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UNITED STATES NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of Public Service Company of New Hampshire, et al. (Seabrook Station, Units 1 & 2)	Docket No. 50-443 OL-1/444-OL-1 ONSITE EMERGENCY PLANNING & TECHNICAL ISSUES

NECNP'S MOTION FOR RECONSIDERATION OF THE BOARD'S DENIAL OF NECNP'S MOTION TO COMPEL, DATED FEBRUARY 17, 1988

I. Introduction

The New England Coalition on Nuclear Pollution ("NECNP") hereby requests that the Licensing Board reconsider its Order dated February 17, 1988 denying NECNP's motion to compel, and ruling that the issue of "microbiologically induced corrosion" ("MIC") is not within the scope of NECNP Contention IV. In support of this motion, NECNP presents an expert affidavit as to the meaning of the Contention, and scientific studies contemporaneous to the admission of Contention IV demonstrating that, in 1982, MIC was recognized as one of the detrimental effects biofouling of nuclear power plants.

NECNP further asks that the Board rule on that portion of NECNP's January 25, 1988 motion to compel regarding Applicants' definition of "biofouling." NECNP notes, in this regard, that the Board's ruling on the question of MIC is not dispositive as to this definitional issue, which concerns fouling by bivalves and debris and is therefore squarely within the scope of NECNP Contention IV.

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Finally, should this Board rule that MIC is within the scope of NECNP Contention IV, NECNP renews its motion to compel discovery with regard to Applicants' refusal to respond to interrogatories directed to "circulating water systems" such as the Fire Protection System.

II. Microbiologically Induced Corrosion and Other Types of Microbial Fouling are Within the Scope of NECNP Contention IV.

A. The Plain Language of the Contention Covers MIC

Contention IV's subject matter and scope is very simple. It states that "The Applicant must establish a surveillance and maintenance program for the prevention of the accumulation of mollusks, other aquatic organisms, and debris in reactor cooling systems." According to the attached affidavit of Dr. James Bryers, a professor in the Center for Biochemical Engineering at Duke University, this statement broadly identifies the process that causes "fouling" and microbiologically induced corrosion in nuclear power plant heat exchangers.[1] It is therefore Dr. Bryers' opinion that both microbial fouling and microbiologically induced corrosion are within the Scope of NECNP Contention IV.[2]

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1 Bryer Affidavit, at ¶ 4, attached as Exhibit A. Dr. Bryers is the author of over thirty published articles in scientific journals and treatises on the subject of microbial fouling and its effects in engineered systems, including nuclear power plant heat-exchange systems, and is a recognized expert in this area. His Curriculum Vitae is attached as Exhibit B.

2 Bryer Affidavit, at ¶ 5, attached as Exhibit A.

This reading of Contention IV as not limited to any one type or effect of fouling is corroborated by scientific studies, which generally define the process of fouling as follows:

> The term fouling refers to the formation of inorganic and/or organic deposits on surfaces. In cooling systems, these deposits form on condenser tube walls increasing fluid frictional resistance, accelerating corrosion and impairing heat transfer."

Bryers, J.D., Characklis, W.G., Zelver, N., and Nimmons, M.G., "Microbial Film Development and Associated Energy Losses," at 12.14-1, Paper No. 12-15 presented at the Proc. 6th OTEC Conference, "Ocean Thermal Energy for the '80's," Washington, D.C., June 19-20, 1979, excerpt attached hereto as Exhibit C. This definition generally corresponds to the definition contained in NECNP Contention IV.

MIC is one of the detrimental effects of biofouling, which can be caused by the interaction between aerobic and anaerobic bacteria, and biofilms. Bryers Affidavit, at ¶ 4. Perhaps the clearest explanation of the process, and different types of fouling, appears in a 1981 article by W.G.Characklis, entitled "Bioengineering Report -- Fouling Biofilm Development: A Process Analysis:"

> The term fouling refers to the formation of inorganic and/or organic deposits on surfaces. These deposits can impede the flow of heat across the surface, increase the fluid frictional resistance at the surface, and increase the rate of corrosion at the surface. In any case energy losses result.
>
> Several types of fouling and their combinations may occur in heat exchangers: 1) crystalline or precipitation fouling, 2) corrosion fouling, 3) particulate fouling, 4) chemical reaction fouling, and 5) biological fouling. Biological fouling results from a) development of a biofilm

consisting of microorganisms and their products (microbial fouling), b) deposition and growth of macroorganisms such as barnacles (macrobial fouling), and c) assorted detritus. Biotechnology and Bioengineering, Vol. XIII, pp. 1923-1960 (John Wiley & Sons, Inc. 1980), attached as Exhibit D.

As the attached affadivit indicates, biofouling has a number of detrimental effects, including blockage, constriction and/or mechanical deterioration of the operating characteristics of valves and pumps, fluid resistance, and corrosion. Bryers Affadivit, at ¶ 7. Nothing in the plain language of Contention IV suggests that the scope of the contention should be limited to the effect of biofouling that cause blockage of intake structures and impairment of heat transfer capabilities, and exclude the corrosive effect of biofouling.[3] Rather, as noted above, the plain language of the contention refers broadly only to the process that causes biofouling, which process can result in a number of detrimental effects, including but not limited to blockage, fluid resistance, and biologically mediated corrosion. Bryers Affidavit, at ¶ 4. Indeed, the bases to the contention clearly describes "corrosion" as one of the problems associated with "fouling." NECNP Contentions," filed June 17, 1982, at 2-3.

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3 The use of the word "blockage" in the caption of NECNP Contention IV cannot be construed as limiting the scope of the contention to only that detrimental effect of fouling, to the exclusion of others. Like the interpretion of statutes, titles or captions cannot be used to alter or vary the plain meaning of provisions. See e.g. Pike v. U.S., 340 F.2d 487 (9th Cir. 1974).

Scientific studies clearly identify corrosion as one of the detrimental effects of microbial biofouling. As is noted above, microbial fouling is a form of biofouling. See Characklis, W.G., "Bioengineering Report -- Fouling Biofilm Development: A Process Analysis:" Biotechnology and Bioengineering, Vol. XIII, pp. 1923-1960 (John Wiley & Sons, Inc. 1980), attached as Exhibit D; Bryers Affidavit, at ¶ 7. The following is a quotation from a 1982 article, White, D., "Microbial Facilitation of Corrosion," at p. 3, presented at The International Corrosion Forum Sponsored by the National Association of Corrosion Engineers, March 22-24, 1982, discussing the correlation between microfouling and microbiologically induced corrosion:

> With the increasing necessity to recycle both fresh and saltwater, problems of microfouling and subsequent microbially facilitated corrosion become more important. Not only do microbial films increase resistance to efficient heat transfer, increase the resistance to fluid flow and provide the conditions for facilitation of corrosion, but they may provide the ideal growth conditions for the human pathogen Legionella.

Excerpt attached as Exhibit E.

If anything, the use of the word "accumulation" in the Contention reinforces a broad, rather than limited construction of Contention IV. The term "accumulation" is used in the biochemistry field to refer to the accumulation of biofilms on heat-exchange systems, and it is this detrimental biofilm or slime that ultimately interacts with bacteria to cause corrosion of heat-exchangers. See Bryers, J.D., Characklis, W.G., Zelver, N., and Nimmons, M.G., "Microbial Film Development and Associated Energy Losses," at 12.14-1, Paper No. 12-15 presented at the

Proc. 6th OTEC Conference, "Ocean Thermal Energy for the '80's," Washington, D.C., June 19-20, 1979, excerpt attached hereto as Exhibit C; Bryers Affidavit, at ¶ 8. Moreover, the term "aquatic organisms" refers both to macro-organism such as mussels, clams, and other bivalves and bivalve larvae, and micro-organisms, including aerobic and anaerobic bacteria. Bryers Affidavit, at ¶ 8. Thus, "the accumulation of aquatic organisms" refers equally to the accumulation of microorganisms and the formation of biofilms, which can ultimately cause corrosion, as well as the accumulation of macroorganisms, such as clams, mussels, and barnacles, which can cause fluid resistance and impair heat transfer. Bryers Affidavit, at ¶ 6.

Moreover, the various causes and effects of biofouling cannot be thought of independently. As was noted in one early articles:

> Biofouling is not limited to microbial activity. The term includes the interaction of the microrganims and the slime layer with both the chemistry of the solid surface and the bulk fluid. These interactions can enhance some of the more commonly known fouling phenomena such as precipitation or crystallization (scaling) and corrosion.

Picologlou, B.F., Zelver, N., and Characklis, W.G., "Effect of Biofilm Growth on Hydraulic Performance," 106 Journal of Hydraulics Div., ASCE, at pp. 733-746 (1980), excerpt attached hereto as Exhibit F.

Microbial fouling often precedes colonization of heat-exchanger surfaces by macro-organisms, since the microbiological organisms which cause the corrosion are a food source for bivalves, permitting and encouraging their settlement and

colonization, and the sedimentation caused by and causing microbiologically induced corrosion enables mussels and oysters to attach more firmly to piping surfaces. Bryers Affidavit, at ¶ 10. Therefore, control of microbial fouling results in control of macrobial fouling. Id.; See also Characklis, W.G., "Bioengineering Report -- Fouling Biofilm Development: A Process Analysis," Biotechnology and Bioengineering, Vol. XIII, pp. 1923-1960 (John Wiley & Sons, Inc. 1980), attached as Exhibit C. Conversely, controlling macro-fouling will not necessaryily control microbial fouling or microbiologically induced corrosion. Bryers Affidavit, at ¶ 10.

Accordingly, because NECNP Contention IV broadly identifies the process of "fouling," discovery and litigation of Applicants' surveillance and maintenance program for the prevention of "microbiologically induced corrosion," as well as other effects of "fouling" not specifically identified, are within the scope of NECNP Contention IV.[4] Any other reading of NECNP Contention IV would preclude NECNP from discovery and litigation of any particular effect of fouling, since none is specifically mentioned.

B. MIC Was Recognized as a Type of Fouling in 1982

The problem of corrosion in engineered systems caused by the interaction between microorganisms and biofilms on pipe-liquid surfaces is not a new one. Bryers Affidavit, at ¶ 9. As early as 1977, the corrosive effects associated with microbial fouling

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4 Bryer Affidavit, at ¶ 5.

and biofilm formation have been the subject of studies by the scientific community, and have been identified as a type of "fouling." See Norman, G., Characklis, W.G., and Bryers, J.D., "Control of Microbial Fouling in Circular Tubes with Chlorine," 18 Development in Industrial Microbiology, pp. 581-590 (1977), excerpt attached as Exhibit G, and other articles quoted above.

III. Applicants' Definition of "Biofouling" Is Incorrect and Inappropriate.

NECNP defines biofouling as "any degree of sedimentation and/or corrosion of nuclear power plant cooling systems by aquatic debris, macro- or micro-biological organisms, silt, and mud, or by any other organic or inorganic material."[5] Applicants refuse to accept this general definition, and instead re-define "biofouling" as "extensive settlement of fouling organisms, resulting in significant percentages of the surfaces being covered and thus measurable affecting flow or heat exchanger efficiency. 'Settlement' means colonization on plant surfaces by fouling organisms, primarily mussels and barnacles."[6] Applicants provide no explanation for why they object to NECNP's definition of biofouling, nor do they provide any support for their re-definition. Interrogatories 2(l), (n), (o), 3(m), (n), (o), (q),

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5 NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV," filed December 23, 1987, at 3.

6 "Applicants Responses to NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV," filed January 14, 1988, at 2.

(r) of NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV, request information regarding biofouling. Accordingly, to the extent that Applicants' responses to this questions are based on an improper definition of "biofouling," their answers to these questions are partially unresponsive.

Neither the plain language of NECNP Contention IV, nor the accompanying statement of basis for the contention, contains any indication that the term "biofouling" encompasses only a particular degree or severity of sedimentation, blockage, or corrosion. To the contrary, biofouling can be very extensive, even with very minute levels of biofilm. Bryers Affidavit, at ¶ 6. Similarly, flow or heat inefficiencies can occur even with minute coverage of fouling organisms on surfaces. Bryers Affidavit, at ¶ 6.

More importantly, the extent or severity of biofouling is one of the ultimate issues in this litigation. It may be, that even minor incidents of biofouling may indicate that Applicants' biofouling monitoring and surveillance program is inadequate. Only <u>after</u> the completion of discovery and after hearing from all parties, is it appropriate to make judgments about the extent or degree of biofouling or sedimentation, for purposes of assessing Applicants' compliance with the relevant General Design Criteria. At the discovery stage, however, it is critical for Applicants to disclose all information about biofouling incidents, treatments, and surveillance programs, regardless of whether or not Applicants consider the degree or extent of biofouling to be sig-

nificant. Otherwise, NECNP will be foreclosed from acquiring information relevant to its contention based on a prejudgment about the merits of NECNP's Contention IV that is not theirs to make.

IV. Relief Requested

Based on the arguments above, NECNP respectfully requests that the Board enter an order compelling Applicants to provide full and complete answers to NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV. Specifically, NECNP requests the following relief from the Board:

1) That the Board rule that microbiologically induced corrosion and other effects of biofouling are within the scope of NECNP Contention IV for purposes of this litigation.

2) That Applicants be order to respond fully to Interrogatories 2(l), (n), (o), 3(m), (n), (o), (q), (r), of NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV, filed December 23, 1987, based on the definition of biofouling contained in NECNP's Second Set of Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV, to wit, "any degree of sedimentation and/or corrosion of nuclear power plant cooling systems by aquatic debris, macro- or micro-biological organisms, silt, and mud, or by any other organic or inorganic material."

3) That Applicants be ordered to respond fully to Interrogatories 2(t), 3(w), 4, 5, 6, and 8, of NECNP's Second Set of

Interrogatories and Request for Production of Documents to Applicants on NECNP Contention IV, filed December 23, 1987, with respect to all circulating water systems at Seabrook, including but not limited to "cooling systems." In the alternative, NECNP requests that Applicants be ordered to identify specifically those circulating water systems that they do not consider "cooling systems."

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that on March 1, 1988, copies of the foregoing pleading were served by first-class mail on all parties listed on the attached service list.

Andrea Ferster