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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING APPEAL BOARD

Before Administrative Judges:

Alan S. Rosenthal, Chairman
Thomas S. Moore
Howard A. Wilber

In the Matter of)

PUBLIC SERVICE COMPANY)
OF NEW HAMPSHIRE, ET AL.)

(Seabrook Station, Units 1 and 2))

) Docket Nos. 50-443-OL
) 50-444-OL

) March 11, 1991

REPLY TO APPEAL BOARD ORDER OF FEBRUARY 22, 1991

In an order dated February 22, 1991 the Appeal Board directed interested parties to respond to a series of questions concerning the ALAB-918 issues remanded by the United States Circuit Court of Appeals for the District of Columbia in Massachusetts v. NRC, No. 89-1306, ___F.2d___ (D.C. Cir. 1991). The Massachusetts Attorney General, The New England Coalition on Nuclear Pollution, and the Seacoast Anti-Pollution League ("the Intervenors") make the following response to the Appeal Board's order:

1. While it is possible that the 1990 exercise mooted the issues raised in the June 1988 On-Site Exercise Contention, there is no information in the record presently before this Board upon which to make such a conclusion. All that is presently known about the December 1990 exercise is that it purported to test the

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on-site emergency plan. See the attached inspection report, Exhibit A. While the inspection report shows no deficiencies in the December 1990 on-site exercise, there is no information as to specifically what steps the on-site operators took to meet the challenges posed in the exercise. For example, while the report indicates that one of the activities observed was accident analysis and mitigation, it does not indicate how the staff analyzed the accident or what steps were taken to mitigate the accident. See page 4 of the report. The report gives no indication whether, for instance, the on-site operators successfully isolated the release path as the Pollard Affidavit alleged they failed to do during the June 1988 exercise.

Since the NRC Staff did not find deficiencies in the September 1989 exercise, nor in the June 1988 exercise, the December 1990 exercise was not designed as a remedial one specifically to test faults observed in those exercises, such as the faults alleged in the On-Site Contention presently under consideration by this Board. The Pollard affidavit identified five examples of exercise weaknesses. At present, there is no information in the record as to whether the December 1990 exercise tested those five weaknesses, nor is there any information as to what steps the on-site personnel took demonstrating that those weaknesses have been corrected. To date neither the Applicants, nor NRC staff, have filed a motion to dismiss the on-site exercise contention as moot and have not provided any affidavits or other evidence that demonstrates it is moot.

2. (a) The premise of ALAB-918 that the five factors set forth in 10 C.F.R., §2.714(a)(1) are solely procedural requirements cannot be squared with the Court's view in Massachusetts v. NRC, Id. It appears that under the Court's opinion while a Licensing Board may consider the procedural requirements of 10 C.F.R., §2.714, at least as to factor III a Licensing Board must also consider the substance of the contention and any supporting affidavits to see if an issue material to licensing is raised. While it is possible that the other four factors should also be considered in some manner quite apart from being purely procedural requirements, that issue does not appear to be directly addressed in Massachusetts v. NRC. Within this context, it is appropriate to take note of the Court's comments that application of the five factors is "odd" in the context of a late-filed contention based on a subsequent exercise.

"On their face, the five factors listed in §2.714(a)(1) as justifying intervention are not well suited to the question of whether a late-filed contention should be considered where based on deficiencies found in a subsequent exercise, and we think it odd that the NRC should choose to apply them in this context. An exercise contention will in practice almost always be filed out of time, so the question of "good cause" seems less central. Two of the other factors also do not make much sense here. Factor (iv) does not seem relevant because there would almost never be other parties already litigating the issues raised by the the new contention. And factor (v) is potentially inconsistent with UCS I's holding that emergency preparedness exercises are material to licensing; it should not be a strike against admitting the contention that it will be "broaden the issues" to include material questions about the adequacy of preparedness. Massachusetts v. NRC, Slip Op. 41-42."

(b) A material issue is one that is relevant to a licensing proceeding such as issues raised by emergency preparedness exercises. When such an issue is presented in a contention, the contention cannot be excluded on a procedural basis alone. In the Intervenor's On-site Exercise Contention the allegation was made that the state of on-site emergency preparedness observed in the June 1988 exercise at Seabrook did not provide assurance that adequate protective measures could, and would, be taken in the event of a radiological emergency as required by 10 C.F.R. §50.47(d). The Contention also alleged that the on-site emergency plan failed to meet the specific planning standards of 10 C. .R., §§50.47(b)(2), (b)(14) and Part 50, Appendix E, §IV.F sub-section (b)(2). Since the contention raised an issue concerning an emergency preparedness exercise, under the Court of Appeal's reading of UCS I, it is material to licensing. Slip Op. at 41-42.

(c) If a material issue is raised in a contention, the third factor weighs in favor of the Intervenor's sponsoring the contention. The third factor must still be balanced against the other four factors and, theoretically, under such a balancing test the contention might be rejected. However, in reality it is unlikely to ever be rejected upon such a balancing test because factors (ii) and (iv) will almost always weigh in favor of Intervenor's. While factor (v) will almost always weigh against the admission of a late filed contention, at best, that will result in a situation where factors (i) and

(v) weigh against the admission of the Contention but factors (ii), (iii), and (iv) weigh in favor. Furthermore, as noted above the Court of Appeal is of the opinion that the application of factor (v) is potentially inconsistent with UCS I where a contention addresses an emergency preparedness exercise issue. Under such a balancing test, the majority of factors will almost always weigh in favor of admission of a contention.

(d) It does not appear that under the Court's rationale a determination of whether a "material issue" is raised is independent of factual issues. A material issue seemingly must be supported by factual allegations. Those facts are then material to the issue raised. It would appear that if facts are in dispute, there must be a hearing to resolve the issue.

(e) The Appeal Board's application of the fundamental flaw test in ALAB-918 would appear to exclude deficiencies in emergency personnel performance from ever being considered a fundamental flaw. Under that interpretation a training deficiency could virtually always be readily correctable by further training. That leads to the anomalous result that one could have an emergency plan, but virtually no personnel competent to implement the plan, and yet, that flaw would not be a hinderance to the issuance of an operating license. In its opinion, the Court of Appeals expressed its concern with that result.

"We nevertheless recognized that even the best of plans may be so poorly implemented that it would be foolhardy to license a plant until fundamental deficiencies detected in an exercise, such as serious shortcomings in staff training, were substantially corrected." Id. Slip Op. at 44-45."

Where there are serious challenges to the adequacy of operator training, such as in the Intervenor's On-Site Contention, one cannot dismiss the contention by saying that the deficiencies are readily correctable through further training.

It would appear that if there are disputed facts, or disputed expert opinions, on this issue a hearing would be required to resolve the issue. See the answer provided to (d) above.

3. In remanding the issue the Court of Appeals indicated that it was vacating ALAB-918 because of an error grounded in "a lack of reasoned decision making." Id. at 46. The Court declined to suspend or vacate the operating license because it balanced that error "against imposing an immensely disruptive interim status quo that may itself be displaced." Id. at 47. Yet, if one considers that "lack of reasoned decision making" in the context of what is required for the issuance of a full power operating, there appears to be cause to vacate and/or suspend the license pendente lite.

For an operating license to issue there has to be reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Until there is a complete resolution of the issues raised in the June 1983

On-Site Exercise Contentions as to the competence of the plant's operating personnel, that assurance is lacking. Attached to the Intervenor's Application For a Stay of LBP-89-32 is an affidavit signed by Steven Sholly and Gregory Minor pointing out the risks inherent in having unresolved training issues. Exhibit B. That affidavit appears to apply with equal force in the present context. Until one can have full faith in the competence of Seabrook Stations' operators, the plant should not be permitted to operate. As long as there is an open and unresolved on-site exercise contention, assurance of the emergency response capabilities of the plant personnel remains an open question. For this reason, the license should be vacated, or at least suspended, pending resolution of the matter.

Respectfully submitted,

NEW ENGLAND COALITION ON
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Dated: February 25, 1991
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EXHIBIT A

**U. S. Nuclear Regulatory Commission
Region I**

Report No. 50-443/90-85
 Docket No. 50-443
 License No. NPF-86
 Licensee: Public Service Company of New Hampshire
 New Hampshire Yankee Division
 Seabrook, New Hampshire 03874
 Facility Name: Seabrook Station, Unit 1
 Inspection Dates: December 11-14, 1990
 Inspection At: Bolton, Massachusetts, and Newington and Seabrook, New
 Hampshire

Inspector: C. G. Amato
 C. G. Amato, Regional Team Leader
 NRC Region I

1/30/91
 date

N. Dudley, Senior Resident Inspector, Seabrook Station
 E. Fox, NRR/PEPB
 R. Fuhrmeister, Resident Inspector, Seabrook Station

Approved: W. J. Lazarus
 W. J. Lazarus, Chief, Emergency
 Preparedness Section, DRSS

1/30/91
 date

**Inspection Summary: Inspection on December 11-14, 1990 (Inspection
 Report No. 50-443/90-85)**

Areas Inspected: Announced, routine, safety inspection of the licensee's emergency
 preparedness exercise.

Results: No exercise weaknesses or plan deficiencies were identified. The licensee
 demonstrated the ability to implement their emergency plan in a manner which would
 protect the health and safety of the public.

DETAILS

1. PERSONS CONTACTED

Unless indicated otherwise the following personnel are Public Service Company of New Hampshire, New Hampshire Yankee Division, Seabrook Station (NHY) staff, who attended the exercise exit meeting at Seabrook on December 14, 1990.

R. Boyd, Jr., Manager, Performance Services
E. Darois, Health Physics Supervisor
B. Drawbridge, Executive Director, Nuclear Production
S. Ellis, Emergency Preparedness Manager, Response and Implementation
T. Feigenbaum, President and Chief Executive Officer, New Hampshire Division, Public Service Company of New Hampshire
G. Gram, Executive Director, Office of Emergency Preparedness and Community Relations
T. Grew, Specialty Training Manager
J. MacDonald, Emergency Preparedness Technical Issues Coordinator
D. McLain, Production Services Manager
D. Moody, Seabrook Station Manager
J. Peschel, Corporate Support Manager
J. Peterson, Assistant Operations Manager
N. Pillsbury, Director of Quality Programs
D. Scanzoni, Corporate Communications Manager
S. Schultz, Vice President, Yankee Atomic Electric Company
P. Stroup, Director, Emergency Preparedness
W. Sturgen, Nuclear Services Manager
D. Tailleart, Emergency Preparedness Manager
D. Young, Scenario Department Supervisor

The inspectors also interviewed and observed the actions of other licensee personnel.

2. EMERGENCY EXERCISE

The Seabrook Station, Unit No. 1 announced, full-participation exercise was conducted on December 13, 1990, from 11:00 a.m. to 7:00 p.m. The State of New Hampshire, the New Hampshire Yankee Off-Site Response Organization, and surrounding New Hampshire Towns participated.

2.1 Pre-exercise Activities

The exercise objectives were submitted to NRC Region I on August 27, 1990 and, the complete scenario package on September 24, 1990 for NRC review and evaluation. Region I representatives had telephone conversations with the licensee's emergency preparedness staff to discuss the scope and content of the scenario. As a result, minor revisions were made to the scenario which allowed

adequate testing of the major portions of the Seabrook Station Unit No. 1 Emergency Plan and Implementing Procedures and also provided the opportunity for the licensee to demonstrate those areas previously identified by the NRC as in need of corrective action. NRC observers attended a licensee briefing on December 13, 1990. NRC suggested changes to the scenario made by the licensee were discussed during the briefing. The licensee identified which emergency response activities would be simulated and indicated that controllers would intercede in exercise activities if necessary to prevent disruption to normal plant activities.

2.2 Exercise Scenario

The exercise scenario included the following events:

- Initial condition equipment out of service: a charging pump, a containment spray pump, a Waste Building Exhaust Fan, and a Control Building Intake Fan;
- A reactor coolant system loop piping weld fails and a leak into the containment results;
- Declaration of an Alert (reactor coolant leak greater than 70 gallons per minute);
- The irradiation specimen basket and specimens fall to the bottom of the reactor vessel;
- The resulting loose parts from the irradiation specimen basket caused fuel damage and the release of fission products to the reactor coolant system water;
- A high radiation alarm on let-down system monitor occurs as a result of high fission product activity;
- Solar storm induced geomagnetic disturbances cause damage to unit substations at the Seabrook Station site and the Newington Emergency Operations Facility (EOF). One alternating current supply to the EOF is lost and several Waste Processing Building electrical loads are lost;
- The high range post-loss-of-coolant monitor indicates exposure rates in excess of 2,500 rem/hr inside the containment as a result of the failed fuel and coolant system leak, causing declaration of a Site Area Emergency;

- The leaking reactor coolant loop piping weld fails completely, resulting in a large break loss-of-coolant accident followed by a reactor trip and safety injection;
- The loss-of-coolant accident results in a high range post-loss-of-coolant monitor reading of 25,000 rem/hr inside containment and declaration of a General Emergency;
- As a result of a damaged containment spray pump, radioactive material is released into the environment.

2.3 Activities Observed

During the conduct of the licensee's exercise, NRC inspection team members made detailed observations of the activation and augmentation of the Emergency Response Facilities and the Emergency Response Organization staff and actions of the Emergency Response Organization staff during operation of the Emergency Response Facilities in response to the simulated emergency. The following activities were observed:

- Use of operations and emergency plan implementing procedures;
- Detection, classification, and assessment of scenario events;
- Direction and coordination of emergency response;
- Notification of licensee and New Hampshire State government personnel and communication of pertinent plant status information to State personnel;
- Communications/information flow, and record keeping;
- Assessment and projection of off-site radiological dose and consideration of protective actions;
- Accident analysis and mitigation.

3. CLASSIFICATION OF EXERCISE FINDINGS

Emergency preparedness exercise findings are classified as follows:

Exercise Strengths

Exercise strengths are areas of the licensee's staff response that provide strong positive indication of their ability to cope with abnormal plant conditions and implement the emergency plan implementing procedures.

Exercise Weaknesses

Exercise weaknesses are areas of the licensee's staff response in which the performance was such that it could have precluded effective implementation of the emergency plan implementing procedures in the event of an actual emergency in the area being observed. Existence of an exercise weakness does not of itself indicate that overall response was inadequate to protect public health and safety.

Areas for Improvement

An area for improvement is an area of the licensee's staff response which did not have a significant negative impact on the licensee's ability to implement the emergency plan and implementing procedures and response was adequate. However, it should be evaluated by the licensee to determine if corrective action could improve performance.

4. EXERCISE OBSERVATIONS

The NRC team noted that the licensee's activation of the Emergency Response Organization, Emergency Response Facilities, and use of these facilities were consistent with their Emergency Plan and Emergency Plan Implementing Procedures. No exercise weaknesses were identified. Following are the detailed observations of performance in each of the emergency response facilities.

4.1 Control Room

The following strengths were identified:

1. Reactor operators recognized symptoms and selected the correct control room procedures and used them properly.
2. Operators correctly interpreted changing containment conditions indicating a reactor coolant leak and took corrective action including estimation of the leak rate.

3. When control room habitability was challenged following loss of positive pressure, air samples were taken and the correct evaluation was made preventing an unnecessary control room evacuation.
4. Operators responded correctly to an anomalous safety parameter display system indication for subcooling margin and reactor coolant system integrity.

No exercise weaknesses or areas for improvement were identified.

4.2 Technical Support Center (TSC)

The following exercise strengths were identified:

1. Excellent command and control was demonstrated and frequent staff briefings were conducted.
2. Data were trended and extrapolated. Problems were anticipated. As a result, the time to reach conditions justifying a Site Area Emergency declaration were accurately predicted.
3. The need to identify plant vulnerabilities as early as possible led to a request to use probabilistic risk assessment.
4. Support resources from Yankee Nuclear Service Division engineers were appropriately requested and utilized.

No exercise weaknesses or areas for improvement were identified.

4.3 Operations Support Center (OSC)

The following exercise strengths were identified.

1. The OSC was promptly staffed with NRC V1 physics personnel and the various disciplines of maintenance personnel.
2. Command and control were excellent. OSC operations were conducted in a quiet professional atmosphere.
3. Repair teams were quickly established, well controlled, and dispatched with adequate protection from hazards.

No weaknesses or areas for improvement were identified.

4.4 Emergency Operations Facility (EOF)

The following exercise strengths were identified:

1. There was excellent support of and interaction with representatives of the New Hampshire State government and the New Hampshire Yankee Massachusetts Off Site Response Organization.
2. There was prompt and correct response to a simulated loss of the main electrical supply to the EOF.
3. Dose assessment personnel anticipated possible release pathways and performed a "what if" calculation based on possible containment breach in anticipation of a possible release.
4. There was good command and control, frequent staff briefings and EOF manager's meetings, which included government representatives and the NHY Massachusetts Off-Site Response Organization.
5. Environmental monitoring teams were repositioned to minimize mission dose.
6. Feedback was obtained regarding implementation of off site protective actions. This information was announced to EOF staff and relayed to other Emergency Response Facilities and Seabrook Station staff.

No exercises weaknesses were identified.

The following areas for improvement were identified:

1. The responsibilities of the NHY staff member processing inhalation pathway samples should be reviewed to ensure that activities which might impede his performance are assigned to other response personnel.
2. The procedure for processing of inhalation pathway samples could be streamlined by restricting concerns to iodine and noble gas concentrations.

4.5 Media Center

The following strengths were identified:

1. There were good press briefings using language understandable to the public.
2. There was good response to the inquiries of real and simulated reporters.

No exercise weaknesses or areas for improvement were identified.

4.6 Correction of Previously Identified Exercise Weaknesses and Areas for Improvement

The inspectors observed licensee response in areas which had previously been identified as weaknesses or areas for improvement during the 1988 and 1989 evaluated emergency exercises.

Four exercise weaknesses were identified during the June, 1988 exercise. All of these weaknesses were re-addressed and closed in a special inspection. The satisfactory resolution of these weaknesses is documented in NRC Inspection Report 50-443/88-10.

Three areas for improvement were identified during the 1989 exercise:

1. Transfer of authority from the Short Term Emergency Director (Shift Supervisor) to the Site Emergency Director was not announced on the plant paging system.
2. Telephone line noise caused some minor communications problems in the Technical Support Center.

These items did not recur. Performance in the above areas was acceptable during this exercise.

3. Boron concentration curves should be reviewed to verify that they cover all reasonably expected conditions.

This item was the result of the scenario which involved a core at end-of-life while the plant was actually at beginning-of-core-life. The curves used during the exercise were appropriate for the actual plant conditions. As the core ages the licensee revises the curves as appropriate. The inspector has no further concerns regarding this item.

The inspector considers each of the previously identified weaknesses or areas for improvement to be satisfactorily resolved.

5. YANKEE ATOMIC ELECTRIC COMPANY (YAEC) SUPPORT OF SEABROOK STATION EMERGENCY PREPAREDNESS ACTIVITIES

5.1 Emergency Response Support

Through contractual arrangement YAEC provides emergency response support to New Hampshire Yankee (NHY) (as well as several other New England area utilities) to supplement emergency response functions performed by the station emergency response organization. Generally, the support services provided are a back-up to functions performed by the NHY staff, however in two cases the functions are the primary tasks of YAEC.

The first of these is the task of core damage assessment, which is conducted for NHY by the Yankee Nuclear Service Division (YNSD) of Yankee Atomic Electric Company at the YAEC Engineering Support Center. The relationship and function are described in the Seabrook Station Radiological Emergency Plan. During the exercise, core damage assessments were conducted promptly, results were consistent with the scenario information available to the emergency response organization, and the information was promptly communicated to the Site Emergency Director in the TSC.

The other emergency response task is the analysis of non-airborne environmental samples (water, soil, milk, vegetation, etc.). As this exercise was not an ingestion pathway exercise, demonstration of this capability was not an objective of the exercise. The YNSD support personnel responsible for this function were observed to arrive at the EOF and set up and test their equipment and would have been ready to perform the appropriate sample analyses if necessary.

5.2 Audit of YNSD Functions

The inspector interviewed YAEC Quality Assurance (QA) personnel and NHY personnel to ascertain whether audits are performed of the emergency response functions that YNSD provides under the Seabrook Emergency Plan. Although YAEC performs audits of the support provided by YNSD to several utilities, the audits are not specific to services provided to NHY. NHY performs project management reviews of the YAEC Nuclear Service Division program. A NHY representative indicated that he believed that a combination of the YAEC audits, YAEC program reviews, and the NHY management reviews adequately ensured the quality of emergency response services provided by YNSD. However, based on the inspector's concerns, NHY agreed to add the audit of the YNSD-supplied services to the routine 10 CFR 50.54(t) audit of the NHY emergency preparedness program.

The inspector had no further questions in this area.

6. LICENSEE CRITIQUE

The NRC team attended the licensee's exercise critique on December 14, 1990 during which the licensee's lead controllers and observers discussed observations of the exercise. The licensee's critique was critical and thorough.

7. SEABROOK STATION EMERGENCY RESPONSE ORGANIZATION (ERO) TRAINING STATUS

To determine if an adequate number of personnel were qualified to implement the on-site portion of the Seabrook Radiological Emergency Plan, the inspector reviewed training summaries, the qualification list, and the drill schedule.

There are 242 positions described in the emergency response organization (ERO). The training status at the time of this inspection indicated that 1088 persons were qualified to fill these positions. A check of the ERO qualification list indicated an adequate number of personnel were qualified for each key position. During 1990 the licensee conducted 14 drills as follows: one dress rehearsal, six medical drills, one radiation monitoring drill, two evacuation drills, two combined functional drills, one NHY Off-site Response Organization call-in drill, and one Post Accident Sampling System drill.

Based on the above review, this portion of the licensee's emergency preparedness program is acceptable.

8. EXIT MEETING

Following the licensee's exercise self-critique, the NRC team met with the licensee's representatives listed in Section 1 on December 14, 1990 to discuss findings as detailed in this report. The NRC team leader summarized the observations made during the exercise. The licensee was advised that no exercise weaknesses were identified and that all previously identified exercise weaknesses and areas for improvement had been adequately demonstrated. The NRC team also determined that within the scope and limitation of the scenario, the licensee's performance demonstrated the capability to implement the Emergency Plan and Emergency Plan Implementing Procedures in a manner that would adequately protect the health and safety of the public.

EXHIBIT B

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

In the Matter of

PUBLIC SERVICE COMPANY OF
NEW HAMPSHIRE, ET AL.

(Seabrook Station Unit 1)

Docket No. 50-443-OL

November 30, 1989

JOINT AFFIDAVIT GREGORY C. MINOR AND STEVEN C. SHOLLY

I, Gregory C. Minor, do make oath and say:

1. My name is Gregory C. Minor. I am a Vice President of MHB Technical Associates. My business address is 1723 Hamilton Avenue, Suite K, San Jose, California 95125. I received a B.S. in Electrical Engineering from the University of California, Berkeley, in 1960 and a M.S. in Electrical Engineering from Stanford University in 1966.

2. I have over twenty-five years experience in the design, development, research, start-up testing, and management of nuclear reactor systems. From 1960-1976, I worked for General Electric Company in the design, development, and testing of safety and control systems for nuclear power plants. My responsibilities included equipment and systems design, as well as management of a large engineering group responsible for new control room design.

3. For the past thirteen years, I have been an independent technical consultant. In that capacity, I have participated in a variety of studies addressing nuclear facility economic, management, and safety issues for various organizations, including the Department of Energy/Sandia National Laboratories, the Swedish Government, and the offices of several states' Attorneys General. I am currently a consultant on several nuclear plant cases in which design, management, and compliance with existing regulations are being investigated.

4. I am a member of the Nuclear Power Plant Standards Committee for the Instrument Society of America. Also, I participated in a Peer Review Group of the Nuclear Regulatory Commission's Three Mile Island Special Inquiry Group. Further details of my qualifications and professional experience are summarized in my Statement of Professional Qualifications which is appended to this affidavit at Attachment I.

I, Steven C. Sholly, do make oath and say:

5. My name is Steven C. Sholly. Since September 1985, I have been employed as an Associate Consultant by MHB Technical Associates. My business address is 1723 Hamilton Avenue, Suite K, San Jose, California 95125.

6. I have been previously employed by the Union of Concerned Scientists as a Technical Research Associate and Risk Analyst from February 1981 to September 1985, and by the Three Mile Island Public Interest Resource Center as Research Coordinator and Project Director from January 1980 to January 1981. I also have non-nuclear experience in the wastewater treatment and science education fields from September 1975 to January 1980. I received a B.S. in Education, with a major in Earth and Space Science and a minor in Environmental Education, from Shippensburg State College (now Shippensburg University), Shippensburg, Pennsylvania, in 1975.

7. For the last nine and a half years, I have been engaged in analyzing technical nuclear safety, management, design, construction, and regulatory issues and providing technical advice to state and local governments (including the States of California, New York, Illinois, Pennsylvania, Maryland, Maine, Connecticut, and Massachusetts, and Suffolk County, New York) and independent organizations on these issues. I have presented testimony concerning these issues before the Connecticut Department of Public Utility Control on behalf of the Prosecutorial Division and Division of Consumer Counsel, before the California Public Utility Commission on behalf of the Division of Ratepayer Advocates, before the Pennsylvania Public Utility Commission on behalf of the Office of Consumer Advocate, and before the Massachusetts Department of Public Utilities on behalf of the Office of the Attorney General, Commonwealth of Massachusetts. I have also participated as an expert witness in proceedings before the Atomic Safety and Licensing Board in the Indian Point Special Investigation and the operating license review of the Catawba nuclear plant, and have presented testimony before the United States Congress and the Sizewell Inquiry (U.K.) on nuclear safety issues. Further details of my experience and qualifications are contained in my Statement of Professional Qualifications which is appended to this affidavit as Attachment 2.

DISCUSSION

8. On May 26, 1989, New Hampshire Yankee received a license from the U.S. Nuclear Regulatory Commission permitting low power operation (not to exceed 5% of full power, with certain other restrictions) of Seabrook Unit 1 (License No. NPF-67).

9. NRC regulations at 10 CFR 50, Appendix E, require the conduct of an exercise to test the operation license applicant's ability to respond to a radiological emergency. During such an exercise, an accident is simulated, and the applicant's ability to achieve certain objectives is

evaluated by the NRC and the Federal Emergency Management Agency (FEMA). In June 1988, a FEMA/NRC graded exercise was conducted at Seabrook Unit 1. Among the established objectives for the exercise was to "*demonstrate the ability to analyze station conditions, parameter trends and develop potential solutions for placing the unit in a safe, stable condition*". 1/ The scenario for that exercise included a large break LOCA which occurred during efforts to restore an emergency feedwater pump. Notwithstanding the occurrence of the large break LOCA, plant personnel were directed to continue efforts to restore an emergency feedwater pump. This action was illogical since the emergency feedwater system cannot help achieve safe shutdown in the event of a large break LOCA, and the action would have accomplished nothing in a real large break LOCA event toward "*develop[ing] potential solutions for placing the unit in a safe, stable condition*". Indeed, New Hampshire Yankee's own Seabrook Unit 1 probabilistic risk assessment 2/ studies do not include the emergency feedwater system in the system event tree for large break LOCAs for that very reason. Continuation of efforts to recover an emergency feedwater pump following a large break LOCA represented a very poor judgment on the part of plant management. 3/

1/ Report of the 1988 FEMA/NRC Graded Exercise, at 2.2-2.

2/ A probabilistic risk assessment (PRA) is an analysis of the likelihood and consequences of postulated severe accidents. The objective of a PRA is to "*identify and delineate the combinations of events that, if they occurred, could lead to undesirable public consequences and to estimate the magnitude of those consequences and their respective probabilities*". See, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Probabilistic Risk Assessment (PRA) Reference Document, Final Report, NUREG-1050, September 1984, at 10. The NRC has published a procedures guide for the conduct of PRAs. See, U.S. Nuclear Regulatory Commission, PRA Procedures Guide: A Guide for the Performance of Probabilistic Risk Assessments for Nuclear Power Plants, NUREG/CR-2300, Vols. 1-2, January 1983.

3/ New Hampshire Yankee has stated, and the NRC staff has agreed, that the EFW pump would be required to operate to support steam generator cooldown in the recovery phase and that continued repair actions were prudent (NRC Inspection Report 88-10, October 6, 1988). This is not correct. Following a large break LOCA, the only heat transfer surface in the steam generators is that of containment atmosphere on the primary side (admittedly containing some steam), and, if EFW is available, water from the condensate storage tank on the secondary side. This is a very inefficient heat transfer configuration, and one which would have no measurable effect on removing decay heat from the core or heat in general from the containment. Following a large break LOCA at Seabrook, the residual heat removal system would be relied upon to remove heat from the core and the containment spray system would be relied upon to remove heat from the containment. The EFW system

10. On May 3, 1989, the Regional Administrator wrote a memorandum to the Director of the Office of Nuclear Reactor Regulation in which he noted a "possible declining trend in facility performance", and observed that two events which constituted part of this trend involved "violations of the special zero-power license conditions associated with locked valves". Notwithstanding these concerns, however, the Regional Administrator recommended issuance of a low power license, which was granted less than three weeks later.

11. Operational performance has continued to decline. On June 23, 1989, following an incident during the conduct of a natural circulation test (1-ST-22) at low power (described below), the NRC Region I Administrator issued a Confirmatory Action Letter (CAL 89-11) which, among other things, prohibits New Hampshire Yankee from operating Seabrook Unit 1 until the Regional Administrator grants his consent. The terms of CAL 89-11 prohibiting operation until the Regional Administrator grants his consent remain in effect (CAL 89-11 is provided as Attachment 3).

12. During low power testing on June 22, 1989, involving a natural circulation test, plant personnel failed to manually trip (i.e., shut down) the reactor in a timely fashion despite exceeding the manual trip criterion. The reactor was later tripped manually only when it became clear that an automatic scram was inevitable (due to factors other than the one which caused the manual trip

simply cannot accomplish either of these safety functions (or any other safety function, for that matter) following a large break LOCA. In the event of a large LOCA, EFW availability would be material only after safe shutdown is reached, after the reactor is defueled, after the large break LOCA break location is repaired, after the reactor is refueled, and after the reactor is restarted and some level of decay heat is accumulated in the core. These actions would almost certainly have required weeks, if not months, to complete, and would have been taken well after the accident was terminated and the Technical Support Center destaffed. Accordingly, EFW availability would have had no impact whatsoever on "steam generator cooldown in the recovery phase". New Hampshire Yankee and NRC staff statements to the contrary demonstrate a remarkable level of ignorance about the capabilities of the emergency feedwater system and its role in recovering from a large break LOCA.

criterion to be exceeded). The plant personnel in the control room who observed this condition included the entire five-person licensed operator crew (including the Unit Shift Supervisor), all of whom had the authority to manually trip the reactor, as well as Startup Manager, the Test Director, the Assistant Operations Manager, and a host of additional management and operations personnel. Following this event, the Vice President - Nuclear Production of New Hampshire Yankee "made a decision to resume testing without completing a detailed and thorough analysis of the underlying causes of the event and without correcting the related human performance deficiencies" (NRC Notice of Violation, October 25, 1989). The next day, as noted above, the NRC Regional Administrator issued a Confirmatory Action Letter precluding further operation without his consent, and the terms of the CAL remain in effect. Moreover, subsequently (October 25, 1989) the NRC staff issued a Notice of Violation and imposed a \$50,000 civil penalty related to these events. 4/

13. On September 15, 1989, the NRC staff informed New Hampshire Yankee that during the week of December 11, 1989, it plans to evaluate the proficiency of all Seabrook shift crews under simulated accident conditions. This is an extraordinary measure that is, to our knowledge, unprecedented. Once nuclear power plant operators have passed their NRC-administered operators' license examinations, as Seabrook's operators have, the NRC does not generally subject them to additional testing under simulated accident conditions. Moreover, this proposed test is unusual in that it will evaluate all of the Seabrook shift operating crews, not just the one crew on duty at the time of the June 1989 natural circulation test. In our view, the NRC's intention to require proficiency evaluations of all of the Seabrook operators under simulated accident conditions accurately reflects the extremely serious nature of the problems evidenced during the failed natural circulation test on June 22, 1989. (The NRC staff letter informing New Hampshire Yankee of the operator proficiency evaluations is provided as Attachment 5.)

4/ The NRC's Notice of Violation and proposed imposition of civil penalties is provided as Attachment 4.

14. The events discussed above give rise to serious questions about the judgment of New Hampshire Yankee personnel in operating Seabrook Unit 1 at power levels above 5% of full power. Human performance is well recognized as an important contributor to the risk of nuclear power plant operation even when operational performance is otherwise nominal. For instance, the NRC's "PRA Reference Document" (NUREG-1050), which summarized insights from dozens of PRA studies, indicated that human interactions with plant safety systems "are extremely important contributors to safety and reliability" of nuclear power plants, that the reliability of human actions important to safety (as well as systems and components important to safety) must be maintained during operation, and that degradation in their reliability can "sharply increase the risk or likelihood of core melt". ^{5/} Human reliability is also important specifically at Seabrook. Among the twenty most likely accidents at Seabrook, New Hampshire Yankee's 1983 PRA study of Seabrook identified several accident scenarios where human actions are an important factor (i.e., actions such as recovering failed systems, failure to establish long term decay heat removal, failure to establish feed and bleed cooling, failure to perform emergency boration, etc.). ^{6/}

15. In addition, it is well-recognized in the PRA field that the likelihood of core damage frequency may be higher in the first year or two of full power operation. This is in part due to the well-recognized fact that transient events which can initiate accidents are much more likely in the

^{5/} Office of Nuclear Regulatory Research, Probabilistic Risk Assessment (PRA) Reference Document, Final Report, NUREG-1050, September 1984, at 6 and 64.

^{6/} Pickard, Lowe and Garrick, Inc., Seabrook Station Probabilistic Safety Assessment, PLG-0300, December 1983, at 2.3-10 and 2.3-11. It should be noted, moreover, that Seabrook's core damage frequency is estimated by that study to be 2.3×10^{-4} per reactor-year, or about one chance in 4,300 per reactor-year for a mature plant assuming nominal human performance. Ibid. Given declining human performance, one would generally expect the core damage frequency to increase due to increasing human error rates. This expectation is confirmed in a recent Brookhaven National Laboratory study for the NRC staff (using the Oconee plant as a case study) which concluded that small changes in human error rates could have significant impacts on risk. See, E. Samanta, et al., Risk Sensitivity to Human Error, Brookhaven National Laboratory, prepared for the Office of Nuclear Reactor Regulation, NUREG/CR-5319, April 1989, at ES-3.

first two years of operation. For example, data for the period of 1984-1988 compiled by the NRC's Office for Analysis and Evaluation of Operational Data indicate that mature Westinghouse plants have a frequency of transients resulting in reactor trip of 0.61 trips/1,000 critical hours, whereas new plants had a frequency of 1.95 trips/1,000 critical hours -- a difference of a factor of more than three (on average). Similarly, personnel errors are a more frequent contributor to reactor trips for new plants than for mature plants -- a rate of 0.17 trips/1,000 critical hours for new plants compared with a rate of 0.53 trips/1,000 critical hours caused by personnel errors, again a factor of more than three difference (on average). 2/

16. Given these circumstances, declining operational performance in the year preceding the full power operation is a very serious matter. To allow Seabrook to initiate operations at full power before resolving the problems identified above would pose an unacceptable and unnecessary added risk to public health and safety.

17. In cases of declining performance involving operating plants, the NRC has not hesitated to step in and cause a cessation of operations (whether by Confirmatory Action Letter or by Order) until the performance problems are corrected and a period of improved performance is seen. 8/ In the case of Seabrook Unit 1, which is licensed for low power testing, there is no basis for more lenient treatment. In our opinion, the NRC should not consider issuance of a full power license until the performance problems identified above are resolved, and until New Hampshire Yankee demonstrates by a period of troublefree activities that it is fully and adequately prepared to undertake power operations. The NRC should assure itself of New Hampshire Yankee's

2/ Office for Analysis and Evaluation of Operational Data, 1988 Annual Report, NUREG-1272, Vol. 3, No. 1, June 1989, at A-59, A-63, A-88, and A-92.

8/ For example, this was the staff practice in the case of Pilgrim (shutdown under Confirmatory Action Letter from April 1986 until December 1988) and Peach Bottom Units 2 and 3 (shutdown under Order from March 1987 until April 1989). Other examples exist as well (Calvert Cliffs Units 1 and 2, Rancho Seco, Davis-Besse, Browns Ferry Units 1, 2, and 3, and Sequoyah Units 1 and 2).

readiness to safely conduct power operations by completion of the planned operator proficiency evaluation, and by conduct of a detailed operational readiness inspection by an inspection team consisting of experts in the various relevant operational disciplines (licensed operators, nonlicensed operators, training, radiological chemistry, health physics, maintenance, management, and so on). (Such inspections have been performed at other plants which have been shut down due to performance problems.)

18. Accordingly, we conclude that it is premature to issue a full power operating license until the problems identified above have been resolved. Indeed, the NRC has tacitly acknowledged as much by requiring a halt in low power operation (CAL 89-11) and by equipping an unprecedented operator proficiency evaluation of all licensed operators at Seabrook.

Signed under the pains and penalties of perjury this 30th day of November 1989.

Steven C. Sholly
 Steven C. Sholly

State of <u>CALIF</u> County of <u>SANTA CLARA</u> } ss.	On this the <u>30th</u> day of <u>NOVEMBER</u> 19 <u>89</u> , before me,
	<u>HARVEY H. DIESNER</u>
	the undersigned Notary Public, personally appeared <u>STEVEN C. SHOLLY</u>
	<input type="checkbox"/> personally known to me <input checked="" type="checkbox"/> proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) _____ subscribed to the within instrument, and acknowledged that _____ executed it. WITNESS my hand and official seal.
	<u>Harvey H. Diesner</u> Notary's Signature

Signed under the pains and penalties of perjury this 1st day of December 1989.

Gregory C. Minor

ATTACHMENT 1

Statement of Professional Qualifications

Gregory C. Minor

PROFESSIONAL QUALIFICATIONS OF GREGORY C. MINOR

GREGORY C. MINOR
MHB Technical Associates
1723 Hamilton Avenue
Suite K
San Jose, California 95125
(408) 266-2716

EXPERIENCE:

1976 to PRESENT

Vice-President - MHB Technical Associates, San Jose, California

Engineering and energy consultant to state, federal, and private organizations and individuals. Major activities include studies of safety and risk involved in energy generation, providing technical consulting to legislative, regulatory, public and private groups and expert witness in behalf of state organizations and citizens' groups. Was co-editor of a critique of the Reactor Safety Study (WASH-1400) for the Union of Concerned Scientists and co-author of a risk analysis of Swedish reactors for the Swedish Energy Commission. Served on the Peer Review Group of the NRC/TMI Special Inquiry Group (Rogovin Committee). Actively involved in the Nuclear Power Plant Standards Committee work for the Instrument Society of America (ISA).

1972 - 1976

Manager, Advanced Control and Instrumentation Engineering, General Electric Company, Nuclear Energy Division, San Jose, California

Managed a design and development group of thirty-four engineers and support personnel designing systems for use in the measurement, control and operation of nuclear reactors. Involved coordination with other reactor design organizations, the Nuclear Regulatory Commission, and customers, both overseas and domestic. Responsibilities included coordinating and managing and design and development of control systems, safety systems, and new control concepts for use on the next generation of reactors. The position included responsibility for standards applicable to control and instrumentation, as well as the design of short-term solutions to field problems. The disciplines involved included electrical and mechanical engineering, seismic design and process computer control/programming, and equipment qualification.

1970 - 1972

Manager, Reactor Control Systems Design, General Electric Company, Nuclear Energy Division, San Jose, California

Managed a group of seven engineers and two support personnel in the design and preparation of the detailed system drawings and control documents relating to safety and emergency systems for nuclear reactors. Responsibility required coordination with other design organizations and interaction with the customer's engineering personnel, as well as regulatory personnel.

1963 - 1970

Design Engineer, General Electric Company, Nuclear Energy Division, San Jose, California

Responsible for the design of specific control and instrumentation systems for nuclear reactors. Lead design responsibility for various subsystems of instrumentation used to measure neutron flux in the reactor during startup and intermediate power operation. Performed lead system design function in the design of a major system for measuring the power generated in nuclear reactors. Other responsibilities included on-site checkout and testing of a complete reactor control system at an experimental reactor in the Southwest. Received patent for Nuclear Power Monitoring System.

1950 - 1963

Advanced Engineering Program, General Electric Company, Assignments in Washington, California, and Arizona

Rotating assignments in a variety of disciplines:

- Engineer, reactor maintenance and instrument design, KE and D reactors, Hanford, Washington, circuit design and equipment maintenance coordination.
- Design engineer, Microwave Department, Palo Alto, California. Work on design of cavity couplers for Microwave Traveling Wave Tubes (TWT).
- Design engineer, Computer Department, Phoenix, Arizona. Design of core driving circuitry.
- Design engineer, Atomic Power Equipment Department, San Jose, California. Circuit design and analysis.
- Design engineer, Space Systems Department, Santa Barbara, California. Prepared control portion of satellite proposal.
- Technical Staff - Technical Military Planning Operation. (TEMPO), Santa Barbara, California. Prepare analyses of missile exchanges.

During this period, completed three-year General Electric program of extensive education in advanced engineering principles of higher mathematics, probability and analysis. Also completed courses in Kepner-Tregoe, Effective Presentation, Management Training Program, and various technical seminars.

EDUCATION

University of California at Berkeley, BSEE, 1960.

Advanced Course in Engineering - three-year curriculum, General Electric Company, 1963.

Stanford University, MSEE, 1966.

HONORS AND ASSOCIATIONS

- Tau Beta Pi Engineering Honorary Society
- Co-holder of U.S. Patent No. 3,565-760, "Nuclear Reactor Power Monitoring System," February, 1971.
- Member: American Association for the Advancement of Science.
- Member: Nuclear Power Plant Standards Committee, Instrument Society of America.

PUBLICATIONS AND TESTIMONY

1. G. C. Minor, S. E. Moore, "Control Rod Signal Multiplexing," IEEE Transactions on Nuclear Science, Vol. NS-19, February 1972.
2. G. C. Minor, W. G. Milam, "An Integrated Control Room System for a Nuclear Power Plant," NEDO-10658, presented at International Nuclear Industries Fair and Technical Meetings, October, 1972, Basle, Switzerland.
3. The above article was also published in the German Technical Magazine, NT, March, 1973.
4. Testimony of G. C. Minor, D. G. Bridenbaugh, and R. B. Hubbard before the Joint Committee on Atomic Energy, Hearing held February 18, 1976, and published by the Union of Concerned Scientists, Cambridge, Massachusetts.
5. Testimony of G. C. Minor, D. G. Bridenbaugh, and R. B. Hubbard before the California State Assembly Committee on Resources, Land Use, and Energy, March 8, 1976.
6. Testimony of G. C. Minor and R. B. Hubbard before the California State Senate Committee on Public Utilities, Transit, and Energy, March 23, 1976.
7. Testimony of G. C. Minor regarding the Grafenrheinfeld Nuclear Plant, March 16-17, 1977, Wurzburg, Germany.
8. Testimony of G. C. Minor before the Cluff Lake Board of Inquiry, Regina, Saskatchewan, Canada, September 21, 1977.
9. The Risks of Nuclear Power Reactors: A Review of the NRC Reactor Safety Study WASH-1400 (NUREG-75/014), H. Kendall, et al, edited by G. C. Minor and R. B. Hubbard for the Union of Concerned Scientists, August, 1977.
10. Swedish Reactor Safety Study: Barseback Risk Assessment, MHB Technical Associates, January, 1978. (Published by Swedish Department of Industry as Document Dsl 1978:1)
11. Testimony by G. C. Minor before the Wisconsin Public Service Commission, February 13, 1978, Loss of Coolant Accidents: Their Probability and Consequences.
12. Testimony by G. C. Minor before the California Legislature Assembly Committee on Resources, Land Use, and Energy, AB 3108, April 26, 1978, Sacramento, California.

13. Presentation by G. C. Minor before the Federal Ministry for Research and Technology (BMFT), Meeting on Reactor Safety Research, Man/Machine Interface in Nuclear Reactors, August 21, and September 1, 1978, Bonn, Germany.
14. Testimony of G. C. Minor, D. G. Bridenbaugh, and R. B. Hubbard, before the Atomic Safety and Licensing Board, September 25, 1978, in the matter of Black Fox Nuclear Power Station Construction Permit Hearings, Tulsa, Oklahoma.
15. Testimony of G. C. Minor, ASLB Hearings Related to TMI-2 Accident, Rancho Seco Power Plant, on behalf of Friends of the Earth, September 13, 1979.
16. Testimony of G. C. Minor before the Michigan State Legislature, Special Joint Committee on Nuclear Energy, Implications of Three Mile Island Accident for Nuclear Power Plants in Michigan, October 15, 1979.
17. A Critical View of Reactor Safety, by G. C. Minor, paper presented to the American Association for the Advancement of Science, Symposium on Nuclear Reactor Safety, January 7, 1980, San Francisco, California.
18. The Effects of Aging on Safety of Nuclear Power Plants, paper presented at Forum on Swedish Nuclear Referendum, Stockholm, Sweden, March 1, 1980.
19. Minnesota Nuclear Plants Gaseous Emissions Study, MHB Technical Associates, September 1980, prepared for the Minnesota Pollution Control Agency, Roseville, MN.
20. Testimony of G. C. Minor and D. G. Bridenbaugh before the New York State Public Service Commission, Shoreham Nuclear Plant Construction Schedule, in the matter of Long Island Lighting Company Temporary Rate Case, case # 27774 September 22, 1980.
21. Direct testimony of Dale G. Bridenbaugh and Gregory C. Minor before the New York State Public Service Commission, Kaiser Engineers Power Corporation Review, Shoreham Nuclear Power Station Costs and Schedule, in the matter of Long Island Lighting Company Temporary Rate Case, Case Number 27774, September 29, 1980.
22. Systems Interaction and Single Failure Criterion, MHB Technical Associates, January, 1981, prepared for and available from the Swedish Nuclear Power Inspectorate, Stockholm, Sweden.
23. Testimony of G. C. Minor and D. G. Bridenbaugh before the New Jersey Board of Public Utilities, Oyster Creek 1980 Refueling Outage Investigation, in the matter of the Petition of Jersey Central Power and Light Company for approval of an increase in the rates for electrical service and adjustment clause and factor for such service, OAL Docket No. PUC 3518-80, BPU Docket Nos. 804-285, 807-488, February 19, 1981.
24. Testimony of G. C. Minor and D. G. Bridenbaugh on FORVs and Pressurizer Heaters, Diablo Canyon Operating License hearing before ASLB, in the matter of Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), Docket Nos. 50-275-OL, 50-323-OL, January 11, 1982.
25. Testimony of G. C. Minor and R. B. Hubbard on Emergency Response Planning, Diablo Canyon Operating License hearing before ASLB, Docket Nos. 50-275-OL, 50-323-OL, January 11, 1982.
26. Systems Interaction and Single Failure Criterion: Phase II Report, MHB Technical Associates, February 1982, prepared for and available from the Swedish Nuclear Power Inspectorate, Stockholm, Sweden.

27. Testimony of G. C. Minor, R. B. Hubbard, M. W. Goldsmith, S. J. Harwood on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Contention 7B, Safety Classification and Systems Interaction, Docket No. 50-322-OL, April 13, 1982.
28. Testimony of G. C. Minor and D. G. Bridenbaugh on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Suffolk County Contention 11, Passive Mechanical Valve Failure, Docket no. 50-322-OL, April 13, 1982.
29. Testimony of G. C. Minor and R. B. Hubbard on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Suffolk County Contention 27 and SOC Contention 3, Post-Accident Monitoring, Docket No. 50-322-OL, May 25, 1982.
30. Testimony of G. C. Minor and D. G. Bridenbaugh on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Suffolk County Contention 22, SRV Test Program, Docket No. 50-322-OL, May 25, 1982.
31. Testimony of G. C. Minor and D. G. Bridenbaugh on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Reduction of SRV Challenges, Docket No. 50-322-OL, June 14, 1982.
32. Testimony of G. C. Minor on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, regarding Environmental Qualification, Docket No. 50-322-OL, January 18, 1983.
33. Testimony of G. C. Minor and D. G. Bridenbaugh before the Pennsylvania Public Utility Commission, on behalf of the Office of Consumer Advocate, Regarding the Cost of Constructing the Susquehanna Steam Electric Station, Unit 1, Re: Pennsylvania Power and Light, Docket No. R-822189, March 18, 1983.
34. Supplemental testimony of G. C. Minor, R. B. Hubbard, and M. W. Goldsmith on behalf of Suffolk County, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Safety Classification and Systems Interaction (Contention 7B), Docket No. 50-322, March 23, 1983.
35. Verbal testimony before the District Court Judge in the case of Sierra Club et. al. vs. DOE regarding the Clean-up of Uranium Mill Tailings. June 20, 1983.
36. Systems Interaction and Single Failure Criterion: Phase 3 Report, MHB Technical Associates, June, 1983, prepared for and available from the Swedish Nuclear Power Inspectorate, Stockholm, Sweden.
37. Systematic Evaluation Program: Status Report and Initial Evaluation, MHB Technical Associates, June, 1983, prepared for and available from the Swedish Nuclear Power Inspectorate, Stockholm, Sweden.
38. Testimony of G. C. Minor, F. C. Finlayson, and E. P. Radford before the Atomic Safety and Licensing Board, in the Matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, regarding Emergency Planning - Evacuation Times and Doses (Contentions 65, 23.D and 23.H), Docket No. 50-322-OL-3, November 18, 1983.
39. Testimony of G. C. Minor, Sizewell 'B' Power Station Public Inquiry, Proof of Evidence Regarding Safety Issues, December, 1983.

40. Testimony of D. G. Bridenbaugh, L. M. Danielson, R. B. Hubbard and G. C. Minor before the State of New York Public Service Commission, PSC Case No. 27563, in the matter of Long Island Lighting Company Proceeding to Investigate the Cost of the Shoreham Nuclear Generating Facility -- Phase II, on behalf of County of Suffolk, February 10, 1984.
41. Testimony of Fred C. Finlayson, Gregory C. Minor and Edward P. Radford before the Atomic Safety and Licensing Board, in the Matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, on behalf of Suffolk County Regarding Emergency Planning - Sheltering (Contention 61), Docket No. 50-322-OL, March 21, 1984.
42. Testimony of G. Dennis Eley, C. John Smith, Gregory C. Minor and Dale G. Bridenbaugh before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting company, Shoreham Nuclear Power Station Unit 1, regarding EMD Diesel Generators and 20 MW Gas Turbine, Docket No. 50-322-OL, March 21, 1984.
43. Revised Testimony of Gregory C. Minor before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, on behalf of Suffolk County regarding Emergency Planning - Recovery and Reentry (Contentions 85 and 88), Docket No. 50-322-OL, July 30, 1984.
44. Testimony of Dr. Christian Meyer, Dr. Jose Roesset, and Gregory C. Minor before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, on behalf of Suffolk County, regarding Low Power Hearings - Seismic Capabilities of AC Power Sources, Docket No. 50-322-OL, July 1984.
45. Surrebuttal Testimony of Dale G. Bridenbaugh, Lynn M. Danielson, Richard B. Hubbard, and Gregory C. Minor, Before the New York State Public Service Commission, PSC Case No. 27563, Shoreham Nuclear Station, Long Island Lighting Company, on behalf of Suffolk County and New York State Consumer Protection Board, regarding Investigation of the Cost of the Shoreham Nuclear Generating Facility, October 4, 1984.
46. Direct Testimony of Dale G. Bridenbaugh, Lynn M. Danielson and Gregory C. Minor on behalf of Massachusetts Attorney General, DPU 84-145, before the Massachusetts Department of Public Utilities, regarding Prudence of Expenditures by Fitchburg Gas and Electric Light Company for Seabrook Unit 2, November 23, 1984, 84 pgs.
47. Direct Testimony of Dale G. Bridenbaugh, Lynn M. Danielson and Gregory C. Minor on behalf of Maine Public Utilities Commission Staff regarding Prudence of Costs of Seabrook Unit 2, Docket No. 84-113, December 21, 1984.
48. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Suffolk County regarding Shoreham Emergency Diesel Generator Loads, Docket No. 50-322-OL, January 25, 1985.
49. Direct Testimony of Dale G. Bridenbaugh, Lynn M. Danielson, and Gregory C. Minor on behalf of the Vermont Department of Public Service, PSB Docket No. 5030, regarding Prudence of Central Vermont Public Service Corporations Costs for Seabrook 2, November 11, 1985.
50. Surrebuttal testimony of Gregory C. Minor on behalf of the Vermont Department of Public Service, PSB Docket No. 5030, Prudence of Central Vermont Public Service Corporations Costs for Seabrook 2, December 13, 1985.

51. Direct Testimony of Dale G. Bridenbaugh, Gregory C. Minor, Lynn K. Price, and Steven C. Sholly on behalf of State of Connecticut Department of Public Utility Control Prosecutorial Division and Division of Consumer Counsel regarding the Prudence of Expenditures on Millstone Unit 3, Docket No. 83-07-03, February 18, 1986.
52. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Massachusetts Attorney General regarding the Prudence of Expenditures by New England Power Co. for Seabrook Unit 2, Docket Nos. ER-85-646-000, ER-85-647-000, February 21, 1986.
53. Direct Testimony of Gregory C. Minor on behalf of the Prosecutorial Division of CDPUC regarding CL&P Construction Prudence for Millstone Unit 3, Docket No. ER-85-720-001 March 19, 1986.
54. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Massachusetts Attorney General regarding WMECo Construction Prudence for Millstone Unit 3, Docket No. 85-270, March 19, 1986.
55. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Massachusetts Attorney General regarding WMECo's Commercial Operating Dates and Deferred Capital Additions on Millstone Unit 3, Docket No. 85-270, March 19, 1986.
56. Rebuttal Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Massachusetts Attorney General regarding Rebuttal to New England Power Company's Seabrook 2, Docket Nos. ER-85-646-001, ER-85-647-001, April 2, 1986.
57. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of State of Maine Staff of Public Utilities Commission regarding Construction Prudence of Millstone Unit 3, in the matter of Maine Power Company Proposed Increase in Rates, Docket No. 85-212, April 21, 1986.
58. Implications of the Chernobyl-4 Accident for Nuclear Emergency Planning for the State of New York, prepared for the State of New York Consumer Protection Board, by MHB Technical Associates, June 1986.
59. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of the Vermont Department of Public Service, regarding Prudence of Costs by Central Vermont Public Service Corporation for Millstone 3, Docket No. 5132, August 25, 1986.
60. Surrebuttal Testimony of Gregory C. Minor in the matter of Jersey Central Power and Light Company, regarding TMI Restart and Performance Incentives, (Oral testimony), OAL Docket No. PUC 7939-85, BPU Docket No. ER851116, September 11, 1986.
61. Surrebuttal Testimony of Gregory C. Minor on behalf of State of Vermont Department of Public Service, regarding CVPS/NU Construction Prudence related to Millstone Unit 3, Docket No. 5132, November 6, 1986.
62. Direct Testimony of Gregory C. Minor and Lynn K. Price on behalf of State of Vermont Department of Public Service, regarding Prudence of Expenditures for Seabrook 1, Docket No. 5132, December 31, 1986.
63. Direct Testimony of Gregory C. Minor on behalf of Suffolk County, before the Atomic Safety and Licensing Board, concerning Shoreham - Protective Action Recommendations (Contention EX 36), in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, Docket No. 50-322-OL-5, February 27, 1987.

64. Direct Testimony of Gregory C. Minor et. al. on behalf of the State of New York and Suffolk County, before the Atomic Safety and Licensing Board, regarding The Scope of the Emergency Planning Exercise (Contentions EX 15 and 16), in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, Docket No. 50-322-OL-5, April 6, 1987.
65. Direct Testimony of Gregory C. Minor regarding Emergency Planning Reception Centers - Monitoring and Decontamination, Shoreham Docket 50-322-OL-3 (Emergency Planning), April 13, 1987.
66. Testimony of Gregory C. Minor, Steven C. Sholly et. al. on behalf of Suffolk County, regarding LILCO's Reception Centers - Planning Basis, before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, Docket No. 50-322-OL-3, April 13, 1987.
67. Rebuttal Testimony of Gregory C. Minor and Steven C. Sholly on behalf of Suffolk County regarding LILCO's Reception Centers (Rebuttal to Testimony of Lewis G. Hulman), in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station, Unit 1, Docket No. 50-322-OL-3, May 27, 1987.
68. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor on behalf of Massachusetts Attorney General, before the Federal Energy Regulatory Commission, regarding Canal Electric Company Prudence Related to Seabrook Unit 2 Construction Expenditures, Docket No. ER87-704-001, July 31, 1987.
69. Direct Testimony of Dale G. Bridenbaugh and Gregory C. Minor before the Pennsylvania Public Utility Commission, Regarding Beaver Valley Unit 1 1979 Outage, Docket No. 1-79070318, OCA Statement No. 2, August 31, 1987.
70. Oral testimony of Gregory C. Minor Before the Illinois Pollution Control Board on behalf of Reed-Custer Community Unit School District No. 255-U, re: Braidwood Cooling Pond September 8, 1988, Case PCB 87-209.
71. Testimony of Gregory C. Minor in the U. S. District Court, Brooklyn, New York, September 31, 1988, re: County of Suffolk vs. LILCO et. al., Case CV 87-646.
72. GE Reactor Report Safety Issue Reviews, Issues 5, 10, and 24, prepared by MHB Technical Associates for The Ohio State University Nuclear Engineering Program Expert Review Panel, Public Utility Commission of Ohio, October 1988.
73. Direct Testimony and Exhibits of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, November 30, 1988, PROTECTED INFORMATION.
74. Supplemental Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, January 20, 1989, Exhibit AG-2.
75. Testimony of Gregory C. Minor, U. S. District Court, Brooklyn, New York, February 3, 1989, re: County of Suffolk vs. LILCO et. al., Case 87 CIV. 646 (JBW).
76. Surrebuttal Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, February 13, 1989, Exhibit AG-74.

77. Surrebuttal Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, February 17, 1989, Exhibit AG-93.
78. History and Performance of Wye-Pattern MSIVs in Boiling Water Reactors, report prepared for Paul Weiss, Rifkind, Wharton & Garrison by MHB Technical Associates, October 1989.

ATTACHMENT 2

Statement of Professional Qualifications

Steven C. Sholly

PROFESSIONAL QUALIFICATIONS OF STEVEN C. SHOLLY

STEVEN C. SHOLLY
MHB Technical Associates
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San Jose, California 95125
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EXPERIENCE:

September 1985 - PRESENT

Associate - MHB Technical Associates, San Jose, California

Associate in energy consulting firm that specializes in technical and economic assessments of energy production facilities, especially nuclear, for local, state, and federal governments and private organizations. MHB is extensively involved in regulatory proceedings and the preparation of studies and reports. Conduct research, write reports, participate in discovery process in regulatory proceedings, develop testimony and other documents for regulatory proceedings, and respond to client inquiries. Clients have included: State of California, State of New York, State of Illinois, Commonwealth of Massachusetts, and Commonwealth of Pennsylvania.

February 1981 - September 1985

Technical Research Associate and Risk Analyst - Union of Concerned Scientists, Washington, D.C.

Research associate and risk analyst for public interest group based in Cambridge, Massachusetts, that specializes in examining the impact of advanced technologies on society, principally in the areas of arms control and energy. Technical work focused on nuclear power plant safety, with emphasis on probabilistic risk assessment, radiological emergency planning and preparedness, and generic safety issues. Conducted research, prepared reports and studies, participated in administrative proceedings before the U.S. Nuclear Regulatory Commission, developed testimony, analyzed NRC rule-making proposals and draft reports and prepared comments thereon, and responded to inquiries from sponsors, the general public, and the media. Participated as a member of the Panel on ACRS Effectiveness (1985), the Panel on Regulatory Uses of Probabilistic Risk Assessment (Peer Review of NUREG-1050; 1984), Invited Observer to NRC Peer Review meetings on the source term reassessment (BMI-2104; 1983-1984), and the Independent Advisory Committee on Nuclear Risk for the Nuclear Risk Task Force of the National Association of Insurance Commissioners (1984).

January 1980 - January 1981

Project Director and Research Coordinator - Three Mile Island Public Interest Resource Center, Harrisburg, Pennsylvania

Provided administrative direction and coordinated research projects for a public interest group based in Harrisburg, Pennsylvania, centered around issues related to the Three Mile Island Nuclear Power Plant. Prepared fundraising proposals, tracked progress of U.S. Nuclear Regulatory Commission, U.S. Department of Energy, and General Public Utilities activities concerning cleanup of Three Mile Island Unit 2 and preparation for restart of Three Mile Island Unit 1, and monitored developments related to

emergency planning, the financial health of General Public Utilities, and NRC rulemaking actions related to Three Mile Island.

July 1978 - January 1980

Chief Biological Process Operator - Wastewater Treatment Plant, Derry Township Municipal Authority, Hershey, Pennsylvania

Chief Biological Process Operator at a 2.5 million gallon per day tertiary, activated sludge, wastewater treatment plant. Responsible for biological process monitoring and control, including analysis of physical, chemical, and biological test results, process fluid and mass flow management, micro-biological analysis of activated sludge, and maintenance of detailed process logs for input into state and federal reports on treatment process and effluent quality. Received certification from the Commonwealth of Pennsylvania as a wastewater treatment plant operator. Member of Water Pollution Control Association of Pennsylvania, Central Section, 1980.

July 1977 - July 1978

Wastewater Treatment Plant Operator - Borough of Lemoyne, Lemoyne, Pennsylvania

Wastewater treatment plant operator at 2.0 million gallon per day secondary, activated sludge, wastewater treatment plant. Performed tasks as assigned by supervisors, including simple physical and chemical tests on wastewater streams, maintenance and operation of plant equipment, and maintenance of the collection system.

September 1976 - June 1977

Science Teacher - West Shore School District, Camp Hill, Pennsylvania

Taught Earth and Space Science at ninth grade level. Developed and implemented new course materials on plate tectonics, environmental geology, and space science. Served as Assistant Coach of the district gymnastics team.

September 1975 - June 1976

Science Teacher - Carlisle Area School District, Carlisle, Pennsylvania

Taught Earth and Space Science and Environmental Science at ninth grade level. Developed and implemented new course materials on plate tectonics, environmental geology, noise pollution, water pollution, and energy. Served as Advisor to the Science Projects Club.

EDUCATION:

B.S., Education, majors in Earth and Space Science and General Science, minor in Environmental Education, Shippensburg State College, Shippensburg, Pennsylvania, 1975.

Graduate coursework in Land Use Planning, Shippensburg State College, Shippensburg, Pennsylvania, 1977-1978.

Short Course on Individual Plant Examinations, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1989.

PUBLICATIONS:

1. "Determining Mercalli Intensities from Newspaper Reports," Journal of Geological Education, Vol. 25, 1977.
2. A Critique of An Independent Assessment of Evacuation Times for Three Mile Island Nuclear Power Plant, Three Mile Island Public Interest Resource Center, Harrisburg, Pennsylvania, January 1981.
3. A Brief Review and Critique of the Rockland County Radiological Emergency Preparedness Plan, Union of Concerned Scientists, prepared for Rockland County Emergency Planning Personnel and the Chairman of the County Legislature, Washington, D.C., August 17, 1981.
4. The Necessity for a Prompt Public Alerting Capability in the Plume Exposure Pathway EPZ at Nuclear Power Plant Sites, Union of Concerned Scientists, Critical Mass Energy Project, Nuclear Information and Resource Service, Environmental Action, and New York Public Interest Research Group, Washington, D.C., August 27, 1981. *
5. "Union of Concerned Scientists, Inc., Comments on Notice of Proposed Rulemaking, Amendment to 10 CFR 50, Appendix E, Section IV.D.3," Union of Concerned Scientists, Washington, D.C., October 21, 1981. *
6. "The Evolution of Emergency Planning Rules," in The Indian Point Book: A Briefing on the Safety Investigation of the Indian Point Nuclear Power Plants, Anne Witte, editor, Union of Concerned Scientists (Washington, D.C.) and New York Public Interest Research Group (New York, NY), 1982.
7. "Union of Concerned Scientists Comments, Proposed Rule, 10 CFR Part 50, Emergency Planning and Preparedness: Exercises, Clarification of Regulations, 46 F.R. 61134," Union of Concerned Scientists, Washington, D.C., January 15, 1982. *
8. Testimony of Robert D. Pollard and Steven C. Sholly before the Subcommittee on Energy and the Environment, Committee on Interior and Insular Affairs, U.S. House of Representatives, Middletown, Pennsylvania, March 29, 1982, available from the Union of Concerned Scientists.
9. "Union of Concerned Scientists Detailed Comments on Petition for Rulemaking by Citizen's Task Force, Emergency Planning, 10 CFR Parts 50 and 70, Docket No. PRM-50-31, 47 F.R. 12639," Union of Concerned Scientists, Washington, D.C., May 24, 1982.
10. Supplements to the Testimony of Ellyn R. Weiss, Esq., General Counsel, Union of Concerned Scientists, before the Subcommittee on Energy Conservation and Power, Committee on Energy and Commerce, U.S. House of Representatives, Union of Concerned Scientists, Washington, D.C., August 16, 1982.
11. Testimony of Steven C. Sholly, Union of Concerned Scientists, Washington, D.C., on behalf of the New York Public Interest Research Group, Inc., before the Special Committee on Nuclear Power Safety of the Assembly of the State of New York, hearings on Legislative Oversight of the Emergency Radiologic Preparedness Act, Chapter 708, Laws of 1981, September 2, 1982.
12. "Comments on 'Draft Supplement to Final Environmental Statement Related to Construction and Operation of Clinch River Breeder Reactor Plant'," Docket No. 50-537, Union of Concerned Scientists, Washington, D.C., September 13, 1982. *
13. "Union of Concerned Scientists Comments on 'Report to the County Commissioners', by the Advisory Committee on Radiological Emergency Plan for Columbia County, Pennsylvania," Union of Concerned Scientists, Washington, D.C., September 15, 1982.

14. "Radiological Emergency Planning for Nuclear Reactor Accidents," presented to Kernenergie Ontmanteld Congress, Rotterdam, The Netherlands, Union of Concerned Scientists, Washington, D.C., October 8, 1982.
15. "Nuclear Reactor Accident Consequences: Implications for Radiological Emergency Planning," presented to the Citizen's Advisory Committee to Review Rockland County's Own Nuclear Evacuation and Preparedness Plan and General Disaster Preparedness Plan, Union of Concerned Scientists, Washington, D.C., November 19, 1982.
16. Testimony of Steven C. Sholly before the Subcommittee on Oversight and Investigations, Committee on Interior and Insular Affairs, U.S. House of Representatives, Washington, D.C., Union of Concerned Scientists, December 13, 1982.
17. Testimony of Gordon R. Thompson and Steven C. Sholly on Commission Question Two, Contentions 2.1(a) and 2.1(d), Union of Concerned Scientists and New York Public Interest Research Group, before the U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board, in the Matter of Consolidated Edison Company of New York (Indian Point Unit 2) and the Power Authority of the State of New York (Indian Point Unit 3), Docket Nos. 50-247-SP and 50-286-SP, December 28, 1982. *
18. Testimony of Steven C. Sholly on the Consequences of Accidents at Indian Point (Commission Question One and Board Question 1.1, Union of Concerned Scientists and New York Public Interest Research Group, before the U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board, in the Matter of Consolidated Edison Company of New York (Indian Point Unit 2) and the Power Authority of the State of New York (Indian Point Unit 3), Docket Nos. 50-247-SP and 50-286-SP, February 7, 1983, as corrected February 16, 1983. *
19. Testimony of Steven C. Sholly on Commission Question Five, Union of Concerned Scientists and New York Public Interest Research Group, before the U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board, in the Matter of Consolidated Edison Company of New York (Indian Point Unit 2) and the Power Authority of the State of New York (Indian Point Unit 3), Docket Nos. 50-247-SP and 50-286-SP, March 22, 1983. *
20. "Nuclear Reactor Accidents and Accident Consequences: Planning for the Worst," Union of Concerned Scientists, Washington, D.C., presented at Critical Mass '83, March 26, 1983.
21. Testimony of Steven C. Sholly on Emergency Planning and Preparedness at Commercial Nuclear Power Plants, Union of Concerned Scientists, Washington, D.C., before the Subcommittee on Nuclear Regulation, Committee on Environment and Public Works, U.S. Senate, April 15, 1983, (with "Union of Concerned Scientists' Response to Questions for the Record from Senator Alan K. Simpson," Steven C. Sholly and Michael E. Faden).
22. "PRA: What Can it Really Tell Us About Public Risk from Nuclear Accidents?," Union of Concerned Scientists, Washington, D.C., presentation to the 14th Annual Meeting, Seacoast Anti-Pollution League, May 4, 1983.
23. "Probabilistic Risk Assessment: The Impact of Uncertainties on Radiological Emergency Planning and Preparedness Considerations," Union of Concerned Scientists, Washington, D.C., June 28, 1983.
24. "Response to GAO Questions on NRC's Use of PRA," Union of Concerned Scientists, Washington, D.C., October 6, 1983, attachment to letter dated October 6, 1983, from Steven C. Sholly to John E. Bagnulo (GAO, Washington, D.C.).

25. The Impact of "External Events" on Radiological Emergency Response Planning Considerations, Union of Concerned Scientists, Washington, D.C., December 22, 1983, attachment to letter dated December 22, 1983, from Steven C. Sholly to NRC Commissioner James K. Asselstine.
26. Sizewell 'B' Public Inquiry, Proof of Evidence on: Safety and Waste Management Implications of the Sizewell PWR, Gordon Thompson, with supporting evidence by Steven Sholly, on behalf of the Town and Country Planning Association, February 1984, including Annex G, "A review of Probabilistic Risk Analysis and its Application to the Sizewell PWR," Steven Sholly and Gordon Thompson, (August 11, 1983), and Annex O, "Emergency Planning in the UK and the US: A Comparison," Steven Sholly and Gordon Thompson (October 24, 1983).
27. Testimony of Steven C. Sholly on Emergency Planning Contention Number Eleven, Union of Concerned Scientists, Washington, D.C., on behalf of the Palmetto Alliance and the Carolina Environmental Study Group, before the U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board, in the Matter of Duke Power Company, et. al. (Catawba Nuclear Station, Units 1 and 2), Docket Nos. 50-413 and 50-414, April 16, 1984. *
28. "Risk Indicators Relevant to Assessing Nuclear Accident Liability Premiums," in Preliminary Report to the Independent Advisory Committee to the NAIC Nuclear Risk Task Force, December 11, 1984, Steven C. Sholly, Union of Concerned Scientists, Washington, D.C.
29. "Union of Concerned Scientists' and Nuclear Information and Resource Service's Joint Comments on NRC's Proposal to Bar from Licensing Proceedings the Consideration of Earthquake Effects on Emergency Planning," Union of Concerned Scientists and Nuclear Information and Resource Service, Washington, D.C., Diane Curran and Elynn R. Weiss (with input from Steven C. Sholly), February 28, 1985. *
30. "Severe Accident Source Terms: A Presentation to the Commissioners on the Status of a Review of the NRC's Source Term Reassessment Study by the Union of Concerned Scientists," Union of Concerned Scientists, Washington, D.C., April 3, 1985. *
31. "Severe Accident Source Terms for Light Water Nuclear Power Plants: A Presentation to the Illinois Department of Nuclear Safety on the Status of a Review of the NRC's Source Term Reassessment Study (STRS) by the Union of Concerned Scientists," Union of Concerned Scientists, Washington, D.C., May 13, 1985.
32. The Source Term Debate: A Review of the Current Basis for Predicting Severe Accident Source Terms with Special Emphasis on the NRC Source Term Reassessment Program (NUREG-0956), Union of Concerned Scientists, Cambridge, Massachusetts, Steven C. Sholly and Gordon Thompson, January 1986.
33. Direct Testimony of Dale G. Bridenbaugh, Gregory C. Minor, Lynn K. Price, and Steven C. Sholly on behalf of State of Connecticut Department of Public Utility Control, Prosecutorial Division and Division of Consumer Counsel, regarding the prudence of expenditures on Millstone Unit III, February 18, 1986.
34. Implications of the Chernobyl-4 Accident for Nuclear Emergency Planning for the State of New York, prepared for the State of New York Consumer Protection Board, by MHB Technical Associates, June 1986.
35. Review of Vermont Yankee Containment Safety Study and Analysis of Containment Venting Issues for the Vermont Yankee Nuclear Power Plant, prepared for New England Coalition on Nuclear Pollution, Inc., December 16, 1986.

36. Affidavit of Steven C. Sholly before the Atomic Safety and Licensing Board, in the matter of Public Service Company of New Hampshire, et al., regarding Seabrook Station Units 1 and 2 Off-site Emergency Planning Issues, Docket Nos. 50-443-OL & 50-444-OL, January 23, 1987.
37. Direct Testimony of Richard B. Hubbard and Steven C. Sholly on behalf of California Public Utilities Commission, regarding Diablo Canyon Rate Case, PG&E's Failure to Establish Its Committed Design QA Program, Application Nos. 84-06-014 and 85-08-025, Exhibit No. 10,935, March, 1987.
38. Testimony of Gregory C. Minor, Steven C. Sholly et. al. on behalf of Suffolk County, regarding LILCO's Reception Centers (Planning Basis), before the Atomic Safety and Licensing Board, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, Docket No. 50-322-OL-3, April 13, 1987.
39. Rebuttal Testimony of Gregory C. Minor and Steven C. Sholly on behalf of Suffolk County regarding LILCO's Reception Centers (Addressing Testimony of Lewis G. Hulman), Docket No. 50-322-OL-3, May 27, 1987.
40. "Seismic Events," Presentation at Severe Accident Policy Implementation External Events Workshop, Sponsored by U.S. Nuclear Regulatory Commission, August 4-5, 1987, Annapolis, Maryland.
41. Review of Selected Aspects of NUREG-1150, Reactor Risk Reference Document, prepared for the Illinois Department of Nuclear Safety by MHB Technical Associates, September 1987.
42. Direct Testimony of Richard B. Hubbard and Steven C. Sholly on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission, Evaluation of Beaver Valley Unit 2 Plant Costs, OCA Statement 6, Docket No. R-870651, October 23, 1987.
43. Final Report: Significant Factors Affecting the Cost of Beaver Valley Power Station, Unit 2, prepared for Pennsylvania Office of Consumer Advocate, by MHB Technical Associates, OCA Exhibit 6A, October 1987.
44. Surrebuttal Testimony of Richard B. Hubbard and Steven C. Sholly before the Pennsylvania Public Utility Commission, on behalf of the Pennsylvania Office of Consumer Advocate, regarding Evaluation of Beaver Valley Unit 2 Plant Costs, OCA Statement 6-1, Docket No. R-870651, December 7, 1987.
45. Testimony on Diablo Canyon Rate Case, Design Quality Assurance, Supplemental and Rebuttal Testimony of Richard B. Hubbard and Steven C. Sholly, on behalf of the California Public Utilities Commission, Division of Ratepayer Advocates, Application Nos. 84-06-014 and 85-08-025, Exhibit No. 16,690, September 1988.
46. Testimony on Diablo Canyon Rate Case, Evolution of QA Requirements And Their Understanding By The Nuclear Industry: Quality Assurance As A Management Tool, Volumes I and II, Supplemental and Rebuttal Testimony of Richard B. Hubbard and Steven C. Sholly on behalf of the California Public Utilities Commission, Division of Ratepayer Advocate, Application Nos. 84-06-014 and 85-08-025, Exhibit No. 16,650, September 1988.
47. GE Reed Report Safety Issue Reviews, Issues 1, 6, and 14, prepared by MHB Technical Associates for The Ohio State University Nuclear Engineering Program Expert Review Panel, Public Utility Commission of Ohio, October 1988.
48. Direct Testimony and Exhibits of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, November 30, 1988, PROTECTED INFORMATION.

49. Supplemental Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, January 20, 1989, Exhibit AG-2.
 50. Surrebuttal Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of the Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, February 13, 1989, Exhibit AG-74.
 51. Surrebuttal Testimony of Dale G. Bridenbaugh, Gregory C. Minor and Steven C. Sholly on Behalf of Massachusetts Department of Attorney General, Re: Pilgrim Nuclear Power Station, Investigation of Pilgrim Outage, DPU 88-28, February 17, 1989, Exhibit AG-93.
 52. Final Report: Severe Accidents at Three Mile Island Unit 1: Severe Accident Characteristics for Radiological Emergency Response Plan Development, prepared for Institute for Resources and Security Studies, February 1989.
 53. A Limited Scope Review of the Second Draft of NUREG-1150, prepared for the Illinois Department of Nuclear Safety, November 1989.
- * Available from the U.S. Nuclear Regulatory Commission, Public Document Room, Lobby, 1717 H Street, N.W., Washington, D.C.

Signed under the pains and penalties of perjury this 1st day of December 1989.

Gregory C. Minor
Gregory C. Minor

State of CALIF.
County of SANTA CLARA } ss.



On this the 1st day of December 1989 before me,

Harvey H. Diesner

the undersigned Notary Public, personally appeared

GREGORY C. MINOR

personally known to me

proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument, and acknowledged that He executed it. WITNESS my hand and official seal.

Harvey H. Diesner
Notary's Signature

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Dated: March 11, 1991