Affidavit of Dr. Chang Chen ("Chen") (Attachment 5); Affidavit of Dr. John D. Stevenson ("Stevenson") (Attachment 6).

Stratman Affidavit

The attached Affidavit of Robert A. Stratman^{5/} describes the results of detailed walkdowns and inspections of the Perry Plant after the earthquake. Prior to the earthquake, a significant number of safety and non-safety systems were in operation. Numerous other systems were energized and in the standby mode. All of the operating safety-related systems continued to operate through the event. None of the safety-related systems in the standby mode experienced any spurious initiations. Id., ¶¶ 4-5.^{6/}

A large number of non-safety systems were operating or in the standby mode at the time of the earthquake, and maintained their status throughout the event. Two non-safety items, the Unit 1 instrument air compressor and the auxiliary steam boiler, tripped on protective signals as intended by their

^{5/} Mr. Stratman is General Supervisor, Operations Section, Perry Plant Operations Department, for The Cleveland Electric Illuminating Co. ("CEI"). He is responsible for the supervision of the operation of Perry Unit 1. As part of the recovery organization established by CEI following the January 31, 1986 earthquake, Mr. Stratman was responsible for determining the plant status and whether plant structures and components had suffered damage. Stratman, ¶¶1-2, Exhibit A.

^{6/} There was a 1-1/2 inch increase in suppression pool level indicated by the water level transmitters at the time of the earthquake. However, an investigation found that this was due to the discharge of air that had become trapped prior to the earthquake in the sensing lines serving the transmitters. Appropriate corrective measures will be taken to prevent air from being trapped in the future. Id., ¶ 8.

design.^{7/}

Immediately following the earthquake, the plant operators performed initial surveys of the plant, including the Transformer Yard, lower elevations of the Turbine Auxiliary, Intermediate and Radwaste Buildings, as well as the Control Complex, Turbine Power Complex, Heater Bay, Water Treatment Building, and all levels of the Reactor Building. No major damage was reported. Mr. Stratman and the Senior Operations Coordinator also surveyed below grade areas and found no unusual or abnormal conditions. Plant maintenance personnel performed additional walkdowns. Id., ¶9.

As part of CEI's response to the earthquake, a team of approximately 65 engineers and technicians was organized on the evening of January 31 to perform systematic walkdowns of all plant areas. All unusual or abnormal conditions, regardless of potential cause, were documented. None of the observations involved structural damage to the plant or equipment. The observations documented were typified by minor hairline cracks in concrete, burned out light bulbs and leaking valve or piping flanges, all of which are normal and expected conditions that would be identified in a comprehensive walkdown without the occurrence of a seismic event. Id., ¶¶ 10-11.

^{7/} Although the Unit 1 non-safety main and auxiliary transformers also tripped, this was due to the fact that the generator protection relays for the transformers were not connected to voltage at the time of the earthquake. Id., ¶ 7.

The engineering evaluation of the walkdown items concluded that only two minor items could be directly attributable to the earthquake. 77% of the items were determined to be preexisting conditions; the remaining items could not be definitively established as preexisting the earthquake. Rework and repair of all conditions will be processed in accordance with a special procedure instituted in response to the earthquake. Id., ¶ 11.

A number of other inspections were also performed to determine the earthquake's effect, if any, on specific plant structures and conditions. Surveys were conducted of the site environs, and of settlement monitoring points. The surveys found no impact from the earthquake. Id., ¶¶ 12-13. A walkdown of the Unit 1 Cooling Tower found no structural damage. Id., ¶14. A review of seismic clearance violations which had not yet been corrected found neither damage nor dimensional change. Id., ¶15. Finally, an engineering study was undertaken of sensitive electrical components (motors, transformers, relays, switchgear breakers, switches, batteries, contacts, valve operators, chargers/inverters, meters, recorders, and transmitters). The study showed that over 47,000 electrical components were energized and experienced no adverse effects in terms of spurious system actuation. Id., ¶ 16.

On February 2, 1986, the Division II diesel generator response time test that was in preparation at the time of the earthquake was performed. The Division II diesel operated

properly and the many pieces of equipment powered by the diesel operated as designed. Id., ¶18, Table 1.

Mr. Stratman concluded from all of these evaluations, inspections, and tests, that the Perry plant structures and equipment were essentially unaffected by the January 31, 1986 earthquake, and that the plant's seismic design was adequate to handle the January 31 earthquake. Id., ¶18.

Holt Affidavit

The attached Affidavit of Richard J. Holt^{8/} discusses the geological and seismological studies that formed the basis of the Perry Final Safety Analysis Report ("FSAR"). The affidavit then describes the results of geological and seismological investigations of the January 31, 1986 earthquake performed by Weston, and their impact on prior geological and seismological conclusions as reflected in the FSAR. Id. ¶ 3. The Holt Affidavit demonstrates that the earthquake does not change the conclusions in the FSAR on the geology and seismology of the Perry site, contrary to OCRE's unsupported assertions at pages 1-2 of the Motion. Id., ¶ 32.

^{8/} Mr. Holt is founder and President of Weston Geophysical Corporation ("Weston"). Weston performs seismic analysis and ground motion studies for major engineered facilities including nuclear plants. Over the past 30 years, Weston has performed geophysical and seismological evaluations for over 40 nuclear plants including Perry. See Holt, ¶¶ 1,2; Exhibit A.

Mr. Holt summarizes in his affidavit the basic geology and tectonics of the Perry region, as described in the PSAR and FSAR. In conjunction with the PSAR and FSAR preparation and reviews, Weston and Gilbert Associates (the project Architect/Engineer) conducted intensive geological and geotechnical investigations at the Perry site. Id., ¶ 11. Two bedrock structural styles were observed involving non-tectonic features associated with glaciated terrain. Id., ¶¶ 4,12.

Specific studies were performed to define the geometry of faults occurring in the intake and discharge tunnels to the north of the Perry Plant beneath Lake Erie. PSAR/FSAR conclusions reached from detailed mapping of the tunnel faults, geophysical surveys, borings, and analysis of fault gorge and seepage included, among other things, that geologic processes responsible for initiation and latest motion are nontectonic and no longer operative. Holt, ¶¶ 13-14.

Based on these studies and following Appendix A of 10 C.F.R. Part 100, Weston determined at the time of the FSAR that no correlation of earthquakes to a particular fault or series of faults which would be designated as "capable" could be made. In addition, no "large scale dislocation or distortion" of the earth's crust designated as a "tectonic structure" could be identified to which earthquakes could be correlated. Consequently, earthquakes were identified with a "tectonic province," representative of a region within which there is a

relative consistency of geologic structural features. Holt ¶ 15; see 10 C.F.R. Part 100, Part A, §§ III(g)-(i), IV, V.

To select the SSE for the Perry site, Weston used a Modified Mercalli Intensity of VII, which was determined to be the maximum intensity earthquake consistent with the geology of the tectonic province. This intensity corresponds to an acceleration value of 0.15g, based upon a number of developed relationships which relate peak acceleration to earthquake intensity values. Weston then developed the response spectra representing the SSE by adopting an NRC Regulatory Guide 1.60 response spectral shape. See Holt, ¶ 16, Figures 4-5.

During the review of the FSAR, the NRC Staff requested that site-specific spectra be constructed for the Perry site. These were developed using a set of ground motion accelerograms from actual earthquakes of magnitude range $5.3 \pm .5$ recorded on rock (to simulate the foundation conditions at Perry) at epicentral distances of 0 to 25 kilometers. The site-specific response spectra fell within the Regulatory Guide 1.60 spectral shape set at a maximum ground acceleration of 0.15 g. See id. ¶¶17-18.

Mr. Holt's Affidavit compares the above PSAR/FSAR conclusions with data describing the January 31, 1986 Ohio earthquake. Based on information collected by the National Earthquake Information Center of the United States Geological Survey ("USGS"), the 1986 earthquake had a magnitude of 4.96 Mblg. Id., ¶ 19.

Immediately after the 1986 earthquake, Weston undertook a number of geological and seismological investigations at CEI's request to provide a thorough understanding of the earthquake, and to assess any impact on previous studies performed for the siting and licensing of Perry. Seismographs were installed at various locations in the epicenter area to provide information about the main shock and any "aftershocks." Five aftershocks, the largest of which had a magnitude of 2.4, have been recorded slightly to the west of the preliminary location of the main shock. See id., ¶¶ 21-22.

Weston has conducted written questionnaire surveys and personal interviews to evaluate the distribution of seismic effects. Preliminary results indicate that most of the perceptions in the epicentral areas of the earthquake are representative of an Intensity VI on the Modified Mercalli Scale. Id., ¶¶ 23-25. Weston geologists have conducted preliminary reconnaissance of bedrock exposures in the epicentral area, and observed no significant expression of surface disturbance. Id., ¶ 26. Examination of previously mapped fault locations revealed no evidence of recent fault movement and no slumping or sliding of the steep slope. Weston observed no evidence suggestive of a "capable fault." Id., ¶ 28.

Mr. Holt recognizes that the free-field design response spectra constructed to represent the SSE may have been exceeded, citing a peak acceleration reading at the foundation

level of Unit 1 of 0.18 g at approximately 20 Hz on the north-south component. However, Mr. Holt notes that the duration of the motion associated with this exceedance^{9/} was less than 0.1 second. He concludes that, since both the Regulatory Guide 1.60 ground motion and the site-specific spectra represent a smoothed spectra at the 84th percentile for a number of strong motion accelograms, exceedances above the smoothed spectra are not unexpected. Id., ¶ 29.10/ Further, at the high frequency end of the spectra, where the exceedance exists, it is important to look at the other parameters of ground motion. The particle velocity and displacement associated with the 0.18 acceleration at 20 Hz is far less than the 1 inch-per-second generally accepted by the U.S. Bureau of Mines as the threshold of damage for non-engineered structures at 20 Hz. Structural damage is therefore not a problem. Id., ¶ 30.

Mr. Holt further concludes, based on his detailed knowledge of the area and region, that the area and region in which the 1986 earthquake occurred is one of low seismicity, contrary to OCRE's unsupported assertions at pages 1-2 of the Motion. See id., ¶ 31.

9/ The word "exceedance," although not found in standard dictionaries, is a statistical term commonly used by seismology experts. See South Carolina Electric and Gas Co. (Virgil Summer Nuclear Station, Unit 1), LBP-82-55, 16 N.R.C. 225, 230 n.4 (1982), aff'd, ALAB-710, 17 N.R.C. 25 (1983).

10/ See § II.C below for a discussion of NRC adjudicatory decisions concerning exceedances.

Thus, Mr. Holt concludes, contrary to OCRE's Motion, that the 1986 earthquake does not change the conclusions in the FSAR on the geology and seismology of the Perry site. In particular: (1) the 1986 earthquake has not altered the basic understanding of the site and area geology contained in the FSAR; (2) there is no evidence suggestive of a "capable fault" as defined in 10 C.F.R. Part 100^{11/} and investigations have not revealed a cause for any geological concern; (3) there is no reason to alter the tectonic approach used to select the SSE for Perry; and (4) there is no evidence to support a change in either the SSE or OBE magnitude or intensity used in the Perry design. Id., ¶ 32.

Engdahl and Benuska Affidavits

Also attached are affidavits, and accompanying reports, of Paul D. Engdahl of Engdahl Enterprises^{12/}, and of Kalman Lee Benuska of Kinometrics, Inc.^{13/} Mr. Engdahl's Affidavit and

^{11/} 10 C.F.R. Part 100, App. A, § III(g).

^{12/} Mr. Engdahl is President of Engdahl Enterprises, which designs, develops, and manufactures seismic instruments used principally at nuclear power plants in the U.S. and abroad. Mr. Engdahl is the inventor of the Engdahl Peak Shock Recorder and Engdahl Peak Acceleration Recorder, which were installed and operational at Perry at the time of January 31 earthquake. See Engdahl, ¶¶ 2-3, Exhibit A.

^{13/} Mr. Benuska is an officer of Kinometrics, Inc. Mr. Benuska has over 16 years of experience in ground motion measurements, structural vibration measurements, data analysis and

(Continued Next Page)

accompanying report (Engdahl, Exhibit B) describe the Engdahl seismic instruments that were installed in the Perry Plant; the status of the instruments at the time of the event; the data recorded from the earthquake; and the subsequent reduction and evaluation of that data under Mr. Engdahl's supervision.

Similarly, Mr. Benuska's Affidavit and report (Benuska, Exhibit B) describe the Kinometrics instrumentation installed in the Perry Plant; their status at the time of the earthquake; and the data reduction and evaluation performed under Mr. Benuska's supervision. See Benuska, ¶ 5, Exhibit B.

The recorded data produced by Engdahl and Kinometrics, as described in the Engdahl and Benuska Affidavits, are discussed and evaluated in the Affidavits of Holt, Chen, and Stevenson,^{14/} as summarized herein.

Chen Affidavit

The Affidavit of Dr. Chang Chen^{15/} describes various

(Continued)

their interpretation. Kinometrics designs and manufactures instrumentation for seismology and earthquake engineering. A Kinometrics time history accelerograph, with two triaxial sensors, was installed and operational in the Perry Plant when the January 31 earthquake occurred. See Benuska, ¶¶ 1-4, Exhibit A.

^{14/} See Holt, ¶¶ 29-30; Chen, ¶¶ 15-38; Stevenson, ¶¶ 6-7, Exhibit B, §§ 2-4.

^{15/} Dr. Chen is Manager of the Civil/Structural Department and Chief Structural Engineer for Gilbert Commonwealth, Inc.

(Continued Next Page)

seismic design reviews and analyses performed by Gilbert in response to the January 31 earthquake. The Affidavit demonstrates the adequacy of the current Perry seismic design. See Chen, ¶¶ 5, 6, 37.

Dr. Chen's Affidavit first reviews the general methodology and definitions used for seismic design of nuclear power plants, as established in 10 C.F.R. Part 100, Appendix A, and NRC Regulatory Guide 1.60, including development of the SSE.^{16/} Chen, ¶ 7; see 10 C.F.R. Part 100, App. A, §§ III(c)-(d).

(Continued)

("Gilbert"), the Perry Architect-Engineer. Dr. Chen is responsible for civil/structural work on nuclear and fossil power plants designed by Gilbert, as well as nuclear power plant equipment seismic qualification on all Gilbert-designed nuclear plants. He has published numerous articles in the fields of nuclear plant civil/structural design and earthquake engineering. Dr. Chen has supervised the seismic analysis and design of the Perry Plant, including development of the Perry design response spectra, since Gilbert commenced the engineering for Perry in 1972.

^{16/} As explained by Dr. Chen, and as discussed supra, the SSE can be described by means of a response spectrum, which depicts the maximum acceleration, velocity or displacement response to an input excitation (here the SSE) at a specified damping value for single degree-of-freedom oscillators of varying natural frequencies. The high frequency end of a response spectrum indicates the "zero period acceleration" ("ZPA") associated with the event. Chen, ¶ 8.

In the design of any plant, it is difficult to predict the shape of postulated earthquake acceleration time-histories and associated ground response spectra. Appendix A of 10 C.F.R. Part 100 therefore requires an SSE to be developed by statistically combining the response spectra from multiple historical earthquakes. Reg. Guide 1.60 provides standardized response spectra that can be used in lieu of spectra developed for each site. Id., ¶¶ 9-10.

Dr. Chen's Affidavit describes how the Perry design response spectra were derived, and the conservatism included in the derivation of response spectra. Chen, ¶¶ 11-13. In addition to this conservatism, there are numerous other conservatisms in the overall design of the Perry structures, systems and components. Examples discussed by Dr. Chen include:

- (1) broadening the envelope of floor response spectra;
- (2) equipment qualification by test; (3) strain hardening not accounted for and static allowables used for dynamic load; (4) use of loading combinations; (5) use of primary versus secondary stresses; and (6) use of conservative damping values. Id., ¶ 14.

Dr. Chen compares acceleration time-histories induced by the January 31 earthquake with corresponding design acceleration time-histories, to demonstrate the low energy content of the January 31 earthquake. The January 31 earthquake was of much less magnitude than the earthquake for which Perry was designed (the SSE) and contained substantially lower total energy than the Perry SSE. Id., ¶ 21. Other comparisons of Reg. Guide 1.60 response spectra, and response spectra from the January 31 earthquake, indicate the low energy content of the January 31 earthquake. See id., ¶ 22.

Table 2 of the Chen Affidavit compares the structural response ZPA's of the recorded data with those of the SSE and OBE. The comparison shows that the recorded values of the 1986

earthquake vary from significantly below OBE values to 74% of SSE values, except at elevation 686 where the N-S and vertical acceleration components exceed SSE values. In addition, recorded response spectra accelerations show that the design response spectra accelerations in certain instances were exceeded at the high frequency end of the spectra. At lower frequencies (at or below approximately 14 Hz) the recorded accelerations are all well under the design values (see response spectra comparisons, Table 3, Figures 20-31). Id., ¶ 23.

The measurement of accelerations outside the predicted responses at the high frequency ends of certain response spectra has no engineering significance. This is explained by the interrelationships among the frequencies, accelerations, velocities, and displacements associated with a seismic event, as set forth in Dr. Chen's Affidavit. Despite some recorded exceedances at higher frequencies, corresponding velocities and small displacements (and resulting stresses) were nevertheless acceptably low. See id., ¶¶ 24-26, Table 4. The lack of structural or equipment damage from the January 31 earthquake (see Stratman Affidavit, discussed supra), is expected based on the low energy, short duration, and low velocities and small displacements of the event. See id., ¶¶ 27-28. These findings and conclusions are also consistent with Section 7.5 of IEEE 344 (employed at Perry), which recognizes that short duration/high frequency/low energy input motions will not cause significant stresses. Id., ¶ 29.

Further evaluations of recorded data at specific plant locations confirm the above conclusions. At all four instrument locations recording response spectra, SSE design spectra are well above the recorded spectra in the frequency range of 1 Hz to 14 Hz. Id., ¶ 30. At high frequencies, the design spectra are exceeded by recorded values in certain cases. However, corresponding displacements based on recorded data are extremely small, demonstrating that the stresses are insignificant despite acceleration exceedances. See id., ¶¶ 31, 34.

Dr. Chen addresses the arguments set forth in OCRE's Motion, based on reported acceleration values of 0.19 g to 0.25 g, as discussed in the newspaper story attached to the Motion. Id., ¶ 35. Dr. Chen explains that the news account was comparing two different types of measurements. When like quantities are compared, as shown in Table 2 of the Chen Affidavit, the recorded SRSS ZPA's are well within their design values. Thus, OCRE's citation to this matter is not a basis for calling the Perry seismic design into question. In any event, exceedances above the design basis response spectra which occurred in the January 31 earthquake are of no significance to the plant's seismic design for the reasons discussed above. Id., ¶ 35.

Finally, to confirm the design adequacy of the active equipment at Perry, equipment qualification data has been compared against recorded response spectra. The evaluation shows

that the original conservatism in the equipment qualification was more than adequate to accommodate the recorded event. Id., ¶ 36. Dr. Chen was involved with equipment margin studies for the V.C. Summer nuclear plant in 1982 with regard to high frequency content earthquakes. Those evaluations concluded that equipment margins in the high frequency region were sufficient. The average margin between seismic response spectra and qualification response spectra was a factor of approximately 2.5. Id., ¶ 36.

For all these reasons, Dr. Chen concludes that the 1986 Ohio earthquake was a low energy, high frequency, short duration, low velocity, and small displacement event, which had no adverse effects on the Perry structures, systems, or components. Therefore, no changes to the Perry seismic design are required. Chen, ¶ 38.

Stevenson Affidavit

Finally, Applicants submit the Affidavit, and accompanying report (Stevenson, Exhibit B), of Dr. John D. Stevenson.^{17/}

^{17/} Dr. Stevenson specializes in design and analysis for extreme loads associated with earthquakes and other phenomena resulting in high stress. Dr. Stevenson's firm has performed extreme load analysis for over 20 domestic and foreign nuclear power plants. Dr. Stevenson serves as Chairman of a committee and subcommittee of the American Society of Civil Engineers ("ASCE") which have responsibility for the development of ASCE codes and standards, including all ASCE nuclear standards. Dr. Stevenson has extensive experience with seismic design and analysis of nuclear safety class structures and equipment. Id., ¶¶ 1-4, Exhibit A.

Dr. Stevenson analyzed the data of the January 31 earthquake, performed a physical walkdown of the site, and interviewed plant technical and operating personnel. See id., ¶ 5, Exhibit B.

Dr. Stevenson addresses the fact that the recorded ZPA's in some cases exceeded the design basis ZPA's. However, if the appropriate adjustment is made to take into account the short duration and low energy of the seismic event, the average elastic response ZPA's are less than SSE ZPA's in all cases, and with one exception equal to or less than one-third of OBE design values (and approximately equal to OBE values in the remaining case). Dr. Stevenson concludes from this that the exceedances are not significant from an engineering standpoint. No damage to safety-related structures, systems and equipment would have been expected from the 1986 earthquake and none has been found. Therefore, in Dr. Stevenson's expert opinion, the 1986 earthquake does not call into question the adequacy of the seismic design of the Perry plant. See id., ¶ 7, Exhibit B.

For the reasons discussed in the affidavits of these six experts, the January 31 earthquake did not adversely affect the Perry plant structures, systems or components, and was within the design capability of the Perry Plant. Applicants' affidavits directly contradict OCRE's unsupported assertion that the earthquake calls into question the licensing basis of the plant. OCRE's assertions that the analysis of site area

seismicity needs to be redone, that the Perry OBE and SSE should be more severe, and that the seismic capability of Perry structures, systems and components should be upgraded (see Motion at 1-2) are wholly unsupportable. Thus, OCRE has failed to raise any safety issue, let alone a significant safety issue, justifying reopening of the record.

C. NRC Case Law Supports The Conclusion That High Frequency Exceedances Do Not Raise A Significant Safety Issue

Previous Appeal Board and ASLB decisions have recognized that short duration/high frequency/low energy earthquakes are of no engineering significance. In Commonwealth Edison Company (Byron Nuclear Power Station, Units 1 and 2), LBP-84-2, 19 N.R.C. 36, 250 (1984), the ASLB considered a short duration, high acceleration exceedance of the SSE at 14 Hz. The ASLB held:

near-field, high-frequency, short-duration earthquakes would not cause any damage to a nuclear power plant such as Byron, which is designed to resist the broad-band acceleration spectrum associated with the larger-energy earthquakes.

Id. at 250.

In Summer, LBP-82-55, the ASLB found that high frequency/short duration earthquakes would have little consequence to the plant structures:

More specifically, with regard to the spectral values of ground motion anticipated at Monticello, we see no likelihood of damage to the nuclear plant structures. To begin with, these structures have natural periods longer than those corresponding to the high frequencies discussed above, at 10 hertz or greater. The peak accelerations, which might occur as random high frequency spikes on the acceleration time history, do not represent a significant energy input to the structures. The response of the structures would be essentially the same whether or not the peaks occur. The high frequency spikes do not contain sufficient energy to overcome the inertia of large structures and the frequency of the spikes is well above the response frequency of the power plant structures, thus precluding resonant response. Staff examined the effect of the spectral exceedances in question on the safety related structures. It testified that these structures all have fundamental frequencies below 10 hertz, significantly removed from the peak high frequency motions characterized by the free-field response spectra. Because of this difference in frequency, the response of major structures of the high frequency motion will be low and less than the response spectra predicted by use of the SSE response spectra.

Id., 16 N.R.C. at 260 (emphasis added). The ASLB noted that the Staff had approved the Applicants' spectra for the design basis earthquake "with the recognition that short duration, high-frequency accelerations from small events could be higher." Id. at 252. At Perry, as in Summer, the design response spectra fully enveloped the recorded spectra at the lower frequencies. See Chen, ¶ 23.

Also supporting the proposition that high-frequency earthquakes generally will have little engineering significance is

Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), ALAB-422, 6 N.R.C. 33 (1977). The Appeal Board there noted the uncontradicted testimony of Dr. Nathan Newmark that the highest acceleration peaks are associated with the highest frequency ground waves, and that these high frequency waves have no significant effect on the large massive structures of a nuclear facility. Id. at 62-63. Similarly, in Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), ALAB-561, 10 N.R.C. 410 (1979) (Dissent of Mr. Farrar), Mr. Farrar noted that "the evidence seemingly left no room for doubt that the extremely high frequency waves which can cause the highest accelerations are of such short duration and low energy that they will have no real consequences." Id. at 432. See also Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-644, 13 N.R.C. 903, 942 (1981) (stating that "high acceleration spikes are not significant from the standpoint of building damage").

It has been noted that the Reg. Guide 1.60 spectrum was developed so that it could be applied to many sites in the United States, and that, consequently, it is overly conservative for most sites. Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), LBP-83-57, 18 N.R.C. 445, 507 (1983). The Reg. Guide 1.60 response spectrum, applied at Perry, was generated at a level equal to one standard deviation greater than the mean of the responses from the data set. This

provides an 84% level of statistical confidence that responses at any particular frequency will not be exceeded by any future SSE event. See Chen, ¶ 9. An exceedance of the design spectrum by a single real event such as the Ohio earthquake does not call into question the adequacy of the design spectrum. See Summer, LBP-82-55, 16 N.R.C. at 252 (Applicants' spectra for the design basis earthquake were approved by the NRC Staff "with the recognition that short duration, high-frequency accelerations from small events could be higher").^{18/} In Shoreham:

LILCO's witness testified that it would be overly conservative to envelop these time histories at any higher percentile of the data, and the Staff testified that it accepts spectra which are even less conservatively enveloped.^{19/}

In addition to the conservatism employed in developing the design response spectra at Perry (see Chen, ¶¶ 11-13), numerous other conservatisms were employed in the analysis and design of the Perry structures, systems, and components. Id.,

^{18/} Indeed, employing this method by definition means that certain exceedances of the design spectrum by the seismic response spectra used to generate it will exist. See Shoreham, LBP-83-57, 18 N.R.C. at 510. There, the ASLB found that the Shoreham site-specific spectrum was in compliance with the regulations and adequately conservative, "even though for five percent damping there are spikes at five frequencies where the earthquakes used to develop the Shoreham SSE spectrum exceed it." Id. at 509.

^{19/} The ASLB found LILCO's testimony to be credible, convincing and uncontroverted. Id. at 510.

¶ 14. It has been recognized that these other types of conservatisms provide additional design capacity, which further explains why the types of exceedances which occurred at Perry do not lead to concern about the adequacy of the seismic design. Thus, in Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-79-26, 10 N.R.C. 453 (1979), the ASLB noted:

The end result of the conservatisms employed in the analyses followed by the conservatisms resulting from standard design practices is a structure with a seismic capability well in excess of the established design goal. This is the reason that the record is replete with cases where well-engineered structures, even those for which no specific seismic design standard was invoked, have withstood major earthquakes while remaining fully functional.

Id., 10 N.R.C. at 498. See also Summer, LBP-82-55, 16 N.R.C. at 260-61 ("Since the Board has found that spectral exceedances due to the reservoir-induced events (both deep and shallow) fall in the range above the fundamental frequencies of the safety related structures, the conservatisms constitute additional reasons why the safety of the structures is beyond question.")

Dr. Chen has confirmed the ample margins of design capacity in the Perry equipment. Chen, ¶¶ 36,37. This is due in part to the vendors' practice of generically qualifying equipment for many sites, thus enveloping the highest SSE value. Chen, ¶ 36, Figures 38-39. The conservatisms inherent in

qualification of nuclear plant equipment was noted in Diablo Canyon, LBP-79-26, 10 N.R.C. at 498-99:

In order to assure fully representative testing with respect to both direction and characterization of vibratory input, a given piece of equipment is subjected to a large number of individual tests, any one of which often equals or exceeds the most likely vibration to be seen by the equipment in any actual earthquake In addition to the number of tests employed, the magnitude of tests, once again, due to the practicalities of designing test equipment to meet myriad test requirements, always exceeds that required (already conservatively defined by virtue of the structural analyses.)

In sum, previous ASLB and Appeal Board decisions have noted the lack of safety significance of high frequency/short duration/low energy earthquakes at nuclear power plants. The Reg. Guide 1.60 spectrum applied at Perry was developed conservatively; exceedance of the spectrum by a single real event is not unexpected. Low energy, high frequency exceedances such as those associated with the Ohio earthquake do not call the plant's seismic design into question. Previous decisions have taken note as well of the numerous other conservatisms in plant analysis and design, which provide additional assurance that the exceedances at Perry do not present a significant safety issue.

D. Consideration of the Earthquake
Information Offered By OCRE Would
Not Have Led To A Different Result

Inasmuch as OCRE has failed to establish the safety significance of the new matter it seeks to raise, it follows that OCRE's contention could not provide a basis for altering the results of the proceeding below, i.e., reversing the ASLB's authorization of issuance of an operating license for Perry Unit 1. Cf. Limerick, ALAB-828, slip op. at 10.

E. The Five Factors Test Does
Not Favor Admission of
OCRE's Late-Filed Contention

As discussed supra, OCRE must also show that a balancing of the following five factors favors admission of its late-filed contentions:

- (i) Good cause, if any, for failure to file on time.
- (ii) The availability of other means whereby the petitioner's interest will be protected.
- (iii) The extent to which the petitioner's participation may reasonably be expected to assist in developing a sound record.
- (iv) The extent to which the petitioner's interest will be represented by existing parties.
- (v) The extent to which the petitioner's participation will broaden the issues or delay the proceeding.

10 C.F.R. § 2.714(a)(1).

The balancing of these five factors as applied to OCRE's late-filed earthquake contention weighs against its admission. Since OCRE filed its contention shortly after the earthquake, Applicants do not dispute that there is good cause for OCRE's late-filing. However, OCRE's argument under factor (ii), that it "knows of no other meaningful ways of protecting its interests," and that a petition under 10 C.F.R. § 2.206 "is not a meaningful option," appears to be specious. OCRE has, in fact, filed a § 2.206 Petition based on the earthquake. Petition For Action Under 10 CFR 2.206 (February 3, 1986) (Attachment "7" hereto). If the filing of a § 2.206 petition were the meaningless option suggested by OCRE, it presumably would not have filed its Petition.

The Appeal Board has recognized that, in some cases, the filing of a § 2.206 petition can provide a sufficient vehicle to protect one's interest under factor (ii) of the test for late-filed petitions. See Limerick, ALAB-828, slip op. at 12 & n.24. In other cases, it has been held that § 2.206 should not be used by a party to a licensing proceeding to request relief on a matter within the jurisdiction of the presiding officer in the proceeding. See, e.g., Pacific Gas & Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-81-6, 13 N.R.C. 443, 444 (1981); General Public Utilities Nuclear Corp. (Three Mile Island Nuclear Station, Units 1 and 2; Oyster Creek Nuclear Generating Station), CLI-85-4, 21 N.R.C. 561, 563,

(1985). However, as is apparent in the Motion and in OCRE's § 2.206 Petition, the relief which OCRE requests goes beyond the question of whether the operating licenses should be issued and includes questions concerning inspections, testing, repairs and investigations. OCRE's requests are therefore similar to that requested in Catawba, where the Director, Office of Inspection and Enforcement, concluded that the § 2.206 procedure was available to a petitioner notwithstanding an ongoing licensing proceeding open to petitioner.^{20/} In these circumstances, § 2.206 is an available means for OCRE to protect its interests; OCRE itself has apparently concluded the same, as evidenced by its filing of a § 2.206 petition.

OCRE fails to demonstrate its ability to contribute to the development of a sound record, under factor (iii). As shown above (see, e.g., Chen, ¶ 35, discussed supra), OCRE's limited discussion of the newspaper account attached to its Motion sheds no light on the January 31 earthquake or its impact on Perry. As evidenced by the affidavits of Applicants' experts,

^{20/} See Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), DD-85-9, 21 N.R.C. 1759, 1762 n.1 (1985) ("The facts raised in the instant petitions . . . have a bearing not only on the question of whether operating licenses should have issued, but also on the question of whether the Staff should exercise its independent responsibilities to enforce the conditions of the NRC's regulations and construction permits. For this reason, the Staff has considered the substantive merit of the petitions to determine whether enforcement action is appropriate in accordance with Subpart B and Appendix C of 10 C.F.R. Part 2").

substantial knowledge and experience is required in order to evaluate the implications of the January 31 earthquake. There is no indication that OCRE possesses such knowledge or experience. OCRE's commitment to search for "seismologists to serve as expert witnesses" (Motion at 3-4) does not amount to an adequate showing under factor (iii). Cf. Limerick, ALAB-828, slip op. at 14 & n.28 (and decisions cited therein).

Moreover, OCRE's motion fails to "set out with as much particularity as possible the precise issues it plans to cover, identify its prospective witnesses, and summarize their proposed testimony." Mississippi Power & Light Co. (Grand Gulf Nuclear Station, Units 1 and 2), ALAB-704, 16 N.R.C. 1725, 1730 (1982).^{21/} And even if it were true, as OCRE claims (Motion at 3), that it was "very capable" with respect to previously litigated issues, this does not mean that OCRE can be expected to make a similar contribution with respect to its proposed seismic contention, about which it apparently has little expertise. See LBP-82-11, 15 N.R.C. 348, 352 (no basis shown for OCRE special competence on core catcher contention).

Applying factor (iv), it does not appear that there will be other parties to represent OCRE's interest in litigating

^{21/} See also Washington Public Power Supply System (WPPSS Nuclear Project No. 3), ALAB-747, 18 N.R.C. 1167, 1177 (1983); Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), ALAB-743, 18 N.R.C. 387, 399 (1983).

this issue. This consideration, however, is heavily outweighed by a consideration of factor (v). OCRE admits that the admission of its proposed contention would "undoubtedly" delay the proceeding and broaden the issues. See Motion at 4. Since the record is closed^{22/}, and the proceeding is in its final stage, it is virtually certain that the admission of OCRE's contention would substantially delay its completion.

Thus, although there is good cause for OCRE's late-filed contention under factor (i), and there may be no other party to protect OCRE's interest in litigating a new contention on the January 31 earthquake, under factor (iv), these considerations are heavily outweighed by factor (ii) (OCRE has other, more appropriate means to protect its interests, which it is already pursuing); factor (iii) (OCRE's Motion, when compared with the attached affidavits, indicates that OCRE cannot be expected to assist in developing a sound record on the January 31 earthquake and its implications for Perry); and factor (v) (the admission of OCRE's contention will substantially expand and delay the proceeding). For these reasons, OCRE fails to satisfy the five factors test applicable to its late-filed contention.

^{22/} The evidentiary record in this proceeding has been closed since May 3, 1985.

III. Conclusion

For all the above reasons, OCRE's motion to reopen the record for the purpose of admitting its late-filed contention on the January 31 earthquake should be denied.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

Harry H. Glasspiegel

Jay E. Silberg, P.C.
Harry H. Glasspiegel
Paul M. Bangser

Counsel for Applicants

1800 M Street, N.W.
Washington, D.C. 20036
(202) 822-1000

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ATTACHMENT 1