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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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before the

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ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
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| In the matter of<br><br>PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.<br><br>(Seabrook Station, Units 1 and 2) | Docket Nos. 50-443-OL-1<br>50-444-OL-1<br>On-site Emergency Planning and Safety Issues<br>Dated: July 2, 1986 |

PETITION OF ATTORNEY GENERAL FRANCIS X. BELLOTTI
TO REVOKE REGULATION 50.47(d) OR IN THE ALTERNATIVE
TO SUSPEND ITS APPLICATION IN THE SEABROOK LICENSING PROCEEDING

Attorney General Francis X. Bellotti, acting pursuant to 10 C.F.R. §2.758, hereby petitions the Commission to revoke the regulation appearing at C.F.R. §50.47(d), or in the alternative to suspend its application in the present proceeding, and as grounds therefor states the following:

(1) Section 189a of the Atomic Energy Act, 42 U.S.C. §2239(a) (1982), provides a right to a prior hearing on all issues material to issuance of an operating license. Union of Concerned Scientists v. NRC, 735 F.2d 1437 (D.C. Cir. 1984).

(2) Regulation 50.47(d) permits the issuance of an operating license authorizing fuel loading and/or low power

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operation at up to 5% of rated power before any findings or determinations are made "concerning the state of off-site emergency preparedness or the adequacy of and capability to implement state and local off-site emergency plans." 10 C.F.R. §50.47(d).

(3) Insofar as Regulation 50.47(d) allows issuance of an operating license, even at less than full power, prior to a hearing on all issues relevant to licensure, including off-site emergency planning, it violates the statutory right to a hearing provided by section 189a and must be held invalid.

(4) No hearing has yet been held in the instant case on off-site emergency planning issues, and regardless of any economic or safety justifications for Regulation 50.47(d) or the fact that a hearing on emergency preparedness issues will be held prior to full-power authorization, operation of the Seabrook nuclear power plant at 5% of rated power will create significant irreversible consequences. Among these irreversible consequences will be irradiation of the plant, significant fuel irradiation, and worker exposure. See Affidavit of Albert Carnesale; Affidavit of Dale G. Bridenbaugh and Gregory C. Minor (prepared for Shoreham licensing proceeding but relevant hereto). None of these consequences can be mitigated by a later hearing, and thus application of Regulation 50.47(d) will effectively deny interested parties their right to a prior hearing on all issues relevant to licensure.

(5) Regulation 50.47(d) which, together with Regulation 50.57(c), authorizes temporary low-power operation prior to a hearing on all issues relevant to licensure is furthermore in violation of the Atomic Energy Act's statutory scheme which twice, on an emergency basis, authorized the issuance of temporary low-power operating licenses prior to completion of a full hearing on all issues relevant to licensure but no longer authorizes such temporary low-power licenses. See 42 U.S.C. §2242 (expired December 31, 1983).

Even if there did exist statutory authority for Regulation 50.47(d) special circumstances warrant an exception to its application in the instant proceeding:

(1) No emergency response plans have been submitted to FEMA or the NRC for that portion of the Seabrook Station's plume exposure EPZ or ingestion exposure EPZ within Massachusetts. See Affidavit of Secretary of Public Safety Charles V. Barry (attached hereto).

(2) Five of the six Massachusetts communities within the plume exposure pathway have voted not to participate in emergency planning and not to participate in any exercise of emergency response plans for Seabrook. See Affidavit of Charles V. Barry.

(3) The Governor of Massachusetts has not to date indicated any intention to submit, or implement in the event of an emergency, compensatory plans for the five Massachusetts communities not participating in emergency planning. See Affidavit of Charles V. Barry.

(4) Furthermore the Governor of Massachusetts has not to date indicated any intention to submit state emergency response plans for the Commonwealth of Massachusetts or to commit state resources to the exercise or implementation of emergency response plans for Seabrook. Indeed, he has ordered the planning process suspended while he attempts to gather information on the Chernobyl accident. See Affidavit of Charles V. Barry.

(5) Regulation 50.47(a)(1) provides that "no operating license for a nuclear power reactor will be issued unless a finding is made by NRC that there is "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." 10 C.F.R. 50.47(a)(1).

(6) Without participation by the Massachusetts state and local governments in emergency planning, it is unlikely that the requisite section 50.47(a)(1) finding for licensure can be made for the Seabrook plant or that the regulatory emergency planning standards set forth in section 50.47(b) can be met, thus raising a strong likelihood that the Seabrook nuclear power plant may never receive a license to operate at full-power, or that if it does receive such license it will not do so until after several years of litigation. See, e.g., Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1) ALAB-88, 22 NRC 651 (1985).

(7) The purpose of low power operation is to allow testing of plant systems prior to full-power operation, which testing

can typically be accomplished in a period of a few months. See, e.g., Notice of Proposed Rulemaking, Emergency Planning, 46 Fed. Reg. 61132, 61133 (December 15, 1981).

(8) No benefit can be derived from low-power operation if the reactor does not receive a license to operate at full-power and little, if any, benefit can be derived from continuing low-power operation beyond the several months required for testing. See Dale G. Bridenbaugh and Gregory C. Minor.

(9) Nevertheless, operation at low-power does produce significant irreversible consequences, such as plant irradiation, fuel irradiation and worker exposure, which consequences only increase the longer a plant operates at lower-power. See Affidavit of Albert Carnesale and Affidavit of Dale G. Bridenbaugh and Gregory C. Minor.

(10) In promulgating Regulation 50.47(d) the Commission contemplanted that low-power operation would be conducted only for a period of short duration. See Notice of Proposed Rulemaking, supra at 61133; Statements of Consideration, Emergency Planning, 47 Fed. Reg. 134 (July 13, 1982).

(11) It is therefore Attorney General Bellotti's contention that Regulation 50.47(d) should be waived in the instant case where there is no assurance that operation at full-power will ever occur and if it does occur will not occur for nearly a year, or possibly years, and thus any possible benefits to be attained from commencing low-power testing at this time will be far outweighed by the significant and

irreversible adverse environmental consequences of such operation. See Affidavit of Dale G. Bridenbaugh and Gregory C. Minor.

(12) In its Statement of Consideration for Regulation 50.47(d), the Commission asserted as basis for its determination that off-site emergency planning was not required for low-power operation that there would be little off-site risk because "the fission product inventory during low power testing is much less than during higher power operation due to the low level of reactor power and short period of operation." See, Statements of Consideration, Emergency Planning 47 Fed. Reg. 30232 (September 1, 1982).

(13) Nevertheless operation at 5% of rated power for a longer period of time will at some point lead to the accrual of waste products in the fuel such that core melting could occur in the event of the interruption of the core cooling. See Affidavit of Gordon R. Thompson.

(14) If Applicants presently receive their license to operate at low-power, such operation is very likely to continue for a period of time much longer than that contemplated by the Commission in promulgating Regulation 50.47(d), thereby raising a risk of off-site consequences not intended by the Commission in adopting Regulation 50.47(d). See Affidavit of Gordon R. Thompson.

(16) Regulation 50.47(d) should further be waived until such time as there is conducted a full investigation and assessment of the recent nuclear accident at Chernobyl, its causes and the implications of such accident for off-site planning (based upon available information, that accident required the evacuation of all persons within an 18 mile radius of the plant even though the Chernobyl reactor was only operating at approximately 6% of rated power when the accident occurred).

Respectully submitted,

FRANCIS X. BELLOTTI
ATTORNEY GENERAL

By: Carol S. Sneider
Assistant Attorney General
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DATED: July 2, 1986

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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| In the Matter of | ) | Docket No. 50-443-OL-1 |
| PUBLIC SERVICE OF NEW HAMPSHIRE | ) | 50-444-OL-1 |
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| (Seabrook Station Units 1 and 2) | ) | |
| | ) | |

AFFIDAVIT OF ALBERT CARNESALE

1. My name is Albert Carnesale. I am Professor of Public Policy and Academic Dean of the John F. Kennedy School of Government, Harvard University, located at 79 John F. Kennedy Street, Cambridge, Massachusetts 02138. I received a Ph.D. degree in nuclear engineering from North Carolina State University in 1966 (a copy of my curriculum vitae is attached). I am currently serving on a voluntary basis as an advisor to Massachusetts Governor Michael S. Dukakis on nuclear power issues, specifically the implications of the Chernobyl nuclear power plant accident for emergency planning at the Seabrook nuclear power plant. (See pertinent press release, attached.)

2. In my capacity as advisor, I have considered the impact of low-power operation of a nuclear reactor. Based on my examination, I have formed the following opinions.

3. Before a nuclear reactor core achieves criticality, neither the uranium fuel nor the reactor components are significantly irradiated or contaminated by radiation. However, low-power testing of a reactor necessarily entails achievement of criticality and operation of the reactor, thus creating irreversible changes to the core, the remainder of the reactor, and some supporting systems. These changes would increase the cost of removal of the reactor fuel and structures, as well as of any potential coversion of the plant facilities to other uses. Furthermore, the increased levels of radioactivity necessarily raise the health and economic risks to the surrounding communities.

4. The nuclear fissions occurring during low-power testing result in the irreversible accumulation within the fuel elements of radioactive materials. The levels and types of fission products and other radioactive nuclides within the fuel elements depend upon the specific operating history of the reactor during the testing program. This increasing inventory of radioactive materials also affects the severity of potential accidents that might occur during the testing program. The consequences include both contamination within the plant and, in the event of a breach of containment, exposure of the public to radioactivity.

5. Neutrons from the fission reactions induce radioactivity within the structural components of the reactor. Again, the resulting types and levels of radioactivity induced depend on the operating history of the reactor. Such induced radioactivity increases the risks and costs associated with disassembly or entombment of the reactor.

6. Operation of the reactor over time also degrades the integrity of the fuel elements, making them more susceptible to leaking. Such leaking elements release radioactive materials into the primary cooling system of the reactor and contaminate it, which could further complicate disassembly or emtombment.

7. In summary, operation of the reactor, even at low power, increases the levels of radioactivity within the nuclear fuel and other portions of the primary cooling system, thereby increasing the risk to public health and safety and the cost of potential conversion, disassembly, or entombment of the nuclear facility.

Signed under the pains and penalties of perjury.

A. Carnesale

Albert Carnesale

Date: July 2, 1986

# ALBERT CARNESALE

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*Education:*

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| B.M.E. | (Mechanical Engineering) | The Cooper Union | 1957 |
| M.S. | (Mechanical Engineering) | Drexel Institute | 1961 |
| Ph.D. | (Nuclear Engineering) | North Carolina State University | 1966 |
| A.M. | (Honorary) | Harvard University | 1979 |
| Sc.D. | (Honorary) | New Jersey Institute of Technology | 1984 |

*Present Position:*

1974-Present Harvard University. Professor of Public Policy, and, since 1981, Academic Dean at the John F. Kennedy School of Government.
Research and teaching interests in international security, with emphasis on policies associated with nuclear weapons and strategies for their use and non-use, and on the impact of technological change on defense and arms control policy.

*Previous Positions:*

1972-74 North Carolina State University, Raleigh, N.C. Professor and Head, Division of University Studies, and University Coordinator for Environmental Studies

1969-72 U.S. Arms Control and Disarmament Agency, Washington, D.C. Chief, Defensive Weapons Systems Divison, and Senior Advisor to head of U.S. Delegation to Strategic Arms Limitation Talks (SALT)

1962-69 North Carolina State University, Raleigh, N.C. Instructor, Assistant Professor, and Associate Professor of Nuclear Engineering

1957-62 Martin Marietta Corporation, Baltimore, MD. Senior Engineer, Nuclear Division

*Other Professional Activities:*

Consultant to U.S. Arms Control and Disarmament Agency and to Departments of Defense, Energy, and State

Head of U.S. Delegation to International Nuclear Fuel Cycle Evaluation, 1978-80

*Recent Publications:*

Hawks, Doves, and Owls: An Agenda for Avoiding Nuclear War, coauthor and coeditor with Graham T. Allison and Joseph S. Nye, Jr. W. W. Norton, 1985.

"The Strategic Defense Initiative," in American Defense Annual, 1985-86, G. E. Hudson and J. J. Kruzel, eds. Lexington Books, 1985.

Living with Nuclear Weapons, coauthor with other members of the Harvard Nuclear Study Group. Harvard University Press, and Bantam Books, 1983.

"The Utility Director's Dilemma: The Governance of Nuclear Power," coauthor with Graham T. Allison. In Uncertain Power, ed. Dorothy S. Zinberg, pp. 134-53. Pergamon Press, 1983.

"ICBM Vulnerability: The Cures are Worse than the Disease," coauthor with Charles Glaser. International Security, Summer 1982, pp. 70-85.

# NEWS RELEASE
## FROM THE OFFICE OF GOVERNOR MICHAEL S. DUKAKIS

May 29, 1986

CONTACT: James Dorsey 727-2759
Karen Schwartzman
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COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE
BOSTON, MA 02133

Nationally known nuclear expert to help state gather, study Chernobyl accident data

Albert Carnesale, a nationally known expert on nuclear issues and President Carter's nominee in 1980 to chair the Nuclear Regulatory Commission, has agreed to assist the commonwealth in gathering and evaluating information about the Chernobyl nuclear power plant accident, Gov. Michael S. Dukakis announced today. Dukakis is currently evaluating emergency evacuation plans for the Seabrook nuclear power plant.

"Al Carnesale has agreed to take time from a very busy schedule to assist the members of my administration as we try to draw appropriate lessons from the Chernobyl accident, in order to make a responsible decision on Seabrook," Dukakis said.

"This is a very important task. I don't think we can make a responsible decision on Seabrook without understanding what happened at Chernobyl and what that accident says about our ability to protect people here from a nuclear plant accident. I have asked Al to help in two ways: to reach out to outside experts as needed, and to help interpret the information that is now becoming available about the Chernobyl accident," the governor added.

Carnesale holds a doctoral degree in nuclear engineer and was President Carter's nominee for chairman of the NRC in 1980. Carter's election loss and Carnesale's opposition to the Clinch River Breeder Reactor led to the withdrawal of his nomination.

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Previously Carnesale had served as a member of the U.S. team which negotiated the first Strategic Arms Limitation Treaty (SALT I), and as head of the U.S. delegation to the International Nuclear Fuel Cycle Evaluation (1979-80), a 66-nation study of the relationship between civilian nuclear power development and the proliferation of nuclear weapons.

Now a professor of public policy and academic dean at Harvard University's John F. Kennedy School of Government, Carnesale's primary research interests are in international security and U.S.-Soviet relations.

Dukakis added that "our goal is not to delay a decision on Seabrook, but to make an informed decision on Seabrook. I still believe that it is appropriate and important that the Federal regulatory agencies, such as the Nuclear Regulatory Commission, undertake a thorough assessment of nuclear power in the light of the Chernobyl accident.

"Whether the Federal agencies act or not, however, we will use our own considerable pool of experts here in Massachusetts to evaluate this issue. We need to know, as best we can, exactly what happened at Chernobyl and why. We need to know the points of similarity and difference between the technology at Chernobyl and nuclear technology here in this country. We need to know whether the spread of radioactivity from Chernobyl in any way challenges the assumptions upon which American nuclear plant design and emergency planning is based. We need to know whether the theory which underlies much of our American nuclear plant emergency planning has been strengthened or weakened by the facts we derive from the Chernobyl accident," Dukakis said.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Appeal Board

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| In the Matter of<br><br>LONG ISLAND LIGHTING COMPANY<br><br>(Shoreham Nuclear Power Station, Unit 1) | Docket No. 50-322-OL |

AFFIDAVIT OF DALE G. BRIDENBAUGH AND GREGORY C. MINOR IN SUPPORT OF MOTION FOR STAY

1. My name is Dale G. Bridenbaugh. I am president of MHB Technical Associates ("MHB"), a technical consulting firm specializing in nuclear power plant safety and licensing matters, located at 1723 Hamilton Avenue, Suite K, San Jose, California 95125. I received a Bachelor of Science degree in mechanical engineering from South Dakota School of Mines and Technology in 1953 and am a licensed professional nuclear engineer. I have more than 30 years experience in the engineering field, primarily in power plant analysis, construction, maintenance and operations. Since 1976, I have been employed by MHB and have acted as a consultant to domestic and foreign government agencies and other groups on nuclear power plant safety

and licensing matters. Between 1966 and 1976, I was employed by the Nuclear Energy Division of General Electric Company ("GE") in various managerial capacities relating to the sale, service and product improvement of nuclear power reactors manufactured by that company. Between 1955 and 1966, I was employed in various engineering capacities working with gas and steam turbines for GE. Included in my duties at GE was supervision of startup testing of equipment in fifteen to twenty fossil or nuclear power plants. I also was responsible for various nuclear fuel projects ranging from the remote disassembly of irradiated fuel to the supply of reload fuel for operating nuclear plants. I have written numerous technical papers and articles on the subject of nuclear power equipment and nuclear power plant safety and have given testimony on those subjects.

2. My name is Gregory C. Minor. I am vice president of MHB. My education background is in electrical engineering (with a power systems option) in which I received Bachelor of Science (University of California, Berkeley, 1960) and Master of Science (Stanford, 1966) degrees. I have over 24 years of experience in the nuclear industry, including design and testing of systems for use in nuclear power plants. Since 1976, I have been employed by MHB and have acted as a

consultant to domestic and foreign government agencies and other groups on nuclear power plant safety and licensing matters. Between 1965 and 1976, I was employed by the GE Nuclear Energy Division as a design engineer and manager of engineering design organizations. My responsibilities included the design, testing, qualification and pre-operation testing of safety equipment and control rooms for use in nuclear power plants. While with GE, I participated in the pre-startup testing of the instrumentation and control systems for a nuclear test reactor and in numerous system tests.

3. Our experience with the Shoreham plant started when we were employed by GE. At that time we were involved with the design of reactor system components for Shoreham and implementation and resolution of problems related to that design. After leaving GE, we have been involved with the Shoreham case on a virtually continuous basis since 1977, when we were originally retained as consultants to Suffolk County. As consultants on the Shoreham plant, we have performed diverse assignments, focusing primarily on technical reviews and analysis of safety and cost issues. Over the course of the Shoreham proceedings, we have visited the plant on numerous occasions and have testified on diverse issues before the NRC's Atomic Safety and Licensing Board and the State of New York Public Service Commission.

4. This Affidavit is to explain the technical reasons why low power testing to 5 percent power at Shoreham is of little value and, in fact, incurs several irreversible losses while producing no electrical power.

## TIMING OF LOW POWER OPERATION

5. Every nuclear plant needs to have fuel loaded and systems tested before it is permitted to operate at power levels where the turbine can be turned and electric power generated. In general, most of the testing is performed at power levels of 5 percent power or less; if the testing is completed satisfactorily and other requirements are satisfied, then the plant is permitted to operate at higher power levels at which sufficient steam may be generated to allow production of electricity.

6. The NRC action to permit Shoreham low power operation at this time represents a deviation from the practice at most other plants. Where nuclear plants are granted an operating license as a result of a single licensing action, fuel loading and low power test activities are then performed and integrated with the approach ("ascension") to full power. Where plants have first been granted a low power license so as to complete the fuel loading and low power testing by the time the full power license is issued, usually the low power testing and the full power licensing are relatively close together in time.1/

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1/ Of 15 plants licensed for low power operation between March 1979 and June 1984, and also receiving a full power

(Footnote cont'd next page)

7. In the case of Shoreham, the low power license has been requested in not one, but four separate phases: Phase I is fuel loading and no criticality (i.e. irradiation of the fuel) is achieved; Phase II is cold criticality testing wherein extremely low levels of criticality (.001% power) are achieved for a very short period of time; Phase III is initial heatup and operation at up to 1% of full power; and Phase IV is low power testing and subsequent heatups involving operation at up to 5% of full power. LILCO obtained on December 7, 1984 a license for Phases I and II only. LILCO completed its fuel loading on January 19, 1985; it began cold criticality testing on February 15, 1985 and completed it roughly 36 hours later, on February 17, 1985.

## IRREVERSIBLE CHANGES IN STATUS QUO RESULTING FROM LOW POWER OPERATION

8. Before a reactor "goes critical" as it does for the first time during low power testing, neither the nuclear fuel

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(Footnote cont'd from previous page)

license, the average time between the low power and full power licensee was less than 5 months. The average time from initial criticality -- which Shoreham achieved in February, 1985 -- to award of the full power license is only 1/2 month (excluding Grand Gulf which was indefinitely delayed). Attachment to Letter from NRC Chairman Palladino to Congressman Edward Markey, June 15, 1984.

nor the reactor or its components, are irradiated or contaminated by radiation. Low power testing, however, necessarily causes irreversible changes to a nuclear reactor and its supporting systems.

9. There is necessarily significant irradiation of the nuclear fuel as a result of low power testing. This irradiation results in the build-up of quantities of fission products within the fuel which requires that the fuel subsequently be handled, transported, and treated as irradiated fuel. Once these fission products have been produced, they cannot be removed from the fuel by any usual means. Thus, the irradiation from low power testing is irreversible. During low power testing other components of the Shoreham plant would also be irreversibly irradiated. These include the 137 control rods and control rod drives, the 31 local power range monitors, a number of source and intermediate range neutron monitors, and other reactor components, equipment, and piping. Once contaminated by substantial quantities of radioactive fission products, special care would be required in handling these items.

10. Because of the unavoidable irradiation and contamination described above, the conduct of low power testing of necessity requires some worker exposure to harmful radiation

during the course of the testing as well as after the testing is completed. The amount of exposure may not be large and unless errors were made, probably would not exceed allowable limits. However, it is an additional unavoidable impact which results from low power testing.

11. During Phases I and II of LILCO's low power testing program for Shoreham, a small amount of irradiation of the fuel and contamination of reactor internals and components occurred. However, the amounts of irradiation and contamination that are involved in Phases III and IV of LILCO's low power testing program are greater by many orders of magnitude. LILCO's cold criticality (Phase II) testing in February, 1985 involved criticality, at 0.001 percent of power, for roughly 36 hours. The amount of fuel irradiation and resulting contamination from Phase II is insignificant when compared to that which would occur during operation at 5% power for roughly two months as contemplated by LILCO's low power testing program.2/ The fuel

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2/ In fact, LILCO has predicted that the amount of time it would operate Shoreham at 5% power could be much greater than that necessary to complete its low power tests. In its Startup Test Program Evaluation for a 5% Reactor Power Limitation (at 4), LILCO stated: "if a delay in receipt of a full power license well beyond the two months [of low power testing] is anticipated, frequent operation at 5% reactor power will be necessary to reactivate startup sources."

irradiation, measured in megawatt days per ton of fuel, was 0.00036 MWDT/Ton from the February 1985 Phase II criticality; it would be over 70 MWDT/Ton, assuming only 60 days of 5% operation. Furthermore, the radiation levels resulting from the brief criticality in February for Phase II, at this time would be even lower than that stated above following initial criticality, since the minimal fission products produced have already had approximately four months to decay. Even if additional criticalities, subsequent to that performed in February, were performed within the Phase II low power license limits of .001% power, the performance of Phases III and IV testing at Shoreham would nonetheless result in a substantial and irreversible change in the status quo.

12. In addition, in its non-irradiated condition, the fuel loaded into the Shoreham core probably had a recovery (or salvage) value nearly equal to the original purchase value (about $65 million) for that fuel. This fuel, if not irradiated, likely could have been sold to other nuclear plants to use as is, or, if necessary, to have it reconfigured for a different reactor. (For example, some bundles might have required manual disassembly and rod rearrangement or reconfiguration of the pellets for the necessary pattern of enrichment.) The fuel still probably has a salvage value even after the light

irradiation involved in Phases I and II. However, once the fuel is substantially irradiated and there is a substantial build-up of fission products as would occur during Phases III and IV, it makes fuel reconfiguration, and therefore most opportunities for reuse of the fuel, more complicated and costly and therefore far less likely to be implemented. According to LILCO, the cost to LILCO of the Shoreham fuel is $65 million. Thus, we believe that positive salvage value could be realized from the fuel in its post-Phase II condition (although not as much as if the fuel were not irradiated at all). There would be no such value if the fuel were used for testing up to 5% power.

13. Phases III and IV would also result in the loss of potential salvage value for other plant components that would be substantially irradiated (i.e., control rods, control rod drives, local power range, source, and intermediate range neutron monitors). We estimate the replacement value of these components to be at least $2 - 6 million. These components are virtually identical in all BWRs and are periodically replaced. Thus, a resale market for them should exist unless they are heavily irradiated. The NRC Staff appears to agree with our opinion. (See Affidavit of Edward G. Goodwin, dated February 20, 1985, filed by the NRC in U.S. Court of Appeals, at 10).

Although as a result of the minimal Phase II criticality, these components have been irradiated to a minor extent, the radiation levels now present would not, in our opinion, preclude altogether their transfer and installation in other reactors, although it would be more difficult and complicated than if they were not irradiated at all. Additional irradiation during Phases III and IV, however, would reduce their marketability to practically nothing.

14. Additional costs resulting from a decision to perform low power testing are the costs of defueling, decontaminating, decommissioning, and disposal of the fuel as well as portions of the primary reactor system following a low power testing period in the event that a full power license is not obtained. The cost of necessary removal/disposal/decontamination efforts could be tens of millions of dollars, depending on the specific disposal requirements. Such efforts also carry with them the potential for additional worker radiation exposure. The irradiated fuel must be disposed of as high level radioactive waste. The U.S. Department of Energy has published expected costs for the receipt and ultimate disposal of irradiated fuel. The costs are currently being collected at a rate of $.001/kwhr of generation for fuel exposed now to be disposed of by DOE in the future. For fuel with a design exposure of 15,000 MWD

(t)/ton this cost is equivalent to approximately $120,000 per ton. The potential cost for disposal by DOE of the 100+ tons at Shoreham is therefore approximately $12,000,000, not counting transportation or possible cost increases. In addition, no disposal facility is planned or expected before about the year 2000, some 15 years in the future. LILCO would therefore be required to store and safeguard the spent fuel on site until that time. Assuming an operations and security staff of at least 10-15 people for this chore, an annual cost of $500,000 to $1,000,000 is not unreasonable and is probably low. The cost of spent fuel disposal alone thus becomes a $20 to 30 million obligation. Reactor component removal, handling and disposal would be additionally required.

TESTING IN PHASES III AND IV IS VERY LIMITED

15. Although according to LILCO 54 systems will be "in service, operated and tested" during Phases III and IV testing, 41 of those systems are already operational and have been checked out as part of Phase I and Phase II testing. Thus, in theory Phases III and IV provide the opportunity to check out only 13 additional systems. However, not even that many systems can be thoroughly or properly checked during Phases III and IV. The main turbine would not be operated during Phases

III and IV. Mr. Gunther, a LILCO employee, stated under oath that LILCO did not intend to try to operate the main turbine during its Phase III and IV testing. Tr. 776, 780; SCLP Ex. 2. And, even if LILCO did intend to operate the turbine, it is highly unlikely that the main turbine could be operated during Phases III and IV. According to LILCO's Vice President-Nuclear, John D. Leonard, Jr.:

> When you bring steam down the pipes at five percent, you can test every component of that plant except the main turbine. . . . It's conceivable we are going to look very, very carefully to see if we could possibly spin the turbine. I don't think we can with that small amount of steam. I don't think we can overcome its inertia.

Transcript of Feb. 8, 1985 Oral Argument to the NRC, at 89. And, in an internal evaluation of 5% power tests, LILCO stated:

> Certain tests in the Low Power Testing phase, such as turbine roll and HPCI, are normally performed at about 20% CTP [Core Thermal Power]. . . .
>
> The modified schedule moves tests requiring nuclear steam flow to the end of 5% testing. These tests (main turbine roll, HPCI fine tuning, heatup of related piping, etc.) are ordinarily conducted prior to TC-1, but with the system at about 10-15% reactor power. Stable operation of the nuclear plant at 5% power may be difficult and has not been demonstrated during operation of other BWR plants.

"A Startup Test Program Evaluation for a 5% Reactor Power Limitation," SR2-K71-393, Oct. 25, 1983, at p.2. Therefore, the Turbine Generator and the turbine control portion of the EHC systems could not be operated in Phases III and IV. In addition, the support systems, consisting of the Turbine Lube Oil System, Generator Seal Oil Systems, and Steam Seal System, could not be completely or finally checked out until the turbine generator is actually run. Thus, only 8 additional systems could be checked out during Phase III and IV testing.

16. In addition, there are several tests which cannot be properly or completely performed at low power levels (5% or less). These include:

- APRM/IRM calibration at overlap point
- Set APRM trip reference point at 55%
- APRM calibration (inaccurate at very low readings and would have to be repeated at higher pow levels)
- Turbine roll and balance at 1800 RPM
- Generator exciter test
- Moisture separator-reheater and drains (dynamic test)
- Extraction steam (dynamic test)
- Local power range monitor calibration

Although there are non-standard methods available to permit partial performance of some of these tests and partial testing of some other systems at 5% power, the tests would have to be substantially repeated at higher power levels.

17. Considering that Phases III and IV would only add a few systems to those already checked out, and that other systems require higher power levels for testing, there is relatively little benefit to be gained by pursuing Phase III and IV operation for the sole purpose of system testing. Furthermore, many of the tests in Phases III and IV are one time tests. That is, they must be done at some point prior to higher levels of operation but exactly when they are performed is not particularly important. However, some of the tests which involve the calibration of two systems at their point of overlap would need to be performed again if the approach to full power were substantially delayed (assuming that at some point a full power license were authorized). Accordingly, while it is difficult to be precise, it appears likely that at least some of the proposed Phase III/IV activities would have to be repeated after a full power license were authorized, if the Phase III/IV activities were conducted soon and then followed by a delay prior to full power operation.

**THERE IS NO PURPOSE SERVED, AND NO BENEFITS PRODUCED, BY LOW POWER TESTING TO OUTWEIGH THE ADVERSE AND IRREVERSIBLE CHANGES IN THE STATUS QUO**

18. The essential purpose of a low power license is to test reactor systems which cannot be effectively tested in non-critical conditions. It is necessary to conduct such testing prior to operating the plant at higher power levels (i.e., greater than 5% power). However, during Phase III and IV testing, the Shoreham reactor would never be put in the "run" mode. Therefore there would be no electric power supplied to the grid as a result of the testing, and there would be no displaced oil or fuel cost savings. Instead, power from the grid would be required to run the plant during the tests. Thus, none of the benefits assumed in the NRC's 1977 EIS for Shoreham would be achieved by low power testing; however, as noted, low power operation would result in environmental impacts, such as plant contamination with radioactive material, the likely loss of the resale value of the fuel and other components once they become irradiated, the cost of decontamination, decommissioning and disposal, and worker exposure.

19. Because low power testing standing alone produces no benefits but does have serious adverse effects, it is our

opinion that there is no reason to conduct low power testing just for its sake alone. Rather, low power testing can be rationally justified only in circumstances where there is no substantial doubt that the plant subsequently will operate at higher power levels so that its benefits (i.e., generation of electricity) will be available to offset the adverse effects (fuel irradiation, radioactive contamination, potential worker exposure) which cannot be avoided. In our technical opinion, the optimum time for performing low power testing of any nuclear reactor is shortly before full power operation is reliably anticipated to begin.

DALE G. BRIDENBAUGH

GREGORY C. MINOR

Subscribed and sworn to before me
on this _____ day of ____, 1985.

NOTARY PUBLIC

My Commission expires:

AFFIDAVIT

1. My name is Charles V. Barry and I am the duly appointed Secretary of Public Safety for the Commonwealth of Massachusetts. In my capacity as Secretary, I am responsible directly to the Governor of the Commonwealth of Massachusetts. My duties include coordination and overall supervision of all emergency planning and management activities for the Commonwealth's major public safety agencies. In particular, I exercise supervisory authority over the Massachusetts Civil Defense Agency and Office of Emergency Preparedness. Under Massachusetts Executive Order No. 144, the Governor has designated me to serve as his chief executive officer in the event of a declaration of emergency in the Commonwealth.

2. Radiological Emergency Response Plans required for nuclear power plants are developed, maintained and updated by the Massachusetts Office of Civil Defense with support from other agencies such as the Department of Public Health. In the case of the Seabrook nuclear power plant, the Governor established a process whereby the Civil Defense Agency and other state officials were charged with responsibility for preparing drafts of such plans in consultation with local officials from the Emergency Planning Zone (EPZ) and Host communities. Under direction from the Governor, I was charged

with responsibility for making a recommendation to him concerning the adequacy of any such plans, the options available to the Governor and the best course of action to follow. To date, I have not recommended a plan to the Governor which we have determined to be "adequate."

3. On March 27, 1986, Governor Dukakis and Attorney General Bellotti announced the "Commonwealth's position" on emergency response plans for the Seabrook Nuclear Power Plant. See copy attached hereto and incorporated herein by reference. Among other things, the Governor declared "[w]e do not believe that the evacuation plans are adequate or capable of implementation during the summer months, unless the Seabrook plant is shut down or adequate shelter is in place. For that reason I do not believe that plans are sufficient for an exercise unless there is assurance that either condition, shutdown or shelter, is met by the Seabrook plant." Neither condition has been satisfied.

4. On or about April 29, 1986, in reaction to the nuclear power plant accident at Chernobyl in the Soviet Union, Governor Dukakis directed that the planning process for the Seabrook Radiological Emergency Response Plans (RERP) be put on hold until further notice. Thereafter, on May 2, 1986, Governor

Dukakis wrote to Mr. Lee Thomas, Administrator of the U.S. Environmental Protection Agency in his capacity as the leader of the federal inter-agency task force on the Chernobyl accident. The Governor wrote to underscore the need to obtain the best possible information and guidance about the implications of the Chernobyl accident. (See copy attached hereto and incorporated herein by reference). We have received an acknowledgement letter from Mr. Thomas, but there has been no analysis of the implications of the Chernobyl accident from the task force or from any other authoritative federal source. On several occasions, Dr. Thomas Murley of the Nuclear Regulatory Commission (NRC) staff has stated that the NRC intends to conduct a study of Chernobyl following receipt of information from the International Atomic Energy Agency (IAEA). This information is reportedly due in late August following the issuance of a report to the IAEA by the Soviet Union. This information is critical to any renewed planning effort which we might undertake.

5. In addition, on May 29, 1986, Governor Dukakis announced that Dr. Albert Carnesale, a nationally known expert on nuclear issues, and a nominee to chair the NRC, had agreed

to assist the Commonwealth in gathering and evaluating information about the Chernobyl nuclear power plant accident. In his public statement on the matter, Governor Dukakis reported that "our goal is not to delay a decision on Seabrook, but to make an informed decision on Seabrook. I still believe that it is appropriate and important that the federal regulatory agencies, such as the Nuclear Regulatory Commission, undertake a thorough assessment of nuclear power in light of the Chernobyl accident." Dr. Carnesale is presently engaged in fact-finding and also is awaiting the IAEA report.

6. By vote of its' Annual Town Meeting on November 18, 1985, the Town of Amesbury voted to accept the recommendation of its Radiological Response Plan Committee to reject the draft Amesbury Response Plan and terminate all further planning. In the weeks following April 29, 1986, four other Massachusetts EPZ communities (the Towns of Newbury, West Newbury, Merrimac and Salisbury) voted in Town Meeting to terminate or otherwise suspend participation in Radiological Emergency Response Planning. On June 30, 1986, an initiative petition signed by 2,000 citizens and proposing a ban on all planning for the Seabrook plant was presented to the Newburyport, Mass. City Council.

AFFIDAVIT OF SECRETARY CHARLES V. BARRY

PAGE FIVE

7. On June 25, 1986, Governor Dukakis wrote to Mr. Edward Brown, President of New Hampshire Yankee Division of Public Service of New Hampshire and urged him, in the public interest, to postpone fuel loading and low power testing at the Seabrook plant. (See copy attached hereto and incorporated herein by reference). The Public Service of New Hampshire has elected not to agree to the Governor's request, although President Brown did respond in writing. (See copy attached hereto and incorporated herein by reference).

Charles V. Barry

Then personally appeared the above named Charles V. Barry and made oath that the above statements are true.

/Mary R. Hayes/
Notary Public
My Commission Expires: Nov 16, 1987

Dated: July 2, 1986

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE • BOSTON 02133

MICHAEL S. DUKAKIS
GOVERNOR

March 27, 1986

Statement of Governor Michael S. Dukakis
on Seabrook Emergency Response Plans

Attorney General Bellotti and I are joining today to announce the Commonwealth's position on the emergency response plans for the six Massachusetts communities located in the evacuation zone of the Seabrook nuclear power plant.

The Attorney General and his staff have worked for many years on the legal issues raised by the siting of the nuclear plant at Seabrook. Members of my own administration have worked intensively for many months on the evacuation plans which must be approved before the Seabrook plant can be licensed to operate. While there is work left to be done on these plans, we have come to some basic conclusions.

First and foremost, we believe there will be a significantly increased hazard posed to the public in the summer months when the Seabrook plant is in operation. The area around the Seabrook plant is a difficult area to evacuate, particularly during those summer weeks when so many Massachusetts residents and visitors use the beaches in the vicinity. We have worked very hard to reduce this increased hazard by developing the best emergency plans we can, but we have concluded that the only prudent way to protect against this hazard is for the Seabrook plant to shut-down during those summer months, until such time as adequate shelter for the public can be planned and built.

We are prepared to work expeditiously and in good faith to set standards for shelters, which we would expect the Seabrook owners to construct under the Commonwealth's supervision. Until such time as those shelters are available to the public, however, we will insist that the Seabrook plant not operate during the period of peak beach usage.

We do not believe that the evacuation plans are adequate or capable of implementation during the summer months, unless the Seabrook plant is shut-down or adequate shelter is in place. For that reason I do not believe the plans are sufficient for an exercise unless there is assurance that either condition, shut-down or shelter, is met by the Seabrook plant.

Let me say that I hope that the Seabrook owners will work with us so that we can put these prudent safeguards into place for the protection of the public. I think it has been clear from the start of construction at Seabrook that the siting of the plant at that location would make the protection of the public difficult. It is unfortunate that the nuclear regulatory process regards emergency planning as almost a last step in the licensing of a nuclear plant.

This has not been an easy process for the citizens of the affected communities. Their concern and their involvement in this process has been a tremendous help to me and to the Attorney General. We will continue to work closely with those affected as this process goes forward. To this end, I have instructed Public Safety Secretary Charles Barry to hold a public hearing within two weeks at which the evacuation plans, with this important new provision, will be reviewed by the citizens of the affected communities.

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE • BOSTON 02133

MICHAEL S. DUKAKIS
GOVERNOR

May 2, 1986

Lee Thomas, Administrator
U.S. Environmental Protection Agency
401 M Street SW
Washington, D.C. 20460

Dear Lee:

I am writing to you in your capacity as leader of the federal inter-agency task force on the Chernobyl nuclear accident to underscore the very real need of Massachusetts and other states to receive the best information and guidance possible on the implications of the Chernobyl accident for nuclear plant safety and evacuation planning here in the U.S.

It seems apparent that nuclear safety standards in the U.S. are higher than in the Soviet Union, and that the Chernobyl reactors are of a type much different than those we have here in New England. Nevertheless, any nuclear accident occuring at this still-young stage in the history of nuclear power is a cause for a serious reassessment.

As you are aware, the state government role in the development of nuclear power plants has been limited greatly by the Atomic Energy Act and successor laws and regulations. However, the evacuation planning requirements created in the wake of the Three Mile Island accident have given states an important responsibility for seeing that people are adequately protected in the event of an accident at a nuclear plant. Thus, state government must be a part of the new reassessment of nuclear power.

Here in Massachusetts this responsibility is heightened because of the pending licensure of the Seabrook nuclear power plant in New Hampshire. Ironically, we have been forced to consider the feasibility of safe evacuation from the Seabrook area only now that the Seabrook plant has reached virtual completion of construction. Massachusetts contended from the inception of the Seabrook project that it was inappropriately sited, but this contention has been consistently ruled out of order by federal regulatory agencies - as recently as this very week.

Nevertheless, we have made a commitment to follow-through on a rigorous evacuation planning process, despite the sincere belief of many local residents that no evacuation plan can be sufficient. But we will not submit an evacuation plan simply for the sake of submitting an evacuation plan. Any evacuation plan that I submit to the federal government will be designed to guarantee to the maximum extent possible the health and safety of the people of Massachusetts.

Our current assumptions about nuclear plant evacuation planning derive from the experience of Three Mile Island. The Chernobyl accident - now the worst in history- may challenge those assumptions anew. For that reason it is vitally important that all states which are exercising their responsibility for nuclear emergency planning receive the benefit of the best information and analysis available.

I realize that the secretive practices of the Soviet Union act to frustrate our need and that of other nations for accurate information. We can only hope that the force of world opinion will cause the Soviets to act responsibly.

Even so, there is much that can be learned through sources available to you and the other federal agencies participating in the federal task force. I would hope and expect that the efforts of the federal task force and its member agencies will be directed towards helping the states exercise the heavy responsibility which now faces them.

Sincerely,

Michael S. Dukakis

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE • BOSTON 02133

MICHAEL S. DUKAKIS
GOVERNOR

June 25, 1986

Mr. Edward Brown, President
New Hampshire Yankee Division
Public Service of New Hampshire
P.O. Box 300
Seabrook, New Hampshire 03874

Dear Mr. Brown:

I am writing in regard to your intention to initiate fuel loading and low-power testing of Seabrook Station in July. After careful analysis of the current status of Seabrook's application for licensure, coupled with the impact that premature low-power testing would have, I have come to the conclusion that such testing would be a grave mistake at this time. Therefore, I urge you to postpone low-power testing until it is determined that Seabrook is entitled to full licensure.

My principal objection to low-power testing is the irreparable injury and irreversible impact it could have on the current situation. First, in the area of health and safety, it is unwise to begin operations at any level, even partial, before off-site emergency safety plans have been certified, much less been tested. The Chernobyl disaster, among other things, reminds us that an accident can occur at low-power. It seems to me foolhardy to proceed unless low-power testing is absolutely essential at this stage.

Second, low-power testing could have a devastating impact on any option for conversion of Seabrook Station to a non-nuclear use. Without in any way prejudging my forthcoming decision regarding off-site emergency preparedness planning, it is clear that the interests of both shareholders and ratepayers will be irreparably harmed if Seabrook Station proves unlicensable for nuclear power production and, at the same time, there is no feasible alternative for preserving the plant for productive use. The loading of nuclear fuel and low-level operation will contaminate the Seabrook site and could eventually render Seabrook Station unavailable for alternative fuel sources. Such a move is decidedly not in the public interest.

Third, low-power operation is particularly imprudent at this point because, at the same time there is so much to lose if operation goes forward, there is very little to be gained. It is my understanding that a relatively short period is required for testing prior to full operation, five months being the general estimate. You have already indicated that you do not believe full operation of the plant is possible before the spring of 1987. At this point we simply do not know when licensure is likely to occur. Indeed, at the Shoreham site in Long Island where low-power operation began last year, the contamination process has begun and the site may be unavailable for alternative energy, and yet licensure by the NRC is unresolved and still uncertain. This is a trap that is extremely unfortunate and still avoidable at Seabrook.

In summary, I believe that the arguments against proceeding to low-power testing at Seabrook at this time are compelling , and I hope that the joint owners will see fit to postpone any testing until such time as the plant's eligibility for full licensure has become clear.

Sincerely,

Michael S. Dukakis

PSNH

Public Service of New Hampshire

New Hampshire Yankee Division

June 26, 1986

NHY #860905

Governor Michael S. Dukakis
The Commonwealth of Massachusetts
Executive Department
State House
Boston, Massachusetts 02133

Dear Governor Dukakis:

I want to assure you that the Joint Owners of Seabrook Station and New Hampshire Yankee will give the request contained in your letter of June 25 very serious study. I will be able to respond after we have had an opportunity to review your concerns thoroughly. I have some questions about specific points contained in your letter and believe that a meeting with you to seek clarification is appropriate. The concerns and the issues are of such significance that a brief meeting would be much more productive than a lengthy exchange of correspondence or discussions through intermediaries.

I must respond to one point contained in your letter regarding the impact of low power testing on public health and safety. There is no evidence of any risk to the public health and safety during testing at up to five percent power and, as has been demonstrated by the performance of the industry in the United States, there is a negligible risk to the public at any power level. Also, the Nuclear Regulatory Commission, after extensive study, does not require completion of offsite emergency response plans prior to fuel load and low power testing.

I will call your office soon to arrange a meeting at a mutually convenient time; in the meantime I will discuss your concerns with the Joint Owners. I look forward to discussing this with you.

Sincerely,

Edward A. Brown
President

FAB:bes

# Affidavit

## of

## Gordon R Thompson PhD

I, Gordon Thompson, hereby depose and say :

My qualifications are set forth in an attached resume. This indicates that I have experience in assessing the potential for accidental releases of radioactive material from nuclear power facilities.

This affidavit concerns the accident potential associated with operation of the Seabrook nuclear power plant, Unit 1, at 5 percent of rated power. Specifically, prolonged operation at this power level may create the potential for core damage and the release of radioactive material to the environment.

Although operation at the 5 percent level will generate a smaller inventory of waste products in the core, and therefore a lower level of decay heating, than will full-power operation for the same period, the potential for core damage may still exist. Most notably, reactor cores of the Seabrook type contain sufficient zirconium that the energy potentially available from zirconium-steam reaction is comparable with the energy needed to melt the fuel inventory. Thus, if the level of decay heating is sufficient to initiate zirconium-steam reaction following an interruption of core cooling, fuel damage may occur.

Should fuel damage occur, and a pathway from the core region to the environment exist, radioactive material may be released to the environment. After prolonged operation at the 5 percent level, this release may be sufficient to produce offsite doses in excess of Protective Action Guides (PAGs).

In the particular circumstances surrounding the Seabrook plant, there could be a long delay, perhaps of 1 year or more, between the commencement of operation at the 5 percent level and the granting of a full power license. It is therefore important to determine the duration of operation at the 5 percent level which could, in the event of an accident,

lead to offsite doses in excess of PAGs. Current licensing practice indicates that operation for that period or longer should not occur in the absence of a radiological emergency response program. For example, NUREG-0654 Rev. 1, November 1980, states (at page 6) that : *The overall objective of emergency response plans is to provide dose savings (and in some cases immediate life saving) for a spectrum of accidents that could produce offsite doses in excess of Protective Action Guides.*

Signed under the pains and penalties of perjury, this 2nd day of July, 1986 :

Gordon R. Thompson

Gordon R Thompson PhD
Institute for Resource and Security Studies
27 Ellsworth Avenue
Cambridge, MA 02139

Commonwealth of Massachusetts
County of Middlesex
Subscribed and sworn to before
me this 2 day of July 1986

Joanne M Ribeiro
Notary Public

Joanne M. Ribeiro
NOTARY PUBLIC
My Commission Expires January 16, 1992

# Resume
# for
# Gordon Thompson

June 1986

## Professional Expertise

Consulting scientist on energy, environment, and international security issues.

## Education

* PhD in Applied Mathematics, Oxford University, 1973.
* BE in Mechanical Engineering, University of New South Wales, Sydney, Australia, 1967.
* BS in Mathematics and Physics, University of New South Wales, 1966.

## Current Appointments

* Executive Director, Institute for Resource & Security Studies ( IRSS ), Cambridge, MA.
* Coordinator, Proliferation Reform Project ( an IRSS project ).
* Treasurer, Center for Atomic Radiation Studies, Acton, MA.
* Member, Board of Directors, Political Ecology Research Group, Oxford, UK.
* Member, Board of Directors, New Century Policies Educational Programs Inc, Cambridge, MA.
* Member, Advisory Board, Gruppe Okologie, Hannover, FRG.

## Consulting Experience ( selected )

* Lakes Environmental Association, Bridgton, ME, 1986 : analysis of federal regulations for disposal of radioactive waste.
* Three Mile Island Public Health Fund, Philadelphia, PA, 1983-present : studies related to the Three Mile Island nuclear plant.
* Attorney General, Commonwealth of Massachusetts, Boston, MA, 1984-present : analyses of the safety of the Seabrook nuclear plant.
* Union of Concerned Scientists, Cambridge, MA, 1980-1985 : studies on energy demand and supply, nuclear arms control, and the safety of nuclear installations.
* Conservation Law Foundation of New England, Boston, MA, 1985 : preparation of testimony on cogeneration potential at the Maine facilities of

Great Northern Paper Company.

* Town & Country Planning Association, London, UK, 1982-1984 : coordination and conduct of a study on safety and radioactive waste implications of the proposed Sizewell nuclear plant.
* US Environmental Protection Agency, Washington, DC, 1980-1981 : assessment of the cleanup of Three Mile Island Unit 2 nuclear plant.
* Center for Energy & Environmental Studies, Princeton University, Princeton, NJ, 1979-1980 : studies on the potentials of various renewable energy sources.
* Government of Lower Saxony, Hannover, FRG, 1978-1979 : coordination and conduct of studies on safety aspects of the proposed Gorleben nuclear fuel center.

Other Experience ( selected )

* Co-leadership ( with Paul Walker ) of a study group on nuclear weapons proliferation, Institute of Politics, Harvard University, 1981.
* Foundation ( with others ) of an ecological political movement in Oxford, UK, which contested the 1979 Parliamentary election.
* Conduct of cross-examination and presentation of evidence, on behalf of the Political Ecology Research Group, at the 1977 Public Inquiry into proposed expansion of the reprocessing plant at Windscale, UK.
* Conduct of research on plasma theory ( while a PhD candidate ), as an associate staff member, Culham Laboratory, UK Atomic Energy Authority, 1969-1973.
* Service as a design engineer on coal plants, New South Wales Electricity Commission, Sydney, Australia, 1968

Publications ( selected )

* Nuclear-Weapon-Free Zones : A Survey of Treaties and Proposals ( edited with David Pitt ), Croom Helm Ltd, Beckenham, UK, forthcoming.
* The Source Term Debate : A Report by the Union of Concerned Scientists ( written with Steven Sholly ), January 1986, Union of Concerned Scientists, Cambridge, MA.
* "Checks on the spread" ( a review of three books on nuclear proliferation ), Nature, 14 November 1985, pp 127-128.
* Editing of Perspectives on Proliferation, Volume I, August 1985, published by the Proliferation Reform Project, Institute for Resource and Security Studies, Cambridge, MA.
* "A Turning Point for the NPT ?", ADIU Report, Nov/Dec 1984, pp 1-4,

University of Sussex, Brighton, UK.

* "Energy Economics", in J Dennis (ed), The Nuclear Almanac, Addison-Wesley, Reading, MA, 1984.
* "The Genesis of Nuclear Power", in J Tirman (ed), The Militarization of High Technology, Ballinger, Cambridge, MA, 1984.
* A Second Chance : New Hampshire's Electricity Future as a Model for the Nation ( written with Linzee Weld ), Union of Concerned Scientists, Cambridge, MA, 1983.
* Safety and Waste Management Implications of the Sizewell PWR ( prepared with the help of 6 consultants ), a report to the Town & Country Planning Association, London, UK, 1983.
* Utility-Scale Electrical Storage in the USA : The Prospects of Pumped Hydro, Compressed Air, and Batteries, Princeton University report PU/CEES # 120, 1981.
* The Prospects for Wind and Wave Power in North America, Princeton University report PU/CEES # 117, 1981.
* Hydroelectric Power in the USA : Evolving to Meet New Needs, Princeton University report PU/CEES # 115, 1981.
* Editing and part authorship of "Potential Accidents & Their Effects", Chapter III of Report of the Gorleben International Review, published in German by the Government of Lower Saxony, FRG, 1979 -- Chapter III available in English from the Political Ecology Research Group, Oxford, UK.
* A Study of the Consequences to the Public of a Severe Accident at a Commercial FBR located at Kalkar, West Germany, Political Ecology Research Group report RR-1, 1978.

Expert Testimony ( selected )

* International Physicians for the Prevention of Nuclear War, 6th Annual Congress, Koln, FRG, 1986 : Relationships between nuclear power and the threat of nuclear war.
* Maine Land Use Regulation Commission, 1985 : Cogeneration potential at facilities of Great Northern Paper Company.
* Interfaith Hearings on Nuclear Issues, Toronto, Ontario, 1984 : Options for Canada's nuclear trade and Canada's involvement in nuclear arms control.
* Sizewell Public Inquiry, UK, 1984 : Safety and radioactive waste implications of the proposed Sizewell nuclear plant.
* New Hampshire Public Utilities Commission, 1983 : Electricity demand and supply options for New Hampshire.
* Atomic Safety & Licensing Board, Dockets 50-247-SP & 50-286-SP, US Nuclear Regulatory Commission, 1983 : Use of filtered venting at the Indian

Point nuclear plants.

* US National Advisory Committee on Oceans and Atmosphere, 1982 : Implications of ocean disposal of radioactive waste.
* Environmental & Energy Study Conference, US Congress, 1982 : Implications of radioactive waste management.

Miscellaneous

* Australian citizen.
* Married, one child.
* Resident of USA, 1979 to present; of UK, 1969-1979.
* Extensive experience of public speaking before professional and lay audiences.
* Author of numerous newspaper, newsletter, and magazine articles and book reviews.
* Has received many interviews from print and electronic media.

**********

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | |
| PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, ET AL. | ) | Docket No. (s) 50-443/444-OL |
| (Seabrook Station, Units 1 and 2) | ) | |
| | ) | |
| | ) | |

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OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

CERTIFICATE OF SERVICE

I, Carol S. Sneider, hereby certify that on July 2, 1986 I made service of the within documents by mailing copies thereof, postage prepaid, by first class mail, or as indicated by an asterisk by express mail, to:

Helen Hoyt, Chairperson
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U.S. Nuclear Regulatory Commission
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Bethesda, MD 20814

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Washington, DC 20555

Carol S. Sneider

Carol S. Sneider
Assistant Attorney General
Environmental Protection Division

July 2, 1986