759

DOCKETED
USNRC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'84 OCT 29 P2:53

LBP-84-45

ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Before Administrative Judges
Marshall E. Miller, Chairman
Glenn O. Bright, Member
Elizabeth B. Johnson, Member

SERVED OCT 29 1984

In the Matter of	Docket No. 50-322-OL-4 (Low Power)
LONG ISLAND LIGHTING COMPANY	(ASLBP No. 77-347-OIC-OL)
(Shoreham Nuclear Generating Plant, Unit 1)	October 29, 1984

INITIAL DECISION

Appearances

W. Taylor Reveley, III, Esq.; Donald P. Irwin, Esq.; Robert M. Rolfe, Esq.; Anthony F. Earley, Esq. and Jessine A. Monaghan, Esq.; Hunton & Williams, Richmond, Virginia
For the Long Island Lighting Company

Lawrence Coe Lanpher, Esq.; Karla J. Letsche, Esq. Herbert H. Brown, Esq.; Alan Roy Dynner, Esq.; John E. Birkenheier, Esq.; and Cherif Sedky, Esq.; Kirkpatrick, Lockhart, Hill, Christopher and Phillips, Washington, D. C.
For Suffolk County, New York

Fabian G. Palomino, Esq.; Robert Abrams, Esq.; and Richard J. Zahnleuter, Esq.; Albany and New York, New York
For the State of New York

Stephen B. Latham, Esq; Twomey, Latham & Shea, Riverhead, New York
For the Town of Southampton

8410300274 841029
PDR ADOCK 05000322
Q PDR

D502

Edwin J. Reis, Esq. and Robert G. Perlis, Esq.;
Office of the Executive Legal Director,
U. S. Nuclear Regulatory Commission, Washington, D. C.
For the Nuclear Regulatory Commission Staff

TABLE OF CONTENTS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of LONG ISLAND LIGHTING COMPANY (Shoreham Nuclear Generating Plant, Unit 1)	Docket No. 50-322-OL-4 (Low Power) (ASLBP No. 77-347-01C-OL) October 29, 1984

I. PROCEDURAL HISTORY

The Applicant, Long Island Lighting Company (LILCO), tendered its application for an operating license for the Shoreham Nuclear Power Station in August, 1975. Proceedings on the application began in April, 1976 with the appointment of a licensing board constituted to conduct adjudicatory hearings in this matter.[1] In the eight years since that time over 180 days of evidentiary hearings have been held, generating more than 34,000 transcript pages, before seven different licensing boards which have issued more than 2900 pages of decisions. More than 310 witnesses have testified, and almost 400 exhibits have been offered into evidence.[2]

---

1 41 Fed. Reg. 17,979 (1976).

2 Tr. 1726-27.

This Initial Decision decides issues relevant to authorization of a low-power operating license, pursuant to 10 CFR §50.57(c) for the Shoreham plant. For reasons set forth below, this Board authorizes the grant of an exemption from the requirements of certain General Design Criteria (GDC), specifically GDC-17,[3] and recommends that a low-power operating license be granted.

---

[3] GDC-17 states:

> "Electric power systems. An onsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.
>
> "The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.
>
> "Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights-of-way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient

(Footnote Continued)

Shortly after the close of the record as to all issues in the proceeding except for offsite emergency planning, LILCO on June 8, 1983, submitted its original motion for a low-power operating license. However, after a failure during testing of the facility's onsite emergency diesel generators (TDIs)[4] a new contention regarding these generators was admitted June 22, 1983.[5] Thus, when the partial initial decision (PID) was issued in this proceeding on September 21, 1983,[6] it said,

> "Even though we resolve all contentions which are the subject of this Partial Initial Decision favorably to LILCO, at least insofar as operation at levels up to five percent of rated

---

(Footnote Continued)

> time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.
>
> "Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies."

4 So-called because of the manufacturer, Transamerica Delaval, Inc.

5 "Memorandum and Order Ruling on Suffolk County's Motion to Admit New Contention," LBP-83-30, 17 NRC 1132 (1983).

6 Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), LBP-83-57, 18 NRC 445 (1983).

> power is concerned, we do not authorize the issuance of the license for fuel loading and low-power operation which LILCO has requested at this time. No such license may be authorized until such time as that portion of Suffolk County's recently admitted emergency diesel generator contention may be resolved in LILCO's favor, at least insofar as necessary to support a finding of reasonable assurance that Shoreham can be operated at levels up to five percent of rated power without endangering the health and safety of the public." 18 NRC 445, 634.

The Licensing (Brenner) Board which authored that PID did not, however, preclude LILCO from proposing other ways it could qualify for low-power operation (Brenner Board, Tr. 21,630-61).

On March 20, 1984, LILCO submitted its "Supplemental Motion for Low-Power Operating License." Therein, LILCO submitted that the pending diesel generator issues need not be resolved prior to the granting of a low-power license for Shoreham,[7] as these generators were not necessary to assure the public health and safety during low-power operations. Because two members of the licensing board with jurisdiction over nonemergency planning matters for Shoreham were heavily committed to work on another proceeding, the instant Board was established on March 30, 1984, to hear and decide LILCO's supplemental motion.[8]

---

7 10 CFR §50.57(c) permits the issuance of a "license authorizing low-power testing (operation at not more than 1% of full-power for the purpose of testing the facility), and further operations short of full-power operation."

8 49 Fed. Reg. 13,611 (1984).

LILCO has divided its proposed low-power testing program into four distinct phases, each consisting of a separate set of operations and testing. These phases are:

(a) Phase I: fuel load and precriticality testing,

(b) Phase II: cold criticality testing,

(c) Phase III: heatup and low-power testing to rated pressure/temperature conditions (approximately 1% rated power); and

(d) Phase IV: low-power testing (1-5% rated power).

The LILCO motion, supported by affidavits, alleged that during Phases I and II, no AC power whatsoever was necessary to protect public health and safety, and therefore no diesel generators were necessary to satisfy NRC regulations. Furthermore, LILCO said, even assuming the TDI diesels are unavailable, ample alternate sources of AC power are available to provide reasonable assurance of no risk to public health and safety up to 5% rated power.

In addition to the in place, though not fully litigated, TDI diesels and the site's access to offsite power grid,[9] LILCO had added certain additional AC power generating equipment as "enhancements" for emergency backup power. These are:

---

9 A 138 KV and 69 KV high voltage network system interconnected with other power networks.

-- four 2.5 MW EMD (Electro-Motive Division, General Motors) deadline blackstart mobile diesel generators

-- a 20 MW gas turbine with deadline blackstart capability.[10]

Although the 20 MW gas turbine and the EMD diesels are physically located on the Shoreham site, they are, for NRC licensing purposes, considered "offsite" -- that is, not fully qualified as "onsite" power sources in compliance with all safety related nuclear requirements.[11]

The necessity for onsite diesel generators derives from General Design Criterion (GDC) 17, which requires that electric power systems assure that, in the absence of either onsite or offsite power systems, (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences, and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.[12] LILCO's motion

---

10 "Blackstart" means able to be started independently of any other power source; "deadline blackstart" means that the equipment recognizes through its own circuitry that a loss of power has occurred, and automatically starts without operator action.

11 Until the main shaft of one of the TDI diesels broke during testing, calling into question the reliability of each of LILCO's three diesels, they were considered fully qualifiable, onsite emergency power sources.

12 10 CFR Part 50, Appendix A.

alleged that a review of the spectrum of transients and accidents postulated in Chapter 15 of Shoreham's Final Safety Analysis Report (FSAR) revealed that there were no requirements for AC power during Phases I and II. Thus there was no need for any emergency power sources to protect public health and safety. During Phases III and IV, LILCO said, the public would be exposed to far less risk than it would be during full-power operations, and LILCO would be well able to restore emergency AC power in the ample amount of time available to avert any danger to public health and safety.

Intervenors Suffolk County and the State of New York opposed LILCO's motion.[13] The NRC Staff, however, supported LILCO. The Staff said that in resolving this issue, the Board must focus on the nature of the license being sought: the issue is whether low-power activities, not full-power activities, may safely be conducted in the absence of a fully-qualified onsite AC power source. The Staff noted that licensing boards have previously determined that the emergency planning measures required for low-power operation were not the same as for full-power operation. However, the protection offered the public during low-power operation should be no less than that afforded at full-power operation

---

13 "Supplement to Suffolk County's Preliminary Views on Scheduling Regarding LILCO's New Motion," March 30, 1984; "Preliminary Views of Governor Cuomo, Representing the State of New York, Regarding LILCO's So-called 'Supplemental Motion for a Low-Power Operating License'", March 28, 1984.

in full compliance with regulations.[14] The Staff concluded that the same concept should be applied to the requirements associated with emergency power sources (specifically GDC-17), and that if the protection afforded the public at low-power levels without approved diesel generators was found to be at least equivalent to the protection afforded the public at full-power with approved diesel generators, LILCO's motion should be granted.[15]

At a conference of counsel on April 4, 1984, oral arguments of the parties were heard on the issues raised by LILCO's Motion. At that conference, LILCO agreed that, for purposes of deciding the instant low-power motion, no discussion of any possible or potential use of the TDIs in an emergency would be relevant (Tr. 18-20). This was consistent with the statements made by the original Licensing (Brenner) Board that

---

14 Southern California Edison Co. (San Onofre Station, Units 2 and 3), LBP-82-3, 15 NRC 61, 185-197 (1982); see also Pacific Gas and Electric Co. (Diablo Canyon Plant, Units 1 and 2), LBP-81-21, 14 NRC 107, 120-23 (1981).

15 In the Staff's Safety Evaluation Report, Supplement No. 5 (SSER-5), served on the Board on April 20, 1984, the Staff reiterated this position:

> "The basis for acceptance of the alternate AC power sources was conformance with the intent of the GDC for the low-power mode of plant operation.... The design provides a level of safety for 5% rated power operations at least equivalent to that required by GDC-17 and 18 for full-power operation, and is acceptable...." Shoreham SSER 5, pages 8-9.

had the TDI contention before it, namely, that that Board had no confidence that any of the TDIs would operate if needed until it had litigated contentions thereon (Tr. 21,631).

Subsequent to the conference, a "Memorandum and Order Scheduling Hearing on LILCO's Supplemental Motion for Low-Power Operating License" (unpublished) was issued April 6, 1984. Therein, it was held that the provisions of 10 CFR §50.57(c), which allow an applicant to request a license for low-power testing while the proceeding for full-power license is pending, must be read together with the requirements of GDC-17, harmonizing the two rules in order to reach a sensible result and respect the purposes of both. The Board established an evidentiary hearing for the purpose of determining whether or not there was "reasonable assurance that the low-power activities can be conducted with the protection to the public at least equal to the protection offered at full-power operations with the approved diesel generators" (Memorandum and Order at 12).

II. ISSUES CONSIDERED

Ultimately, the Commission considered the issues raised by the LILCO low-power motion and, after hearing the arguments of counsel, it

issued an Order[16] (May 16 Order). The Commission held that "10 CFR §50.57(c) should not be read to make General Design Criterion 17 inapplicable to low-power operation," and the Board's Order of April 6, 1984, was vacated to the extent that it was inconsistent with such ruling (Order of May 16, at page 1155). The Commission noted that LILCO had indicated that it would seek an exemption to NRC regulations under 10 CFR §50.12(a).[17] The Commission stated that LILCO would have to show that operation of the facility at low-power levels without a qualified AC power source would be as safe as operation with such a source, and to demonstrate the "exigent circumstances" which favor the granting of this extraordinary form of relief. The Commission explained that:

> "A finding of exceptional circumstances is a discretionary administrative finding which governs the availability of an exemption. A reasoned exercise of such discretion should take into account the equities of each situation. These equities include the stage of the facility's life, any financial or economic hardships, any internal inconsistencies in the regulation, the applicant's good-faith effort to comply with the regulation from which an exemption is sought, the public interest in adherence to the Commission's regulations,

---

16 CLI-84-8, 19 NRC 1154 (1984).

17 10 CFR 50.12(a) specific exemptions:

> (a) The Commmission may, upon application by an interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest.

and the safety significance of the issues involved" (Order at 1156, footnote 3).

LILCO submitted its Application for Exemption on May 22, 1984, in which it requested an exemption under §50.12(a) from the requirements of GDC-17, and from other applicable regulations if any, which require that the TDI diesel contentions be fully adjudicated prior to conducting the low-power testing described in LILCO's March 20 motion. On May 31, 1984, we issued our "Order Establishing Schedule for Resumed Hearing." The evidentiary hearing commenced on July 30, 1984, and the record was closed on everything except security issues (discussed infra pp. 17-22) on August 7, 1984.

A. SUMMARY DISPOSITION OF PHASES I AND II

On May 22, 1984, following the issuance of the Commission's May 16 Order, LILCO filed motions for summary disposition on Phases I and II of its low-power testing program.[18] LILCO stated that, in the words of GDC-17, the onsite AC power source must be of "sufficient capacity and capability" to assure the performance of the specified safety functions. LILCO's affidavits demonstrated that during Phase I

---

18 See page 5, supra, for definitions of the phases of low-power testing.

fuel loading and precriticality testing, there are no fission products in the core and no decay heat. Therefore, core cooling is not required because with no fission product inventory, fission product releases are not possible. Thus, LILCO contended that as to Phase I, no AC power, either offsite or onsite, is necessary to perform health and safety functions. The reliability of LILCO's onsite diesels is therefore not material, and hence a license for fuel loading and precriticality testing should be granted without any litigation.[19]

LILCO also requested summary disposition of its Phase II testing program. LILCO contended that during Phase II, which includes cold criticality testing of the plant at essentially ambient temperature and atmospheric pressure, the extremely low levels of fission products and decay heat in the core provide essentially unlimited available time before core cooling would have to be restored in case of an accident. Thus, LILCO said, in this Phase there is also no need for AC power, and the activities of Phase II should be authorized prior to litigation of other low-power issues.

On July 24, we issued our "Order Granting in Part and Denying in Part LILCO's Motions for Summary Disposition on Phase I and Phase II

---

19 The Commission has recently approved fuel loading and precriticality testing in Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2) CLI-83-27, 18 NRC 1146 (1983).

Low-Power Testing." In ruling on the LILCO motions, we gave weight to the guidance that the NRC Staff had provided in its June 13 Response to the motions. Therein, the Staff had opined that the Commission's May 16 Order (CLI-84-8) stands for the proposition that GDC-17 must be literally satisfied (or an exemption thereto must be obtained) before any license may be issued pursuant to 10 CFR §50.57(c). Thus, we granted summary disposition only as to some of LILCO's uncontroverted statements of material facts.[20] Those facts were of a technical nature, supported by affidavits, and not disputed by any other party. Those admitted facts are as follows:

Phase I

(1) During all of the activities in Phase I, the reactor will remain at essentially ambient temperature and atmospheric pressure. The reactor will not be taken critical. Any increase in temperature beyond ambient conditions will be due only to external heat sources such as recirculation pump heat. There will be no heat generation by the core.

(2) Of the 38 accident or transient events addressed in FSAR Chapter 15, 18 of the events could not occur during Phase I because of the operating conditions of the plant. An additional six events could physically occur, but given the plant conditions, would not cause the phenomena of interest in the Chapter 15 safety analysis. The remaining

---

20 See Findings No. 7-19, post.

14 events could possibly occur, although occurrences are highly unlikely given the plant conditions. The potential consequences of these 14 events would be trivial.

(3) During Phase I fuel loading and precriticality testing, there are no fission products in the core and no decay heat exists. Therefore, core cooling is not required. In addition, with no fission product inventory, no fission product releases are possible.

(4) Even a loss of coolant accident would have no consequences during Phase I since no core cooling is required. No fission products exist and therefore no decay heat is available to heat up the core. The fuel cladding simply would not be challenged, even by a complete drain down of the reactor vessel for an unlimited period of time.

Phase II:

(1) Under the plant conditions present in Phase II, many events analyzed in FSAR Chapter 15 could not occur or would be very unlikely. Even the possible Chapter 15 events would have no impact on public health and safety regardless of the availability of the TDI diesels.

(2) Of the 23 possible Chapter 15 events reviewed, 20 would not be adversely affected by the loss or unavailability of offsite AC power. Therefore, the consequences of these events are unaffected by the unavailability of the TDI diesels.

(3) The three events that are adversely affected by the loss or unavailability of offsite AC power are: pipe breaks inside the primary

containment, feedwater system pipe break, and the loss of AC power event.

(4) Because of the extremely low power levels reached during Phase II testing, fission product inventory in the core will be only a small fraction of that assumed for the Chapter 15 analysis. The FSAR assumes operation at 100% power for 1,000 days in calculating fission product inventory; inventory during Phase II low-power testing will be less than 1/100,000 (0.00001) of the fission product inventory assumed in the FSAR.

(5) If a LOCA did occur during the cold criticality testing phase (Phase II), there would be time on the order of months available to restore makeup water for core cooling. At the power levels achieved during Phase II, fission product inventory is very low. At most, the average power output will be a fraction of a watt per rod, with no single rod exceeding approximately two watts. With these low decay heat levels, the fuel cladding temperature would not exceed the limits of 10 CFR §50.46 even after months without restoring coolant and without a source of AC power. Thus, there is no need to rely on the TDI diesel generators, or any source of AC power.

(6) During Phase II cold criticality testing conditions, there is no reliance on the diesel generators for mitigation of the loss of AC power event or the feedwater system piping break event. For these events, no loss of coolant occurs and the decay heat is minimal. Core

cooling can be achieved for unlimited periods of time without AC power using the existing core water inventory and heat losses to ambient.

(7) The LOCA and the feedwater system piping break postulate the double-ended ruptures of a piping system. Because the reactor will be at essentially ambient temperature and atmospheric pressure during Phase II, it is extremely unlikely that such a pipe break would ever occur. The NRC Staff does not require double-ended ruptures to be postulated for low temperature and low pressure systems in safety analyses.

(8) None of the events analyzed in Chapter 15 could result in a release of radioactivity during cold criticality testing that would endanger the public health and safety.

(9) Even if AC power were not available for extended periods of time, fuel design limits and design conditions of the reactor coolant pressure boundary would not be approached or exceeded as a result of anticipated operational occurrences, and the core would be adequately cooled in the unlikely event of a postulated accident.

On September 5, 1984, we issued an "Order Reconsidering Summary Disposition of Phase I and Phase II Low-Power Testing." Therein, we concluded that the Staff's original advice to the Board regarding the summary disposition motions for Phases I and II was not correct. Accordingly, we reconsidered and revised our prior order.

The LILCO motions had asserted that because no emergency AC power was needed for protection of public health and safety during Phases I and II, there was no requirement that AC power sources be

available during these phases. The Staff, in its June 13, 1984 filing said, "the Staff believes this argument runs afoul of the position taken by the Commission in CLI-84-8. In arguing that no AC power is needed during Phases I and II, LILCO is essentially arguing that GDC-17 does not apply at this level of operation" (Staff's Response at 4). The Staff mischaracterized LILCO's argument. LILCO did not assert that GDC-17 is inapplicable to Phases I and II; what LILCO said was that the requirements of GDC-17 (power capacity and capability sufficient to assure performance of safety functions specified by the criterion), when applied, are satisfied, even with no power source available during Phases I and II. This is not an attempt to "harmonize" GDC 17 and 10 CFR §50.57(c), contrary to the Commission's May 16 decision. Rather, we simply took the original requirements of GDC-17 as set forth in the regulation and applied a rule of reason in its interpretation as a matter of "simple logic and common sense" (Order at page 10).

B. SAFEGUARDS/SECURITY

On June 2, 1984, LILCO filed a motion to preclude discovery upon security issues in this proceeding. The Board granted that motion based upon the fact a Final Security Settlement Agreement had been

signed by the parties on November 24, 1982,[21] and ratified by a specially appointed Licensing Board on December 3, 1982.[22] Our "Order Granting LILCO's Motion In Limine" was issued June 20, 1984.[23]

Subsequently, the Commission found that some guidance on the litigability of security issues in this proceeding was appropriate. Although LILCO's exemption application was held not to be an occasion for parties to relitigate issues already decided in the main operating license proceeding, the Commission said parties would be permitted to raise new contentions that were: (1) "responsive to new issues raised by LILCO's exemption request;" (2) "relevant to the exemption application and the decision criteria as set forth in the Commission's Order of May 16, 1984;" (3) "reasonably specific;" and (4) "otherwise capable of on-the-record litigation." The Commission further explained that security issues, if any, may only be litigated:

---

21 The agreement was signed by LILCO, Suffolk County and the NRC Staff. Although the State of New York was at that time a party to this proceeding, it chose not to participate in security issues.

22 "Memorandum and Order Canceling Hearing, Approving Final Security Settlement Agreement, and Terminating Proceeding," December 3, 1982.

23 The Agreement itself containing safeguards information, was not before the Board; our ruling was based upon the discussion set forth in the December 3, 1982 Memorandum and Order, supra, footnote 23.

(1) to the extent they arise from changes in configuration of the emergency electrical power system, and

(2) to the extent they are applicable to low-power operation.[24]

On August 13, 1984, Suffolk County and the State of New York filed seven proposed security contentions. These proposed contentions were designated as restricted "safeguards information" by the proffering parties. On August 17 we issued a Protective Order setting requirements for the restricted treatment of safeguards information. All subsequent filings on this matter have been designated as safeguards information and treated as such. After LILCO responded to the proposed contentions, the Intervenors filed Replies which contained a new superseding set of seven "Revised" contentions. At an in camera conference of counsel[25] on August 30, we heard the additional arguments of all parties.[26] On September 19 we issued a 20-page "Restricted" Order Denying Revised Security Contentions, and a brief summary thereof for public release.

---

24 Commission's Memorandum and Order, entered July 18, 1984.

25 All proceedings involving security issues were held in camera, and were reported in restricted transcripts numbered S-1 through S-333.

26 Subsequent to that conference, but before this Board had ruled on the contentions, the NRC Staff (Division of Licensing, Office of Nuclear Reactor Regulation) issued a letter which apparently constituted an abrupt change in the previous position of the Staff on the issues of vital areas or equipment. We therefore found it necessary to hold another conference with counsel on September 14, 1984 to discuss the "effect and implications" of the Staff's letter "upon substantive issues and scheduling" in this proceeding.

A pervasive issue throughout the proffered revised security contentions was whether LILCO's power "enhancement" equipment should be treated as "vital," thus located in "vital areas" under NRC regulations.[27] We held as a matter of law that under a request for exemption from certain regulations for the purpose of low-power testing, the power enhancements need not be treated as "vital." To require this equipment to be treated as vital would, in effect, negate the exemption provisions. Thus, we rejected contentions which asserted that the enhancements must be so treated.

The Intervenors also argued that the "change in configuration" wrought by the addition of the enhancements created new or different vulnerabilities for the site. However, these proffered contentions failed to show with reasonable specificity that they were not encompassed within the approved Security Plan, as to which the Intervenors have had detailed information for almost two years. The

---

27 10 CFR §73.2 contains the following definitions:

> "(h) 'Vital area' means any area which contains vital equipment.
>
> "(i) 'Vital equipment' means any equipment, system, device, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation. Equipment or systems which would be required to function to protect public health and safety following such failure, destruction, or release are also considered to be vital."

proposed revised contentions also failed to meet the six criteria described in the Commission's guidance in its July 18, 1984 Memorandum and Order, supra, and they were denied for reasons set forth with more specificity in our Restricted Order Denying Revised Security Contentions, entered September 19, 1984 (unpublished).

On October 2, 1984, LILCO informed the NRC Staff[28] that it would voluntarily implement certain "enhancements" to the physical security arrangements provided for the EMD diesels.[29] The "enhancements" would be in place prior to the commencement of Phase III of low-power operation, and would remain until the regular emergency power system (TDI diesels) was fully qualified. The NRC Staff indicated its belief that LILCO's commitments "adequately resolve the security concerns" which had prompted the Staff to determine that the subject power equipment must be treated as "vital."[30]

---

28 Letter of October 2, 1984, from John Leonard, LILCO, to Harold Denton, NRC (SNRC-1090).

29 The additional security arrangements were set forth in an attachment to LILCO's letter, designated "safeguards information," and will be documented in an Appendix to the Shoreham Security Plan.

30 Letter of October 10, 1984, from Albert Schwencer, NRC, to John Leonard, LILCO.

C. "AS SAFE AS"

In its May 16 Order, the Commission said that LILCO must show that "at the power levels for which it seeks authorization to operate, operation would be as safe under the conditions proposed by it, as operation would have been with a fully-qualified onsite AC power source" (19 NRC 1156).

LILCO states that it has shown that "[o]peration of Shoreham as proposed by LILCO will be as safe as operation would have been with a fully-qualified onsite AC power source because the effect on public health and safety will be the same; there will be none."[31] Suffolk County says that "reliance on the alternate AC power system substantially reduces the margin of safety and constitutes a severe reduction in the defense in depth protection which generally is central to the NRC's licensing concept."[32] Thus, LILCO would have us define "as safe as" to mean providing equivalent safety in the functional sense. The County on the other hand would hold us to a point-by-point comparison which would require the alternate power sources to be

---

31 Long Island LIghting Company's Post-Hearing Brief in Support of Application for Exemption, August 31, 1984, at 3.

32 Brief of Suffolk County in Opposition to LILCO's Motion for Low-Power Operating License and Application for Exemption," August 31, 1984, at 3.

absolutely equivalent in all respects, such as qualifications, automation, and speed of response, regardless of whether they provide an equivalent level or amount of safety.

The NRC Staff approaches this question from the standpoint of function. The Staff states that it has been shown that, following a loss of offsite power (LOOP), LILCO would have at least 55 minutes to restore power necessary to mitigate a loss of coolant accident (LOCA). Because it has also been shown that there exists adequate assurance that power can be restored using alternate power sources well within 55 minutes, the proposed alternate power system provides as comparable level of protection as would a source in compliance with GDC 17 and thus it meets the "as safe as" standard set out by the Commission in CLI-84-8.[33] We adopt the Staff's definition and application of the "as safe as" standard.

Staff witness Wayne Hodges described the concept of "margin of safety" as like driving on a four-lane bridge, being in the outside lane near the edge as opposed to the inside lane. There is no less margin of safety in crossing the bridge (Tr. 1751). Suffolk County points out that there are differences between the emergency electric power configuration as originally proposed (the TDIs) and LILCO's proposed alternate. With a fully qualified power system, emergency power could

---

33 Staff Proposed Findings, at 23.

be supplied to safety loads within 15 seconds; the alternate power sources could not supply power for several minutes, perhaps as long as 30 minutes.

There is unquestionably a lesser margin of safety provided by LILCO's alternate power system. Nevertheless, evidence regarding the time needed to restore power[34] and the time in which the alternate system would be able to do it, shows that power will be restored in time to prevent harm to the public notwithstanding the reduction in margin of safety. The difference in "margins of safety" involved does not preclude a finding of "as safe as" when applied to operation "at the power levels for which it seeks authorization to operate" (May 16 Order at 1156).

NRC regulations do not require that a licensee be able to restore emergency power within 10 seconds, or 15 seconds, or any other specific time. Rather, an applicant makes analyses of a variety of accident scenarios and determines the times needed to prevent any resulting danger to the public. The Staff reviews the Applicant's analysis, and tells it that it must be able to restore emergency power within a specified time.

---

34 This time -- 55 minutes using the most conservative assumptions in the very worst case -- is uncontroverted in the record.

The main purpose of emergency power relevant here is to get emergency cooling water to a reactor's core in order to avoid, or immediately reverse, uncovering the core. At full-power operation equipment that can provide power in a matter of seconds, such as the TDIs, is essential.[35] However, in the limited circumstances before us, of low-power operations at not more than five percent of rated power, emergency power is not needed as quickly.[36] Since there are at least 55 minutes to restore emergency power before core damage results, it is not necessary to restore power within 10 seconds. Safety, after all, is the purpose of design requirements.

Suffolk County's arguments would have us conduct a point-by-point comparison of Shoreham's emergency power configuration with TDI diesels and without them. "As safe as" cannot be based on such a point-by-point comparison of the components of systems. In comparing any roughly equivalent power systems, neither is required to be better than the other in every respect; even two "qualified" systems would not be identical in every respect. If LILCO's original and alternate emergency power systems were identical in every respect, there would be

---

35 The core of a reactor operating normally at full-power can survive uncovery for approximately 30 seconds before safety margins set forth in NRC criteria are violated.

36 Nor is as much emergency power needed, in view of the capacity of mitigating systems, the lesser inventory of fission products, and lower decay heat.

no need for an exemption. The purpose of these systems is to provide protection for public health and safety, by whatever combination of features they possess. Even the General Design Criteria themselves are premised upon the idea of what a system must be able to do, not upon whether one machine might be somewhat better than another.

In short, the question of "as safe as" must be approached in a functional sense (does it serve the purpose of protecting public health and safety) rather than in an absolute sense (is it the very best possible machine available for the purpose). To make such a finding, we approach the question from the viewpoint of the time needed to restore power and the availability of power from the alternate system during that time.

The General Design Criteria set forth the functional requirements of what safety equipment must be able to do. In 10 CFR §50.46(b), concrete criteria are set forth. An operating reactor must be able to withstand postulated accidents and transients and remain within the limits specified in §50.46(b) with regard to fuel cladding temperature, oxidation of fuel cladding, hydrogen generation, changes in geometry, and decay heat removal. The limits are set conservatively to provide a safety margin (Tr. 1786-87). Any plant operating with a fully qualified onsite power system in accordance with GDC-17 must meet the limiting criteria of §50.46(b). Plants with differing onsite emergency power systems are all deemed to be safe once they have met those criteria, no matter by how small or great a margin.

In this case LILCO is asking authorization to operate its plant at low-power with no emergency AC power system. There is evidence that in the event of a LOOP/LOCA while the plant is operating in the low-power mode, the core can be cooled before the limits of §50.46(b) are exceeded. Thus, the requirements of the regulations are met notwithstanding that the challenge is met by "offsite" power enhancements rather than by a qualified "onsite" source. If the core will be cooled in time to satisfy the regulations, the system is as safe under our regulations as any other emergency power system (including Shoreham's TDIs) would be during low-power operation.

The term "as safe as" may be defined as presenting no greater potential harm to the public than would a plant operating at low-power with a fully qualified power source. However, the NRC Staff has suggested that "as safe as" should be interpreted to mean "substantially as safe as."[37] In other words, that the system is in substance just as safe. The substance of safety is the actual protection provided to the public, and under this definition our finding herein would be the same. In any case, the standard set forth in the NRC Staff's proposed findings ("a comparable level of protection") clearly falls within the ambit of our interpretation of "as safe as."[38]

---

37 Tr. 3045-47.

38 Tr. 3043-47.

The "as safe as" standard used by the Commission in CLI-84-8 is an articulation of what LILCO had said it could prove. The applicable regulation, 10 CFR §50.12(a), requires only a showing that the grant of an exemption "will not endanger life or property." If LILCO can show that it has met this higher standard, it will have done more than is necessary to make the safety showing required to support the grant of its requested exemption.

III. PUBLIC HEALTH AND SAFETY

A. TIME REQUIRED TO RESTORE AC POWER

1. Phases I and II

LILCO described in its supplemental low-power motion before this Board the activities that would occur during each phase.[39] As discussed above (Section IIA, page 11, supra), its request for summary disposition of Phases I and II included proposed statements of material fact which were uncontroverted and were therefore admitted.[40] In no case did either Intervenor challenge any technical aspect contained in the statements of material fact.

Phase I included loading fuel into the reactor and performing certain tests, summarized in the testimony of William E. Gunther.[41] During Phase I, the reactor will be at atmospheric pressure and at essentially ambient temperature; the only additional heat would be from sources external to the core, such as the recirculation pump. Of the 38

---

39 LILCO's Supplemental Motion for Low-Power Operating License, dated March 20, 1984.

40 Order Granting In Part and Denying In Part LILCO's Motions for Summary Disposition on Phase I and II Low-Power Testing, entered July 24, 1984, page 10 et seq.

41 Gunther, Tr. 202-04, 214-17.

transient or accident events identified and analyzed in Chapter 15 of the Shoreham FSAR, almost half could not occur during Phase I because of the operating conditions of the plant. Of the remaining number, some could not cause the phenomena of interest in the safety analysis, and the potential consequences of the rest would be trivial. Since the reactor would remain subcritical, there would be essentially no fission products. Therefore there would be no decay heat and hence no necessity for cooling the fuel.[42] Even should a LOCA occur, in the absence of decay heat there would be no means of increasing the temperature of the core; it could remain without water indefinitely without harm. It follows that if no cooling is required to mitigate any untoward event that might occur under the conditions that would exist during Phase I, there is no requirement for emergency AC power.[43]

During Phase II the reactor would be taken critical and operated at very low power levels.[44] Otherwise the system conditions (temperature and pressure) would be the same as in Phase I. Many of the events analyzed in Chapter 15 of the FSAR could not occur or would be highly unlikely. Even the possible events could have no effect on the public health and safety regardless of the availability of AC power from

---

42 Findings No. 9, 10.

43 Findings No. 11, 20.

44 Finding No. 12.

any source. Should there be a break in the feedwater system piping, the minimal amount of decay heat could be removed through the existing core water inventory and heat losses to ambient. The fission product inventory postulated in the Chapter 15 analyses is based on operation for 1000 days at 100% power, while Phase II power would be, at most, 0.001% of thermal rated power and for much shorter periods of time. Thus the decay heat would be appreciably lower than at full power and the limits on fuel temperature would not be approached, even should a LOCA occur and coolant not be restored for months.[45]

Since there is no reasonable means of releasing the relatively few fission products that could be generated during Phases I and II, there can be no adverse impact of loss of AC power on the public health and safety. Accordingly, the Board reaffirms the findings and conclusions contained in its orders of July 24 and September 5, 1984.

2. Phases III and IV

As set forth in LILCO's supplemental motion for low-power license as well as its exemption request, Phases III and IV would encompass increasing the power of the core to one percent and five percent, respectively, of rated power. During Phase III the system is

---

45 Findings No. 13-20.

taken, in steps, to the rated temperature and pressure conditions and the power raised to about one percent of the rated level. These conditions are beyond the essentially zero power and ambient temperature and pressure conditions of Phase II. Testing of systems and components will be carried out under plant operating conditions, except for heat output from the reactor core. Phase IV extends the thermal reactor power to five percent, thereby permitting testing and calibration of additional portions of the total system.[46] These activities are all necessary and conventional preliminaries to bringing a plant on-line at full design operating power, whether they be performed during a formally designated low-power program or as part of a full-power license.

Although LILCO separated phases III and IV, they are discussed together here since they are bounded by Phase IV conditions with respect to the necessity of restoring AC power should offsite power be lost. In other words, if LILCO has demonstrated that AC power can be restored in a sufficiently short time to take care of the decay heat from the fission products resulting from operation at five percent power,[47] operation at one percent power will be no problem because the required time in which power must be restored would be longer.

---

46 Findings No. 31, 32.

47 Although LILCO indicated that operation at five percent power would be for a time short of equilibrium conditions, the analyses on
(Footnote Continued)

Chapter 15 of the FSAR identified and analyzed the transients and accidents that must be accommodated by the Shoreham Plant, at full-power operation, in order to demonstrate compliance with NRC regulations. Two witness panels, one of LILCO and one of NRC Staff, presented testimony concerning those events that could occur during low-power operation.[48] Essentially all of those witnesses agreed that the 38 accidents and transients of Chapter 15 fall into three categories: (1) those that cannot occur during low-power, (2) a loss of coolant accident (LOCA), and (3) all others. Of these 38 events, three could not occur[49] and, of the remaining ones, only four require the assumption of the unavailability of offsite power. These four events are: loss of AC power, LOCA, steam line break, and feedwater system piping break, of which the LOCA is obviously the one of most severe potential consequence.[50] For the purposes of this exemption request there is no need to discuss any save the four events, since the others

---

(Footnote Continued)
which our opinion is based assume, for conservatism, five percent power for essentially unlimited time.

48 Rao, et al., Tr. 265 et seq.; Hodges and Quay, Tr. 1782-1800.

49 Staff witnesses considered that five events could not occur. In addition to those identified by LILCO, Staff determined that control rod removal and fuel assembly insertion error during refueling could not occur by definition, since no fuel handling activity is contemplated during Phases III and IV (Hodges, Tr. 1789).

50 Finding No. 32.

are not affected by the assumption of loss of offsite power. In addition, their consequences are bounded by the Chapter 15 analyses, and therefore pose no undue threat to health and safety.

In the absence of a LOCA during low-power operation and without available AC power, the water in the reactor vessel would boil off slowly, dropping from the normal level to the top of the fuel over an extended period of time. Two systems would be available to provide makeup water: the Reactor Core Isolation Cooling (RCIC) System and the High Pressure Coolant Injection (HPCI) System. These systems, which operate automatically, are steam driven and use DC (battery) power supplies that will last without recharging a minimum of 24 hours. Each system has sufficient coolant makeup inventory to supply any required core cooling.[51] If either system acts even once during the first four days to restore the water level, the subsequent heat losses would compensate for the decay heat being generated in the core and thereby prevent the water level falling below the top of the fuel and the peak cladding temperature[52] of 2200° F would never be reached. Containment

---

51 Finding No. 35; LILCO's DC power supplies will last a minimum of 24 hours providing sufficient power for at least two more days of core cooling. Using an onsite portable generator and battery chargers, the DC power can be maintained indefinitely.

52 This value delimits the peak cladding temperaturein accordance with 10 CFR §50.46(b) for loss-of-coolant accidents.

and suppression pool limits would not be exceeded for approximately 30 days following loss of AC power.[53]

For loss-of-coolant accidents, 10 CFR §50.46(b)[54] lists five limits that must be satisfied. These limits address maximum cladding temperature, cladding oxidation, hydrogen generation, core deformation, and the requirement for removal of decay heat for an extended period of time.

---

53 Finding No. 33.

54 10 CFR §50.46(b) states:

(b)(1) Peak cladding temperature. The calculated maximum fuel element cladding temperature shall not exceed 2200° F.

(2) Maximum cladding oxidation. The calculated total oxidation of the cladding shall nowhere exceed 0.17 times the total cladding thickness before oxidation....

(3) Maximum hydrogen generation. The calculated total amount of hydrogen generated from the chemical reaction of the cladding with water or steam shall not exceed 0.01 times the hypothetical amount that would be generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react.

(4) Coolable geometry. Calculated changes in core geometry shall be such that the core remains amenable to cooling.

(5) Long-term cooling. After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core.

Both NRC Staff and LILCO witnesses testified that a LOCA is the most potentially damaging accident that can be anticipated at power levels up to and including five percent of rated power.[55] Analyses of the consequences of a LOCA occurring during either Phase III or Phase IV were performed to determine the times within which core cooling would have to be restored in order to meet these criteria. Using the conservative assumptions required by the models of Appendix K of Part 50 (including the accumulation of one percent of the fission products assumed in the FSAR for full-power operation, no convective heat transfer following the initial blowdown, and loss of inventory until spray or injection is initiated), the occurrence of a LOCA at one percent power would require restoration of AC power within about six hours. Using more realistic assumptions as input to the same models, more than 24 hours would be available for core cooling. Staff and LILCO differed slightly in the results of their analyses for a LOCA at five percent power using conservative assumptions, reporting 55 and 86 minutes, respectively. Values that more nearly reflect actual core conditions and history during operation at five percent power, such as peaking factor and 60 days equivalent operation rather than 1000 days,

---

55 Rao, et al., Tr. 252, 297-98, 302, 313; Hodges, Tr. 1785..

predict times of 110 minutes and more than three hours by Staff and LILCO, respectively.[56]

The potential need for the standby gas treatment system (SGTS) was investigated. The Staff assumed that this system would mitigate the consequences of the fuel handling accident and the LOCA. Since no fuel handling is anticipated during low-power testing, there is no need to consider that potential accident. The availability of the standby gas treatment system would be important in the case of a LOCA with breach of fuel cladding and consequent release of iodine to the environment. However, if core cooling can be restored within 55 minutes following a LOCA accompanied by loss of offsite power, the cladding temperature will not exceed 2200° F at any location, and there will be no cladding failure and no need for the SGTS.

It is possible that an oxidation limit would be reached before the fuel temperature limit is reached. However, this would occur at less than five percent power, and a substantially longer time would be available before any limits are approached. Therefore restoration of AC power within the time suggested by the most conservative assumptions, 55 minutes, would prevent reaching any of the limits of §50.46.

The peak cladding temperature limit of §50.46 is a conservative value chosen to assure that the cladding retains some

---

56 Finding No. 36.

ductility so that the fuel will remain in a coolable geometry when coolant is restored. Some data indicate that the cladding would retain some ductility at 2700° F and the fuel would not melt. At 2200° F the local cladding oxidation is 6.5% (the regulatory limit is 17%). Thus the fuel and cladding would remain intact and there could be no release of fission products.[57]

It is apparent that the worst case would be a LOCA while operating at five percent power accompanied by a loss of offsite power. If AC power can be restored to move cooling water, in addition to that supplied by the HPCI and/or the RCIC systems, onto the core within 55 minutes (the most conservative estimate), the regulatory limits will not be exceeded. Therefore there will be no fuel or cladding damage and no release of fission products or effect on health and safety.

Neither Suffolk County nor the State proffered any witness who challenged these calculations or any technical aspect of low-power operation under the conditions of the requested exemption. The only challenge offered by the Intervenors to the above conclusions regarding times available for restoration of AC power had nothing to do with the validity of the results or with whether the criteria of §50.46 would be met. Their sole assertion in this area was only that the enhanced AC power sources might not be available within the 15 seconds postulated

---

57 Findings No. 37, 38, 39, 42.

for the "fully qualified" onsite emergency power. The Intervenors did not challenge the assertion of LILCO and Staff that it is unimportant whether core cooling starts within 15 seconds or 55 minutes as far as protection of the core and therefore public health and safety are concerned. We find the temperature difference between 550° and 1086° is of no consequence, because both are substantially less than the regulatory limit of 2200° F.[58]

B. AVAILABILITY OF AC POWER

This opinion has explored the circumstances under which AC electrical power could be required during fuel loading and operation up to five percent of rated power. Under the terms of the requested exemption from the literal requirements of the General Design Criteria, particularly GDC-17, for operation at low-power, all electrical power for the site should be considered offsite, including the enhanced power sources discussed infra. The Board has held that, for the purposes of this case, LILCO can take no credit for its TDI diesels, which were intended to be the source of emergency AC power, although the Board is aware that LILCO has rebuilt them and is in the process of again attempting to qualify them as onsite sources. The Board is also aware

---

58 Finding No. 39.

that LILCO has purchased Colt diesels and is preparing for their installation and subsequent qualification; these, also, are beyond the scope of the Board's consideration in this low-power decision. Thus for the purposes of this case, all sources of power are considered to be offsite, no matter where they are physically located. It is therefore necessary to determine what and where the sources are, the diversity of routing to the Shoreham site, the reliability of the system, and the time within which AC power could be reestablished should it be lost.

1. Reliability of LILCO's Normal Offsite Power System

With respect to normal offsite electrical power sources, GDC-17 mandates two physically independent circuits, not necessarily on separate rights of way, which may come together in a common switchyard; functional requirements for these power sources are also specified.[59] LILCO has exceeded these physical requirements significantly, as the following discussion indicates, which would presumably augment in like amount the realization of the functional requirements.[60]

---

59 GDC-17 states in pertinent part:

> "Electric power from the transmission network...vital safety functions are maintained.... (See complete text at fn. 3, supra).

60 Findings No. 56, 57.

LILCO has at present 3,721 MW of its own generating capacity consisting of base-load, mid-range, and peaking steam turbine units, and internal combustion units, both gas turbines and diesel generators.[61] Four major steam power generating stations essentially surround Shoreham on three sides. Each of these stations is equipped with one or more blackstart[62] gas turbines.[63] In addition to those on the sites of the steam generating stations, deadline blackstart[64] gas turbines are also at three other locations near the Shoreham site. Any one of the gas turbines is of sufficient capacity for Shoreham's emergency power needs. Should Shoreham receive an operating license, standing orders to the system operator will require restoration of power to Shoreham as a priority action; the times estimated or determined for this power restoration are between six and 25 minutes, depending on the transmission routing available.[65]

---

61 Finding No. 43.

62 Blackstart means that, when a loss of power exists, an independent source of starting power allows the systems operator to start a gas turbine from either a local or a remote location.

63 Findings No. 44, 45, 46, 49, 51.

64 Deadline blackstart means that the unit can recognize through its own circuitry that power on the line has been lost and can start automatically without operator action.

65 Findings No. 45, 46, 49, 51.

In addition to its own generating capacity, LILCO has a single connection with the New England Power Exchange and three with the New York Power Pool.[66] It also has in place automatic load-shedding capabilities for removing loads from the grid and reducing voltages to prevent cascading outages on the system. The single outage on a substantial portion of LILCO's grid since the 1965 Northeast Blackout occurred in 1979, before all of the present equipment and procedures for power restoration were in place. Even so, power was restored to the system within slightly more than an hour.[67]

Seven circuits from LILCO's system serve the Shoreham site through two switchyards. Four separate 138 KV lines enter the 138 KV switchyard, about 1300 feet south of the Plant, over two separate and independent rights-of-way, each of which carries two circuits. This switchyard consists of two sections that can be electrically isolated from each other in case of trouble in one section. Each section receives two of the four 138 KV circuits, one from each right-of-way. From this switchyard, power is transmitted to the normal station service transformer (NSST).[68]

---

66 Finding No. 47.

67 Finding No. 48.

68 Finding No. 54.

The Wildwood Substation, approximately one mile south of Shoreham, is fed by three 69 KV circuits from two separate rights-of-way. From the Substation a single line, part of which has been placed underground, can supply power, via the 69 KV switchyard, to the reserve station service transformer (RSST), thereby providing independence between the NSST and the RSST. In addition, a bypass (partially overhead and partially underground) of the underground portion of this line, around the 69 KV switchyard, goes directly to the RSST. These provisions allow restoration of power to the RSST without the necessity of repairing the underground line from the switchyard or a fault in the yard itself.[69]

In summary, seven power circuits enter the Shoreham site along two completely separate and independent corridors, with no ties or interconnections. One of the two switchyards fed by these circuits is apparently electrically equivalent to two yards, and the other can be bypassed completely. Witnesses for the NRC Staff affirmed that this design exceeds NRC requirements for offsite power systems.[70]

With respect to loss of offsite power from natural phenomena, we observe that this has not been a significant problem in the past. The transmission system is designed to withstand winds in the range of

---

69 Finding No. 55.

70 Findings No. 56, 57.

100 to 130 miles per hour; the system has not been extensively damaged by hurricanes in the last 10 years, although major storms have caused outages on individual lines.[71] Similarly, the transmission system has not been adversely impacted by either tornadoes or earthquakes[72] in the last 20 years.[73] The impact of ice storms and lightning strikes on the system has not been severe and has affected at most small segments of line.[74] Even so, LILCO has committed to initiate steps to place the plant in cold shutdown should any of the following events occur during low-power testing in order to minimize the possible consequences of loss of normal offsite power: a "hurricane warning," a "tornado watch," a "severe thunderstorm watch," a "winter storm watch," or a coastal flood warning for the Shoreham area; an indication of seismic activity of .01g on the Shoreham seismic monitors;[75] the prolonged or unscheduled outage

---

71 Findings No. 58, 59.

72 See "Seismic Capability," Section III.B.3, post.

73 Finding No. 58.

74 Finding No. 58.

75 There was some discussion by the Intervenors' seismic witnesses, Meyer and Roesset, that this alarm would provide little protection in the event of a significant seismic event (Tr. 2797-99). This testimony reflected uncertainty that the alarm would precede larger seismic shocks by any appreciable length of time or, alternatively, that an alarm indicating small foreshocks might precede major shocks by so much time as to be meaningless. While there are clearly uncertainties, the commitment to shut down the plant in the (Footnote Continued)

of two of the four LILCO interconnections to the New York Power Pool and the New England Power Exchange; or a low electrical frequency condition on the LILCO transmission system which reaches an alarm set point.[76] LILCO's procedures direct immediate commencement of a controlled shutdown upon notification from the system operator that any of these conditions exist.[77]

The Board orders that these commitments shall become a part of the license conditions for low-power operation.

The Intervenors essentially ignored the normal offsite power system except for some attack on the vulnerability of transformers, insulators, and line poles to seismic events.[78] We note that the regulations contain no requirements for the seismic qualification of normal offsite power, and we find no justification for imposing such qualification for low-power operation, particularly in light of the

---

(Footnote Continued)
event of such an alarm indicates LILCO's willingness to avoid any hazard if possible and may, in fact, prevent the operation of the plant during a seismic event. In any event, as discussed below, it is unnecessary to postulate a seismic event concurrent with a LOCA and, therefore, plenty of time would be available to restore AC power even if a transmission line, transformer or other element of the offsite system were to be affected adversely.

76 Finding No. 61.

77 Finding No. 62.

78 See, for example, Tr. 340 et seq.

commitment of LILCO to proceed to cold shutdown should ground motion of 0.01g be detected by the Station monitor.

We note that the offsite power sources and transmission system discussed above will be the same as that for full-power operation. In considering the exemption request before us for low-power operation, we must be concerned with availability of AC power for operation of those plant systems necessary to protect the public health and safety during low-power operation, regardless of the sources of that power. The Board finds that LILCO's substantial and diverse generating capacity, coupled with the multiplicity of paths through which power can be transmitted to the site, more than satisfies the requirements of GDC-17 with respect to normal offsite power and makes it unlikely that power would be unavailable to either the NSST or the RSST from normal offsite sources.

2. Offsite Enhancements at Shoreham

The enhancement of the offsite system which LILCO has put in place consists of two independent power sources, both located on the Shoreham site. One source, a 20 MW deadline blackstart gas turbine, is physically located in the 69 KV switchyard 300 feet south of the reactor building.[79] The other source is a group of four EMD diesel generators,

---

79 Knox and Tomlinson, Tr. 2342.

also deadline blackstart, manufactured by General Motors. Each EMD is rated at 2.5 MW, and the total unit supplies 10 MW for emergency power.[80] The four units are grouped together in the protected area just southwest of the reactor building.

The gas turbine is equipped with a compressed air starting system. Air to the starter is supplied from a receiver which is kept pressurized automatically by a compressor.[81] The EMD diesels have dual starting motors which are powered by a continuously charged battery.[82] Upon loss of offsite power the two systems start simultaneously. If power from the gas turbine is available it is routed through a transformer in the 69 KV switchyard to the switchyard bus and then to the safety-related switchgear. If power from the gas turbine is not available, power from the EMD diesels is routed through a nonemergency switchgear room to the safety-related switchgear room. Power from the gas turbine could be established conservatively in 10 minutes; power from the EMD diesels in 30 minutes.[83]

The starting reliability of the gas turbine, based on actual start attempts on a similar unit in 1982-83, was 97.6%. Actual start

---

80 Knox and Tomlinson, Tr. 2342; Schiffmacher, Tr. 332, 494.

81 Tomlinson, Tr. 2346.

82 Tomlinson, Tr. 2347.

83 Knox, Tr. 2349-52.

attempts for the EMD diesels over the same time period showed a reliability of 98.6% per diesel, with the reliability of the system approaching 100% that at least one diesel would start. These levels of reliability compare favorably with qualified emergency power systems, whose industry-wide starting reliability is between 92-99%.[84]

The County offered testimony in the following areas: (a) the reliability of the EMD diesels; (b) the testing of both sources; (c) the vulnerability of both systems to single failure; and (d) the resistance of the sources to seismic events. We consider these, seriatim.

a. Reliability of the EMD Diesels

The starting reliability of the EMD diesels has been described above. Suffolk County alleges that occurrences such as breakage of the fuel line supplying all four EMD diesels, fire detection and mitigation of the EMDs, and common location of EMD electrical breakers, among others, show that the EMD diesels are not as reliable as a fully-qualified system would be.[85] Even the County does not, however, reach the conclusion that the EMDs are so unreliable that they cannot be considered capable of performing their ultimate mission: that of acting

---

84 Schiffmacher, Tr. 463; Tomlinson, Tr. 1863; Knox, Tr. 2346; SSER 6, p. 8-9.

85 Intervenors' Proposed Findings No. 104-89.

as a backup to the gas turbine. The evidence shows that the EMDs have sufficient reliability to perform their intended function.

Both Staff and LILCO point out that a number of actions have been or will be taken to ameliorate the major concerns that have been stated in the record. These actions would either be executed voluntarily by LILCO or would be made conditions in any license which might issue.[86] Maintenance and repairs of the EMDs will be performed by experts who have a great deal of experience with EMD diesels and, indeed, performed the maintenance and repair of the instant diesels when they were used by New England Power Co. for unattended production of peaking power.[87] The reliability of the EMDs in this previous service was excellent.[88]

b. Testing of the Sources

Suffolk County witnesses testified that the test procedures to be used for the gas turbine were not rigorous enough to demonstrate the availability of the source for capacity loads.[89] The Staff, in its review leading to SSER 6, determined that the proposed test procedure was not complete. The Staff will therefore require LILCO to perform a

---

86 SSER 6, pp. 13-2, 13-3; Knox, Tr. 2354-55.

87 Iannuzzi and Lewis, Tr. 1173-76.

88 Id., at Tr. 1178-79.

89 Minor and Bridenbaugh, Tr. 2580, 2614-15.

test of the turbine to full capacity before beginning Phases III and IV. The Staff will also require a monthly test to demonstrate that loads normally connected to certain buses used by the turbine are automatically disconnected, and that the gas turbine output will be automatically connected to the 69 KV bus within two to three minutes.[90] The Board finds that this requirement adequately addresses Suffolk County's concern.

The Staff also determined that more stringent testing is required for the EMD diesels. Before operation in Phases III and IV, a test will be required which will load each EMD diesel to its design load for one hour, and the voltage and frequency must be verified to be within required limits. The Staff will also require all four EMDs to be tested on a biweekly basis and demonstrate that they can be normally reconnected to their loads if they are disconnected for any reason.[91]

c. Single Failure Criterion

Suffolk County's testimony was devoted almost exclusively to showing that each unit in the enhanced system (the gas turbine and the EMDs) was either inferior to the qualified system or, in the case of the EMDs, that the potential existed for a single failure which would

---

90 SSER 6, pp. 8-2, 8-3.

91 SSER 6, p. 8-4.

disable all four of them.[92] The Board finds this line of evidence to be irrelevant. The two units (the gas turbine and the EMDs) were planned as a system, and it is the system that the Staff has reviewed and has determined that the alternate power source was adequate.[93] The only potential common fault is that the output of both units gains entry to the nonemergency switchgear room through a concrete block wall, but even here they are separated by approximately forty feet.[94] The EMDs also will have an independent line which allows their output to be delivered to the emergency switchgear room.[95] The Board therefore finds that the EMDs and the gas turbine are adequately independent of each other.

d. Seismic Capability

Extensive testimony concerning the seismic capability of the enhanced AC power sources was presented by both LILCO[96] and by Suffolk County.[97] While LILCO does not claim that either the 20 MW gas turbine or the EMD diesels meet the seismic qualification criteria for safety-related equipment, the record shows that it is reasonable to

---

92 Eley, et al., Tr. 2452, 2459-60; Eley, 2572 et seq.

93 SSER 6, p. 8-5; Smith, Tr. 2482.

94 Knox, Tr. 1885-86.

95 Schiffmacher, Tr. 842, 863.

96 Christian et al., Tr. 962 et seq.

97 Meyer et al., Tr. 2762 et seq.

expect that this system will survive a seismic event[98] with little if any damage.[99]

Suffolk County testimony and cross-examination of LILCO witnesses was directed toward establishing that a fully qualified system would be more resistant to seismic forces and therefore a safer system than the enhanced power system. It is, of course, obvious that a fully qualified system would have an established and documented higher resistance to seismic events than does the system proposed by LILCO for use during low-power testing. However, there is no need to consider the relative merits of the two systems per se, because for the purpose of the exemption request, it is only necessary to establish that the enhanced system is capable of performing its intended function.[100]

A LOCA is by design an unlikely event. In addition, the plant, including the piping that would be affected to produce a LOCA, was designed to withstand any credible seismic event, the occurrence of which is considered unlikely. Thus a LOCA and a seismic event must be considered independent events. To have a LOCA concurrent with an

---

98 The operating basis earthquake (OBE) and the safe shutdown earthquake (SSE) for Shoreham were established as 0.1g and 0.2g, respectively.

99 Findings No. 83-98.

100 Findings No. 99, 101.

earthquake, one must postulate the simultaneous occurrence of two unlikely events, and this is not required for licensing purposes.[101]

Although these power sources are not formally qualified to withstand possible seismic forces, they do have seismic capabilities as demonstrated by testing and analysis of similar units. These studies revealed some accessory items that might not be operable following a seismic event, and recommendations were made for corrective modifications. These modifications LILCO has either implemented or has indicated it will complete should an exemption be granted.[102] As a result, the units should be capable, by analysis if not by test, of withstanding an SSE.[103]

The portions of the RCIC system required for coolant injection are seismically qualified and modifications to the HPCI system to complete its seismic capability will be implemented prior to Phase III operation. These systems are steam-driven and use DC power supplies (See Section III.A.2, supra).[104]

---

101 Finding No. 102. See also Southern California Edison Company (San Onofre Nuclear Generating Station, Units 2 and 3), CLI-81-8, 14 NRC 1091, 92 (1981).

102 Findings No. 97, 98.

103 Findings No. 83-100.

104 Finding No. 104.

There are no requirements in the regulations for seismic qualification of offsite power sources, transmission lines, or any other portion of the offsite system. The record indicates that there are no practices in the industry directed specifically toward mitigating the effects of ground motion on transmission systems, even in areas of frequent and more potentially severe seismic activity. It was noted supra[105] that the number and diversity of paths for supplying offsite power to Shoreham far exceed the regulatory requirements.

The Board has determined[106] that for any event that made the enhanced system inoperable but did not result in a LOCA, the plant has at least 30 days in which to restore AC power.[107] The Board has also found that there is a high likelihood that this could be done. The Board therefore finds that it is not necessary that the enhanced system be able to withstand a seismic event.

The Board has reviewed all of the pertinent parts of the record in this proceeding. We have concluded that the enhanced offsite system has the required redundancy, meets the single failure criterion and has sufficient capacity, capability and reliability to supply adequate emergency power for low-power operation of the Shoreham unit.

---

105 Section III.B.1.

106 Section III.A.2, page 34, supra.

107 Id.

We find that there is adequate assurance that the enhanced system can supply sufficient power within 55 minutes in the event of a concurrent LOCA and loss of offsite power. We therefore further find that the enhanced system provides a comparable level of protection[108] as a fully-qualified system would and thus meets the "as safe as" standard set by the Commission in CLI-84-8.[109]

---

108 See Section II.C, supra, at page 27; Tr. 3043-47.

109 Section II.C, "As Safe As," supra, at pages 22-28.

IV. EXIGENT CIRCUMSTANCES

Under the provisions of 10 CFR §50.12(a), the Commission may "grant such exemptions from the requirements of the regulations" as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest. This regulation has a long history, as a version of it authorizing specific exemptions has been in existence for over twenty years. The specific exemption route of §50.12(a) was used extensively to approve site preparation activities prior to the issuance of construction permits, until passage of the National Environmental Policy Act (NEPA) necessitated certain changes.[110]

In 1974, alternative methods were developed to handle early site preparation activities consistent with then-new NEPA responsibilities, by establishing limited work authorization (LWA) procedures under §50.12(b). A specific exemption under §50.12(a) was still maintained as an option, but the Commission stated that it should be used "sparingly" and only in cases of "undue hardship" or "extraordinary" circumstances.[111] After the LWA provisions became final

---

110 United States Department of Energy (Clinch River Breeder Reactor Plant), CLI-82-4, 15 NRC 362, 373 (1982).

111 39 Fed. Reg. 14506, at 14507 (April 24, 1974).

in 1974, only one §50.12(a) specific exemption for site preparation activities had been issued prior to Clinch River I, whereas that specific exemption route had been used for 49 facilities prior thereto.[112]

In the instant case, the Commission stated in its May 16, 1984 Order that it "regards the use of the exemption authority under 10 CFR §50.12 as extraordinary." Citing a later Clinch River decision,[113] the Commission further noted that "[t]his method of relief has previously been made available by the Commission only in the presence of exceptional circumstances.... A finding of exceptional circumstances is a discretionary administrative finding which governs the availability of an exemption" (CLI-84-8, 19 NRC 1154, at 1156, footnote 3). A reasoned exercise of such administrative discretion should take into account the equities involved in the surrounding circumstances of each situation.

The later Clinch River decision alluded to above was issued in order to clarify the Commission's previous findings of "exigent and other extraordinary circumstances" which warranted the grant of an

---

112 CLI-82-4, 15 NRC 362, at 373, 380 (1982). See also 37 Fed. Reg. 5744, at 5746 (March 21, 1972); 39 Fed. Reg. 14506, at 14507-08 (April 24, 1974); 40 Fed. Reg. 8774 (March 3, 1975).

113 United States Department of Energy (Clinch River Breeder Reactor Plant), CLI-83-1, 17 NRC 1, 4-6 (1983).

exemption for the initiation of early site preparation activities.[114] The term "extraordinary" was used in the Waterford[115] and Shearon Harris I[116] decisions. In Shearon Harris II[117] it was held that "the timely satisfaction of public needs by reducing unanticipated delays in the realization of facility benefits and the avoidance of costs induced by such unanticipated delays constitute exigent circumstances."[118] It thus appears that Commission precedent on the grant of exemptions provides some illustrations of exigent circumstances, and establishes that they are to be determined "by the totality of the particular circumstances in each case."[119]

The Commission's May 16 Order stated that a reasoned exercise of discretion governing the availability of an exemption should take into account the equities of each situation. Here, these "equities include the stage of the facility's life, any financial or economic

---

114 CLI-83-1, 17 NRC 1, 2.

115 Louisiana Power and Light Company (Waterford Generating Station, Unit 3), CLI-73-25, 6 AEC 619, 622 n. 3 (1973).

116 Carolina Power and Light Company (Shearon Harris Nuclear Power Plant, Units 1 2, 3 and 4), CLI-74-9, 7 AEC 197, 198 (1974) (Shearon Harris I).

117 CLI-74-22, 7 AEC 938 (1974) (Shearon Harris II).

118 17 NRC 1, 4.

119 Id., at 3.

hardships, any internal inconsistencies in the regulation, the applicant's good-faith effort to comply with the regulation from which an exemption is sought, the public interest in adherence to the Commission's regulations, and the safety significance of the issues involved." These equities, of course, do not apply to the findings on public health and safety and common defense and security required by §50.12(a) (19 NRC at 1156, fn. 3).

A. STAGE OF THE FACILITY'S LIFE

The only evidence addressing the stage of the facility's life was the testimony of William Gunther, LILCO's operating engineer for the Shoreham facility. His uncontradicted testimony established that the plant is physically completed, and that it is being maintained in condition that would allow fuel to be loaded within 2-3 weeks of obtaining a low-power license.[120] Proceedings involving the application for an operating license have been pending in one phase or another for 180 hearing days over eight years before seven different licensing boards. The facility has now been physically completed, and all contentions have been decided in favor of licensing except emergency planning and TDI diesel generator issues, now pending before two other

---

120 Tr. 866, Finding No. 105.

licensing boards.[121] Under these unusual circumstances, this equity favors the grant of a low-power exemption.

B. FINANCIAL OR ECONOMIC HARDSHIPS

It is almost self-evident that there must be financial hardships to someone when there is a physically completed nuclear facility, standing unused and nonproductive because of substantial licensing delays. It is not necessary to allocate blame for such a situation, but the economic consequences and waste of resources make no sense. Someone has spent or is spending billions of dollars for capital investment or debt servicing in connection with the construction costs of the Shoreham facility, but it cannot produce electricity for a utility that uses chiefly oil as fuel. Consequently, Shoreham cannot earn revenues to compensate for its costs of construction and maintenance.

Financial data and analyses of Shoreham's operations were presented by Anthony Nozzolillo, LILCO's Manager of Financial Analysis and Planning Department.[122] His testimony showed that LILCO has serious financial problems which make it difficult for it to obtain necessary

---

121 PID, LBP-83-57, 18 NRC 445 (1983).

122 Tr. 1377.

external financing. In his opinion, the granting of a low-power exemption would send a positive signal to the capital markets that could help to alleviate LILCO's financial distress in obtaining vitally needed cash by the issuance of securities.[123] We find this testimony to be reasonable and credible.

If necessary low-power testing is completed three months earlier as a result of granting the exemption request, commercial operation could also commence approximately three months earlier. Earlier commercial operation would allow an equivalent earlier displacement of oil-fired generating capacity. The resulting fuel savings would be approximately $50,000,000 over the three-month period.[124] This reduced dependence on foreign oil as a fuel source at a rate of four to five million barrels a year, would also be consistent with our national policy in that respect.[125] A three month earlier commercial operation date could also result in an economic benefit of approximately eight million dollars in terms of present worth of revenue requirements, assuming that LILCO receives conventional rate treatment.[126] However, a claimed benefit of $45 million based on

---

123 Tr. 1377-82, 1385-86, 1395, 1398.

124 Tr. 1393-94.

125 Tr. 1322, 2889-91.

126 Tr. 1354, 1407.

synchronization of the plant for federal income tax purposes in 1984 cannot be allowed, because licensing for full-power operation and connection to the LILCO grid, as required, cannot reasonably be anticipated to occur before the end of December, 1984.[127] Low-power operations could not achieve this tax reduction result.

The costs of unusually heavy and protracted litigation may also properly be considered in evaluating financial or economic hardships as an equity in this exemption proceeding. Brian McCaffrey, LILCO's Manager for Nuclear Licensing and Regulatory Affairs, described the very lengthy and expensive litigation associated with the Shoreham licensing process.[128] The unremitting and often bitter opposition of Suffolk County as an intervenor has resulted in litigation of very extensive scope and depth. It is beside the point to argue that such litigation is permitted under NRC regulations. Although not illegal, such interminable litigation has resulted in great expense to LILCO, both in terms of time and resources.[129] These proceedings to date have cost LILCO more than $33 million.[130] These proceedings have involved over 15,000 pages of written testimony, 400 exhibits, 180 days of

---

127 Tr. 1357-62, 1373, 1406, 1410, 1904, 1988-92.

128 Tr. 1715 et seq.

129 Tr. 1722-23.

130 Tr. 1726-27.

hearings, more than 310 witnesses, 34,000 pages of transcripts, and more than 160 depositions.[131] From the record scope and intensity of this litigation, both direct and collateral,[132] it can be concluded that Suffolk County's costs of litigation including attorneys fees must also be measured in the millions of dollars.

The unusually heavy financial and economic hardships associated with the very protracted Shoreham licensing proceedings constitute a significant equity, which we hold can reasonably be held to amount to exceptional circumstances in the context of granting a low-power exemption.

C. INTERNAL INCONSISTENCIES IN THE REGULATIONS

Another equity to be considered in exercising discretion regarding an exemption request is the presence of internal inconsistencies in the regulations. That inquiry includes an analysis of the prior interpretations and applications of the regulations, as well as the four corners and literal wording of the regulations standing alone. In that connection, the prior practice of the NRC Staff in

---

131 Tr. 1726-27.

132 ALAB-777, 20 NRC __; ALAB-779, 20 NRC __ (1984). See also Memorandum by Nunzio J. Palladino, Chairman, in Docket No. 50-322-OL, filed September 21, 1984.

handling licensing situations involving less than full compliance with the regulations, is illuminating.[133]

For over two decades, the Staff had recognized that although a plant was ready for low-power operation, it might not fully comply with every regulation at full-power. In those circumstances, "noncompliances" typically were dealt with by staff imposed license conditions requiring completion before a particular power level, or by a particular time. In issuing operating licenses, the NRC Staff only considered or explicitly granted exemptions in instances of long-term or permanent noncompliance with regulations. Recently in seeking guidance from the Commission on the standard for exemptions, the Staff stated that the Shoreham decision in CLI-84-8, "establishes practices and requirements for licensing which differ significantly from prior regulatory interpretation and practice."[134] The Staff cited this Shoreham decision as ruling (at least implicitly) that an exemption must be granted if Shoreham is to be licensed for low-power operation prior to compliance with GDC-17. The Staff further stated that in the context of exemptions, "these

---

133 These prior inconsistent practices and interpretations were discussed in our Order Reconsidering Summary Disposition of Phase I and Phase II Low-Power Testing, 20 NRC ___, (September 5, 1984), at 4 et seq. of the slip opinion. That Order is pending before the Commission for an immediate effectiveness review pursuant to CLI-84-8.

134 July 17, 1984 Staff paper on "Need And Standards For Exemptions," SECY-84-290, at pages 1 and 2.

determinations regarding 'exigent circumstances' and 'as safe as' are wholly new requirements going beyond anything explicitly required by 10 CFR §50.12. (The concept of 'exigent circumstances' had previously been considered a factor only in exemptions granted pursuant to 10 CFR §50.12(b), issuing limited work authorizations.)"[135] The Staff further observed that the Shoreham exemption requirement "is a substantial departure from past staff interpretation and practice...."[136] The Commission has under consideration the Staff's request for guidance, but it is clear that there are substantial inconsistencies between prior NRC interpretation and practice regarding exemption situations, compared with whatever guidance the Commission ultimately gives concerning the interpretation and application of the "Shoreham rule."

Another inconsistency in the treatment of Shoreham lies in the fact that both the Catawba and Grand Gulf facilities have unresolved questions about similar TDI diesel generators, yet they have received low-power and full-power licenses, respectively.[137]

---

135 Id., at page 3.

136 Id., at page 4.

137 Catawba Nuclear Station, Unit No. 1, Issuance of Facility Operating License, 49 Fed. Reg. 30611 (1984). See also our Order Reconsidering Summary Disposition of Phase I and Phase II Low-Power Testing, issued September 5, 1984, 20 NRC ___, slip opinion page 10.

The Staff has also applied the security and safeguards regulations inconsistently in the case of Shoreham. For example, in SSER No. 5 filed in April, 1984, the Staff stated that "there is no technical reason to protect the temporary diesels and the gas turbine generator as vital equipment because they are not required for safe shutdown (in the absence of a LOCA" (at page 13-3). However, with admittedly no changes in circumstances, the Staff issued a letter September 11, 1984, directing LILCO to amend the previously-approved Security Plan to protect the temporary alternative equipment as vital equipment. No adequate reasons were given for this abrupt change in the application of regulations, which was overruled by the Licensing Board as a matter of law.[138] Subsequently, LILCO voluntarily agreed to make certain security enhancements to its safeguards arrangements. The Staff has indicated that such commitments adequately resolve its security concerns.[139]

---

138 Order Denying Revised Security Contentions, issued September 19, 1984. At the same time the Board issued an expanded order containing the underlying reasons for overruling the Staff's actions in this case, but that order is Restricted because it might contain security or safeguards information.

139 See Section II.B, page 21, supra; Finding No. 25.

D. GOOD-FAITH EFFORT TO COMPLY WITH REGULATIONS

The evidence shows that LILCO intends to comply fully with the requirements of GDC-17 for full-power operation. This proceeding involves only a limited and temporary exemption for the purpose of low-power testing. The testimony of Brian McCaffrey showed that the TDI diesels were purchased under specifications designed to comply with GDC-17. When problems were discovered, extensive efforts were undertaken to cure the deficiencies. LILCO is installing another qualified source of AC onsite power (Colt diesels) that are designed to meet all GDC-17 requirements. LILCO has also provided enhancements to its offsite power system to assure that AC power will be available during low-power testing.[140] The Intervenors attempted by cross-examination to show that in hindsight, LILCO might arguably have pursued some problems differently or more aggressively.[141] However, the requirement established by the Commission involved "good-faith efforts" to comply with the regulations, not whether they were perfect or sufficiently prudent. LILCO's efforts as described in detail constitute the good faith to be considered in evaluating the equities, and support the grant of an exemption.

---

[140] Tr. 1703-15; Findings No. 106-112.

[141] Tr. 1439-1510.

E. PUBLIC INTEREST IN ADHERENCE TO REGULATIONS

In view of the demonstrated safety of low-power testing as proposed under the circumstances of this case, there is minimal public interest in strict or mechanical adherence to the regulations. There is also a concurrent public interest in recognizing that the practice of granting exemptions from regulations "is in accord with both the Act and sound principles of administrative law."[142] The U. S. Supreme Court has stated the principle as follows:

> "It is well established that an agency's authority to proceed in a complex area...by means of rules of general application entails a concomitant authority to provide exemption procedures in order to allow for special circumstances."[143]

The low-power exemption requested in this proceeding is for a very limited period of time, about 3 months. The extensive evidentiary hearing record has demonstrated that the grant of the requested exemption would have no adverse effects upon the public health and safety. In view of the level of protection that will be provided to the public by the enhanced AC power sources and the limited nature of the

---

142 NRC General Counsel's Discussion of Exemptions, dated July 24, 1984 (SECY-84-290A), at page 6.

143 U. S. v. Allegheny - Ludlum Steel Corp., 406 U.S. 742, 755 (1972). See also U.S. v. Storer Broadcasting Co., 351 U.S. 192 (1956); National Broadcasting Co. v. U.S., 319 U.S. 190 (1943).

low-power operations requested, this equity favors grant of the exemption.

F. SAFETY SIGNIFICANCE OF THE ISSUES INVOLVED

With regard to Phases I and II of the proposed low-power testing operations, we have already found that no AC power is needed to provide core cooling in the event of a postulated accident or transient.[144] Accordingly, if no emergency AC power is required, then the proposed changes or enhancements in the power source could have no effect upon the "functioning of structures, systems, and components important to safety," as required by GDC-17.

As to operations under Phases III and IV, the Board has found that operations at low-power with the proposed enhancements for emergency AC power, will be "as safe as" operation would have been if a source in compliance with GDC-17 were used.[145] Therefore, there is no adverse safety significance of the issues involved, and this equity favors granting the exemption.

---

144 Section II.A, pages 11-17, and III.A.1, pages 29-31, supra. See also our Order Reconsidering Summary Disposition of Phase I and Phase II Low-Power Testing, LBP-84-35A, 20 NRC ___ (September 5, 1984).

145 Section II.C, pages 22-28, and III.A.2, pages 31-39, supra.

On balancing the equities identified by the Commission in its May 16 Order, the Board finds that they meet the "exigent circumstances" test there described, and warrant a discretionary finding of exceptional circumstances that justify the granting of the exemption requested.

V. FINDINGS OF FACT

In making these findings of fact, the Board has reviewed and considered the entire evidentiary record of this proceeding. The positions of the parties are set forth in their proposed findings and briefs as follows:

LILCO's Proposed Findings of Fact;

LILCO's Post-Hearing Brief;

Suffolk County and State of New York Proposed Findings of Fact;

Brief of Suffolk County in Opposition to LILCO's Motion;

Brief of State of New York in Opposition to LILCO's Motion;

NRC Staff Proposed Findings of Fact and Conclusions of Law (all dated August 31, 1984); and

LILCO's Reply to Suffolk County/State of New York Proposed Findings of Fact, dated September 7, 1984.

Matters examined during the evidentiary hearings which are not discussed herein were considered by the Board and found to be without merit or immaterial to our decision. Those proposed findings not incorporated below, either directly or by fair implication, are rejected as being unsupported by the record or unnecessary to the rendering of this decision.

1. LILCO tendered its application for an operating license for the Shoreham Nuclear Power Station in August, 1975 (Tr. 1715). As of the middle of 1984 there had been over 180 days of prehearing

conferences and hearings, with approximately 310 witnesses testifying, 15,000 pages of written testimony and 400 exhibits, resulting in over 34,000 pages of written transcript. There have been over 160 persons deposed, and the written rulings of various boards and the Commission exceed 2900 pages (Tr. 1726).

2. On June 8, 1983, LILCO submitted its original motion for low-power operating license. The motion was denied in a Partial Initial Decision issued on September 21, 1983 (LBP-83-57, 18 NRC 445), in which another Licensing Board said that a low-power operating license could not be granted prior to conclusion of litigation on outstanding contentions regarding the TDI diesels. At a conference of the parties on February 22, 1984, the Chairman of that Board indicated that LILCO was not precluded from proposing ways it might qualify for low-power operation without reliance on the TDI diesels (Brenner Board, Tr. 21, 630-61).

3. LILCO filed a "Supplemental Motion" for low-power operating license on March 20, 1984. On March 30 this Board was established to hear and decide issues relevant to that motion (49 Fed. Reg. 13, 611).

4. LILCO proposes to test Shoreham at low-power employing "power enhancements" to provide emergency AC power in lieu of the TDI diesels. The "enhancements" are four EMD diesels and one 20 MW gas turbine. LILCO's low-power testing program consists of four discrete phases: Phase I is loading fuel into the reactor vessel and precriticality testing; Phase II is initial criticality and testing at power levels of

0.0001% to 0.001% of rated power at essentially ambient temperature and atmospheric pressure; Phase III is reactor heatup and pressurization to rated temperature and pressure conditions at approximately 1% of rated power;; and Phase IV is testing at up to 5% of rated power (Gunther, Tr. 201-11).

5. The Commission in CLI-84-8 said LILCO must apply for and obtain an exemption to the requirement for an "onsite" source of emergency AC power, as set forth in GDC-17. LILCO sought an exemption by filing its Application for Exemption on May 22, 1984.

6. This Low-Power proceeding has involved nine days of hearings, and six days of conferences with counsel. Transcript pages generated have been 3118, plus pages S-1 through S-333 in camera proceedings on security issues.

7. LILCO moved for summary disposition on its proposed Phases I and II on May 22, 1984. We granted summary disposition as to certain statements of material facts on July 24, 1984. On September 5, upon reconsideration, we granted summary disposition as to the ultimate issues by authorizing commencement of Phase I and II activities.

8. Phase I of LILCO's proposed low-power testing program involves placing fuel in the reactor vessel and conducting various tests of reactor and support systems (Gunther, Tr. 162, 164, 201-02).

9. During Phase I, the reactor will not be taken critical. It will remain at essentially ambient temperature and pressure. There will be no decay heat generated, and there will be no fission products in the

core. Therefore, core cooling will not be required, and no fission product releases are possible (Rao, et al., Tr. 279, 284).

10. Of the 38 accident or transient events addressed in Chapter 15 of Shoreham's FSAR, 18 could not occur during Phase I, another six could physically occur, but would not cause phenomena of interest in Chapter 15 safety analysis. The remaining 14 events could possibly occur, although their occurrence would be highly unlikely. The potential consequences of these events would be trivial from a safety standpoint (Rao, et al., Tr. 279-80).

11. A LOCA would have no consequences during Phase I. In the absence of fission products and decay heat, the fuel cladding would remain unchallenged, even in the event of a complete drain down of the reactor vessel for an unlimited period of time. Since no core cooling is required during Phase I, no AC power is necessary to cool the core (Rao, et al., Tr. 284-85).

12. Phase II of LILCO's proposed low-power testing program involves achieving criticality at 0.0001% to 0.001% of rated thermal power utilizing a specified control rod withdrawal sequence. Criticality is maintained for periods of up to five minutes during this Phase (Gunther, Tr. 204-06).

13. Of the 38 transients and accidents addressed in Chapter 15 of Shoreham's FSAR, 15 cannot occur during Phase II. Of the remaining 23 that could occur, 20 are independent of onsite or offsite power. The three events that would be adversely impacted by loss of offsite AC

power are: pipe breaks inside the primary containment (LOCA), feedwater system pipe break, and the loss of AC power event. Even the possible Chapter 15 events would have no impact on public health and safety regardless of the availability of TDI diesels (Rao, et al., Tr. 286-96).

14. The fission product inventory in the core during Phase II will be less than 1/100,000 (0.00001) of the fission product inventory assumed in the FSAR (Rao, et al., Tr. 295).

15. A LOCA would be the most serious FSAR event that could happen during Phase II. If a LOCA did occur, there would be time on the order of months available to restore makeup water for core cooling. With power output averaging a fraction of a watt per rod, with no single rod exceeding approximately two watts, the fuel cladding temperature would not exceed the limits of 10 CFR §50.46 even after months without restoring coolant. Thus, there is no need to rely on the TDI diesel generators, or any source of AC power (Rao, et al., Tr. 292-93, 295-96).

16. During Phase II no reliance on the diesel generators is necessary for mitigation of either the loss of AC power event or the feedwater system piping break event. During these events, no loss of coolant occurs and the decay heat is minimal. Core cooling can be achieved for unlimited periods of time without AC power using the existing core water inventory and heat losses to ambient (Rao, et al., Tr. 293-94).

17. The LOCA and the feedwater system piping break events postulate double-ended ruptures of a piping system. With the

essentially ambient temperature and atmospheric pressure during Phase II, it is extremely unlikely that such a pipe break would ever occur. The NRC Staff does not require double-ended ruptures to be postulated for low temperature and low pressure systems in safety analyses (Rao, et al., Tr. 294).

18. Even if AC power were not available for extended periods of time, fuel design limits and design conditions of the reactor coolant pressure boundary would not be approached or exceeded as a result of anticipated operational occurrences, and the core would be adequately cooled in the event of a postulated accident (Rao, et al., Tr. 295-96).

19. None of the events analyzed in Chapter 15 could result in a release of radioactivity during Phase II that would endanger the public health and safety (Rao, et al., Tr. 295).

20. If no AC power is needed, a change in or the absence of emergency power sources has no effect on the safety of operation (Hodges, Tr. 1792; Rao, et al., Tr. 293).

21. A Final Security Settlement Agreement was signed by LILCO, Suffolk County and the NRC Staff in November, 1982. The site security plan is geared toward function, setting forth security principles, procedures and goals, rather than item-by-item specifics. It is readily adaptable to minor changes in plant configuration, such as the addition of the four EMDs and the 20 MW gas turbine.

22. Placement of additional equipment outside of and a reasonable distance from the Shoreham plants vital areas, does not impair nor

impact upon established security procedures for protection of the vital areas.

23. Because the degree of potential danger to public health and safety at low-power operations is substantially less than at full-power (Rao, et al., Tr. 278), the need for security of emergency AC power systems during low-power operation is diminished. In the posture of a request for exemption from certain regulations for purpose of low-power testing, emergency AC power sources need not be protected as "vital" equipment.

24. LILCO's security arrangements provide reasonable assurance that its emergency power enhancements will be protected during the occurrence of a security-related event.

25. The NRC Staff believes that LILCO's voluntary commitment (as described by letter dated October 2, 1984) to implement "certain identified enhancements" to the physical security arrangements for the EMD diesels, operates to "adequately resolve the security concerns" that had led the Staff to suggest (by letter of September 11, 1984) that LILCO's emergency backup power equipment should be treated as "vital."

26. The main purpose of backup emergency power systems in the context of LILCO's proposed low-power testing program is to assure that cooling water can be provided in order to avoid uncovery of the core.

27. In comparing two roughly equivalent emergency AC power systems, neither is required to be better than the other in every

respect in order to be found adequate for the purposes of protecting public health and safety.

28. NRC regulations do not require a licensee to be able to restore emergency power within any specified time. The time limit is determined by analysis of a variety of accident scenarios, based upon the functional determination of how much time is available to effect emergency core cooling before damage results. So long as there is enough time to cool the core, any "margin of safety" in the form of some shorter time is irrelevant.

29. If a loss of offsite power were to happen concurrently with a LOCA, LILCO would have at least 55 minutes to restore emergency power in order to replace cooling water before core damages would occur (Hodges, Tr. 1786-88). Emergency power could be restored in order to run cooling pumps and other emergency equipment within 55 minutes of a loss of power (Knox, Tr. 2357; Staff Ex. 2 (SSER 6 at 8-9)).

30. 10 CFR §50.46(b) sets forth five specified limits within which an operating reactor must remain during postulated accidents and transients with regard to: fuel cladding temperature, oxidation of fuel cladding, hydrogen generation, coolable core geometry, and long-term decay heat removal. In the specific case of the limiting LOCA at five percent power, the peak cladding temperature limit (2200° F) would be reached prior to any other limit of §50.46(b) (Hodges, Tr. 1795). In the event of a LOCA with no makeup at all, there are at least 55 minutes before the cladding temperature would exceed 2200° F (Hodges, Tr. 1786).

Emergency power could be restored within that time (Finding No. 29). Thus, the plant during low-power operation meets the requirements of §50.46(b), and is deemed safe regardless of the margin by which it meets or exceeds those requirements.

31. During Phase III, the temperature and pressure of the system are increased to intended operating conditions. This permits testing related to such items as thermal expansion of piping, verification of source range monitor calibration and response, establishment of overlap data between source range and intermediate range monitors, determination of scram time data for reactor control rods, as well as testing of approximately 54 plant systems and support systems and their integration into the total plant (Gunther, Tr. 220-227).

32. Operations and testing related to Phases III and IV are clearly separable in that some testing can be performed initially at one or the other power level. However, the consequences of misadventures are less at one percent than at five percent rated power and the time within which to respond is greater. At one percent power, assuming a LOCA and using conservative models and assumptions, power must be restored within 370 minutes, while at five percent power the corresponding time is 86 minutes (Rao et al., Tr. 251-52, 296 et seq.).

33. For a non-LOCA accident at five percent power, if either the Reactor Core Isolation Cooling (RCIC) or the High Pressure Coolant Injection (HPCI) system acts to restore water to the reactor core, a peak cladding temperature of 2200° F would never be reached. These two

systems depend on DC power sources and are completely independent of AC power (Hodges, Tr. 1785; SSER 6 at 15-6 and 15-7; Rao et al., Tr. 310-11).

34. Operation at low-power (up to and including five percent rated power) results in reduced fission product inventory, increased time to take corrective or mitigative action, and reduction in required capacity of mitigative systems (Hodges, Tr. 1789-92; Rao et al., Tr. 298-301; Staff Ex. 2 following Tr. 721 at 15-4, 15-5).

35. For an accident other than a LOCA during Phases III or IV, water in the reactor vessel would boil off very slowly and the level would drop to the top of the fuel after an extended time, if no system acts to replace coolant. If either the RCIC or the HPCI system acts once during the first four days following an accident, heat losses to the environment, through the vessel walls to the containment, would equal the decay heat and the fuel would never be uncovered. The reactor vessel would depressurize slowly and the temperature of fuel and cladding would remain near the saturation temperature of the water (Hodges, Tr. 1785; Rao et al., Tr. 308-13).

36. Using the conservatisms of the approved evaluation model of Appendix K to 10 CFR 50 and no makeup coolant from any source, calculations indicate that the core could be without cooling for 55 minutes before the peak cladding temperature would exceed 2200° F. Using "best estimate" models, this time would be more than three hours (Hodges, Tr. 1786; Rao et al., Tr. 298, 302-08).

37. Exceeding the 2200° limit does not result in fuel or cladding damage. This value of the temperature is chosen conservatively in order to assure that the cladding would retain some ductility following reflooding of the core (Hodges, Tr. 1786-87).

38. Since oxidation is dependent on both time and temperature, it is possible that exceeding 2200° F could result in exceeding the oxidation limit. On the basis of very conservative analysis, the maximum local oxidation was calculated to be 6.5 percent (Hodges, Tr. 1787-88).

39. The peak cladding temperature following a LOCA with qualified TDI diesels was calculated to be 550° F and local oxidation 0.033 percent. If it is assumed that the 20 MW gas turbine fails to start and the EMD diesels are started within 30 minutes, the calculated peak cladding temperature would be 1086° F and local oxidation 0.034 percent (Hodges, Tr. 1788).

40. For operation up to five percent power, the fission product inventory will not exceed five percent of the equilibrium value given in the FSAR (Hodges, Tr. 1790).

41. The standby gas treatment system (SGTS) is not needed at five percent power (Quay, Tr. 1745, 1797).

42. In case of a LOCA at five percent, cladding integrity is maintained and thus no fission products are released if AC power is restored, from any source, within 55 minutes.

43. Without the Shoreham generating station, LILCO has a total generating capacity of 3721 MW, consisting of 2240 MW of base load and 432 MW of midrange and peaking oil-fired steam turbine units, and 1049 MW from gas turbines and diesel generators (Schiffmacher, Tr. 4487-88).

44. LILCO has four major steam generating stations. Each station is equipped with at least one backup blackstart gas turbine (Schiffmacher, Tr. 486-508).

45. There are ten 50 MW gas turbines at Holtsville, about 15 miles southwest of Shoreham. Five are deadline blackstart. Any one of these gas turbines would be sufficient for Shoreham's emergency needs at low-power. Actual tests under simulated conditions have shown that power can be restored to Shoreham from Holtsville in six minutes (Schiffmacher, Tr. 446-47, 488-89, 506-08).

46. Port Jefferson is a 380 MW generating station located about 11 miles west of Shoreham. It has a 16 MW gas turbine which starts in about five minutes. Switching operations necessary to get the power to Shoreham could take 25 minutes (Schiffmacher, Tr. 500-01).

47. In addition to its own generating capacity, the LILCO grid has three ties to the New York Power Pool and one to the New England Power Exchange. These interconnections provide, through both their normal and reserve capacities, the ability to respond rapidly to changing system conditions in order to provide reliable sources of power (Schiffmacher, Tr. 520-24).

48. LILCO's entire grid has not been lost since the 1965 blackout. In 1979, it lost the portion of its grid east of the Holbrook station due to vandalism, but power was restored completely in just over an hour. Since then, LILCO has implemented procedures whereby power could be restored in minutes by utilizing various blackstart gas turbines (Schiffmacher, Tr. 519-22).

49. A 14 MW gas turbine with deadline blackstart capability is located at Southold, about 27 miles east of Shoreham. Power could be restored to Shoreham within ten minutes via 69 KV lines to Riverhead, thence via either 69 or 138 KV lines to Shoreham (Schiffmacher, Tr. 502-06).

50. The system operator has procedures requiring that power be restored to Shoreham on a priority basis. This requirement should enhance the already very reliable system, to the benefit of Shoreham (Schiffmacher, Tr. 504-05).

51. A 20 MW gas turbine with deadline blackstart capability is located at East Hampton, about 35 miles from Shoreham. Power from it could be routed to Shoreham in about 15 minutes via 69 KV lines to Riverhead and then via either 69 or 138 KV lines to Shoreham. The transmission system from East Hampton to Riverhead is independent of that Southold to Riverhead (Schiffmacher, Tr. 502-03).

52. Power from Holtsville can be routed to Shoreham over various transmission paths leading ultimately to any of the four 138 KV lines or the three 69 KV lines into the plant (Schiffmacher, Tr. 488-89, 508).

53. Three 69 KV circuits enter the Wildwood substation, about one mile south of Shoreham, over two separate rights of way. From the substation, a single 69 KV circuit enters the 69 KV switchyard and has been placed underground in the vicinity of the 138 KV line from the 138 KV switchyard to the normal station service transformer in order to provide additional independence between circuits. The 69 KV line serves the reserve station service transformer (RSST) (Schiffmacher, Tr. 445-46, 517-18).

54. The Shoreham plant is connected to the LILCO system through seven 138 KV and 69 KV circuits. Four separate 138 KV transmission lines serve the 138 KV Shoreham switchyard, approximately 1300 feet south of the plant. The four circuits enter the 138 KV switchyard on two separate and independent rights of way, each containing two of the four 138 KV circuits. The 138 KV switchyard is arranged in a two bus configuration with circuit breakers and switches arranged to permit isolation and/or repair of either bus section. This permits continuation of 138 KV power supplied from separate rights of way even in the event a bus section is out of service (Schiffmacher, Tr. 515-19).

55. A bypass 69 KV circuit, around the 69 KV switchyard and its associated cable, runs directly from the 69 KV overhead line from Wildwood to the RSST. This line makes it possible to restore power to the RSST without having to repair the underground cable or route power through the 69 KV switchyard (Schiffmacher, Tr. 371-74, 517).

56. Offsite power circuits enter the plant along two different corridors, with no common points between the corridors and no crossing or meeting. They do not pass through a common switchyard (Knox, Tomlinson, Tr. 2353-54).

57. The multiplicity of transmission lines into the Shoreham site and the use of two separate and independent switchyards decrease the possibility of common failures and increase the reliability of maintaining normal offsite power.

58. Neither tornadoes nor earthquakes have had serious impact on LILCO's transmission system in the past 20 years. Ice storms and lightning have affected, at most, small segments of line (Schiffmacher, Tr. 511, 513).

59. The transmission system has suffered outages on individual lines but no major outage as a result of high winds or hurricanes in the last 10 years. The transmission system is designed to withstand winds in the range of 100 to 130 miles per hour, which exceeds the requirements of the National Electrical Safety Code (Schiffmacher, Tr. 513-14).

60. LILCO designs, constructs, and maintains its own transmission system, and therefore has the capability to restore any facilities that may become inoperative for any reason. LILCO can restore a mile of 69 KV line within 24 hours (Schiffmacher, Tr. 509-14).

61. LILCO has committed to initiate steps promptly to place the plant in a cold shutdown condition in the event of any of the following

during Phases II, III and IV of the low-power testing program, thus further minimizing the probability that a loss of the normal offsite transmission system will occur and adversely affect operation of the plant from a safety standpoint:

(a) a "hurricane warning" for the Shoreham area issued by the National Weather Service;

(b) a "tornado watch" or a "severe thunderstorm watch" for the Shoreham area issued by the National Weather Service;

(c) a "winter storm watch" for the Shoreham area issued by the National Weather Service, including ice storms;

(d) a coastal flood warning for the Shoreham area issued by the National Weather Service predicting that a high tide greater than five feet above normal high water will occur within 24 hours;

(e) an indication of seismic activity of .01g on the Shoreham seismic monitors;

(f) the outage of two of the four LILCO interconnections to The New York Power Pool and The New England Power Exchange (except short outages of less than eight hours of a second intertie required for inspection, testing or minor maintenance where the intertie could be restored to service if needed); and

(g) a low electrical frequency condition on the LILCO transmission system which reaches the alarm set point (Museler Tr. 558, 561-62, 574).

62. A cold shutdown condition can typically be reached in six hours from five percent power (Museler, Tr. 562; Gunther, Tr. 412-13; Gunther, ff. Tr. 1214, at 17). The procedures direct immediate commencement of a controlled reactor shutdown upon notification from the system operator that any of the foregoing weather conditions is predicted (Gunther, ff. Tr. 1214, at 16). Upon notification, the operator is expected to begin insertion of control rods taking the reactor subcritical within 15 minutes. The operator is not precluded from initiating a more rapid shutdown if he feels an unsafe condition exists (Gunther, Tr. 414-15, 471-72).

63. LILCO's two "offsite power enhancements" are one deadline blackstart 20 MW gas turbine and a group of four deadline, blackstart 2.5 MW EMD diesels, which supply a total of 10 MW. Both are located in the Shoreham plant site: the turbine in the 69 KV switchyard, approximately 300 feet south of the reactor building, and the EMDs near the southwest corner of the reactor building (Schiffmacher, Tr. 322, 494; Knox and Tomlinson, Tr. 2342).

64. The gas turbine is started using a starting motor which operates on compressed air. The compressed air is supplied from a receiver in which sufficient pressure is automatically maintained by a compressor (Tomlinson, Tr. 2346).

65. Each of the four EMD diesels has two starting motors, powered by a 112V, 420 AH lead acid battery (Tomlinson, Tr. 2347).

66. Power from the gas turbine could be established and operating cooling equipment within 10 minutes; from the EMDs, power could be established in 30 minutes (Knox, Tr. 2351-52).

67. Starting reliability of a gas turbine virtually identical to the one at Shoreham is 97.6% (Knox, Tomlinson, Tr. 2346; Schiffmacher, Tr. 497). Starting reliability of the EMD diesels is 98.6% (Tomlinson, Tr. 1863, 1882-84; Schiffmacher, Tr. 463), with reliability approaching 100% that at least one diesel would start (Tomlinson, Tr. 1863). Typical onsite nuclear power system diesel generators exhibit 92-99% reliability (Staff Ex. 2, SSER 6, ff. Tr. 721, at 8-9).

68. The EMD diesels have only a single electric output cable from the EMD control cubicle, a single starter system, a single fuel supply system, and a common location of breakers (Eley, et al., Tr. 2581-91).

69. The EMD diesels contain no fire detection equipment and no fixed, remotely operated fire extinguishing system, and it is unlikely that if one diesel were on fire the other could be kept running (Eley, et al., Tr. 2591-95).

70. The EMD diesels are sufficiently reliable in view of their function as backup for all the other available power sources, as the failure of all other sources of AC power must be assumed before the EMDs would be called upon for emergency power.

71. The EMDs are physically located far enough from the 20 MW gas turbine so that a fire in the EMDs would not incapacitate the turbine (Eley, Tr. 2493).

72. The shutdown of the EMDs would have no effect on the gas turbine (Smith, Tr. 2500).

73. Although the gas turbine and the EMDs are deadline blackstart, manual operations are necessary to transfer their power output to the emergency buses. Demonstration showed that power could be restored to plant systems from the gas turbine in four minutes and from the EMDs in nine minutes (Clifford, Tr. 1852).

74. LILCO will implement the following additional test procedures:

(a) demonstrate on a biweekly basis through an actual test that the Holtsville blackstart gas turbines can supply power to Shoreham in less than 15 minutes;

(b) demonstrate on a biweekly basis through an actual test that the 20 MW gas turbine at Shoreham can be manually started, synchronized and loaded to at least 13 MW on the grid;

(c) demonstrate on a monthly basis that the 20 MW gas turbine at Shoreham will start automatically on a loss of grid voltage signal;

(d) demonstrate on a biweekly basis that the East Hampton and Southhold gas turbines can be manually started, synchronized and loaded to at least 50% capacity of the grid; and

(e) demonstrate on a biweekly basis that at least three of the four GM EMD diesel generators onsite can be manually started and can supply power to plant systems (Museler, Tr. 577).

75. The EMD diesels have been adequately maintained and their maintenance and repair will be adequate to assure reliable operation in the foreseeable future (Iannuzzi and Lewis, Tr. 1175-76, 1201-11).

76. The reliability and availability of Shoreham's EMDs while in service at New England Power Company has been high (Iannuzzi and Lewis, Tr. 1178-79).

77. LILCO's performance of a test of the turbine to full capacity prior to Phase III and performance, on a monthly basis, of a test to demonstrate that loads normally connected to certain buses used by the turbine are automatically disconnected and that the gas turbine may be automatically connected to the 69 KV bus within two to three minutes (Staff Ex. 2, SSER 6, ff. Tr. 721, at 8-2, 8-3), will adequately address significant concerns regarding test procedures for the gas turbine (Minor and Bridenbaugh, Tr. 2580, 2614-15).

78. A test which will load each EMD diesel to its design load requirements for one hour and verify that voltage and frequency are maintained within required limits, will performed prior to commencement of Phase III. Additional tests to demonstrate that the EMDs can be manually reconnected to their loads following disconnection, performed on a biweekly basis (Staff Ex. 2, SSER 6, ff. Tr. 721, at 8-4), will

adequately resolve concerns regarding the EMDs (Eley, et al., Tr. 2579, 2597-2600).

79. The gas turbine and the EMDs are considered a system (Smith, Tr. 2482) whose two parts (turbine, EMDs) are adequately independent of one another for compliance with the single failure criterion (Staff Ex. 2, SSER 6, ff Tr. 721 at 8-5, 8-6).

80. The cables carrying power from the gas tubine and the EMD diesels both go through the block walls in the nonemergency switchgear room (Knox, Tr. 1886). Sufficient independence exists because these two cables enter the nonemergency switchgear room separated by a distance of about 40 feet along the wall (Staff Ex. 2, SSER 6, ff. Tr. 721 at 8-6) and because the EMDs will have an additional, independent line allowing their output to be routed into the emergency switchgear room (Schiffmacher, Tr. 842, 863; Knox and Tomlinson, Tr. 1890).

81. If Shoreham were to lose power from LILCO's normal power grids, the power enhancements' deadline blackstart feature will cause them to sense that there is no power on the grid and start up automatically (Schiffmacher, Tr.x 333). Both the turbine and the diesels will start simultaneously. If power is available from the gas turbine the operator will open and close breakers from the control room to supply the safety loads through a transformer in the 69 KV switchyard to the switchyard bus and then to the safety-related switchgear. If power from the gas turbine is unavailable, power from the EMDs is routed

through the nonemergency switchgear room to the safety-related switchgear room (Knox, Tr. 2349-51).

82. The gas turbine or one EMD diesel, acting alone, is capable of providing sufficient AC power for cooling the core at low-power (Knox, Tr. 2352; Schiffmacher, Tr. 1868).

83. The 20 MW gas turbine and the four GM EMD diesels have significant seismic capabilities and are likely to be available following a seismic event (Staff Ex. 2, SSER 6, ff. Tr. 721 at 8-7 to 8-8).

84. The manufacturer of the 20 MW gas turbine has provided assurance that the machine would remain structurally sound during a design basis seismic event at Shoreham (Staff Ex. 2, SSER 6, ff. Tr. 721, at 8-7; see also Meyer, Tr. 2787).

85. Sargent & Lundy performed a study of the seismic capabilities of the four GM EMD diesels at Shoreham (Christian, et al., Tr. 972-73). Sargent & Lundy had previously performed seismic qualifications for more than 12 GM EMD diesels that are similar to the diesel generator sets installed at Shoreham (Meligi, Tr. 968).

86. Seismic capabilities of the diesel engine were evaluated using a combination of analyses and test results. Shock tests performed by the U.S. Navy on EMD engines similar to those at Shoreham confirmed that the engine block and internals could withstand loads in excess of the Shoreham SSE. In addition, supplemental analysis was performed to address external components attached to the engine. This combination of

testing and analysis demonstrated that the engine assembly and all of its integral components would be able to function properly following an SSE level earthquake at Shoreham (Meligi, Tr. 981-84). The EMD diesels which were used for the testing and analysis were comparable to the EMD diesels at Shoreham (Meligi, Tr. 956-57).

87. Accessory components are those items that are not an integral part of the engine assembly. These components were analyzed using bounding calculations which demonstrated that stresses and deflections of the components were within allowable limits. With some exceptions, all accessory items were found to be suitable to withstand a SSE level earthquake and remain operable following the event. For the exceptions noted, Sargent & Lundy made recommendations for modifications which will result in those components being able to withstand the SSE (Meligi, Tr. 980-81).

88. LILCO has accepted the recommendations of Sargent & Lundy. The recommendations either have been completed or will be after an exemption is granted. Upon completion of recommendations made by Sargent & Lundy, the four EMD diesel generators at Shoreham will be capable of surviving an SSE level earthquake and remaining operable following the event (Meligi, Tr. 986).

89. Electrical equipment was also analyzed as part of the Sargent & Lundy study of the seismic capabilities of the EMD diesels. First, a detailed finite element analysis was performed on the worst case electrical panel to demonstrate the structural integrity of the panels

(Meligi, Tr. 984). Second, the operability of electrical equipment was confirmed by determining that the elevated response spectra for Shoreham were bounded by the response spectra used by Sargent & Lundy in qualifying other EMD diesels. By confirming that certain electrical devices installed on Shoreham were similar to devices previously analyzed by Sargent & Lundy, it was possible to conclude that these devices would withstand the SSE. For electrical equipment that could not be analyzed using this technique, Sargent & Lundy used methods set out in NUREG/CR-2405, "Subsystem Fragility." Additionally, a detailed check was performed of the mounting bolts on many of the instruments. The overall results of the analysis demonstrated that electrical components and devices on the Shoreham EMD diesels will withstand the SSE (Meligi, Tr. 984-85).

90. In addition to the Sargent & Lundy study, Stone & Webster performed analyses of any aspect of the seismic capabilities of the machines not covered by Sargent & Lundy's study that would affect their ability to operate under seismic conditions (Christian, Wiesel, Tr. 988). The scope of the Stone & Webster work coupled with the Sargent & Lundy work was adequate to determine the overall seismic capabilities of the machines (Wiesel, Tr. 958).

91. A static sliding and overturning analysis was performed on the EMD diesel mounting. Earthquake-induced sliding forces were compared to the support system's capability to resist those sliding forces with friction. This analysis showed that sliding of the EMD diesels will not

occur during an SSE. A similar analysis was done for overturning forces and demonstrated that the EMD diesels would not overturn in the event of an SSE (Wiesel, Tr. 941, 989-91).

92. Analysis also demonstrated that the wooden beam support structure for the diesel engines would not slide either (1) at the contact between the wooden beams and the gravel or (2) at a failure surface passing below this contact point through the gravel and soil (Christian, Tr. 992-93). Suffolk County's witnesses agreed that Stone & Webster had correctly concluded that the EMD diesels would not slide or overturn (Meyer, Tr. 2793-94).

93. Similar analyses demonstrated that the switchgear cubicle for the EMD diesels could resist sliding or overturning for a ground input of up to 0.13g (Wiesel, Tr. 991).

94. Stone & Webster evaluated the EMD diesel fuel oil line installation and recommended it be buried to improve its ability to withstand a seismic event (Wiesel, Tr. 991-92). Buried, it will have adequate seismic resistance (Christian, Wiesel, Tr. 998).

95. Stone & Webster also performed an assessment of the potential for soil liquefaction in the vicinity of the EMD diesel generators. Soils in that vicinity can withstand up to 0.13g, which exceeds the operating basis earthquake of 0.1g, without liquefaction. This does not mean that liquefaction will occur above 0.13g; it only means that it cannot be predicted with confidence that liquefaction will not occur (Christian, Tr. 993-95).

96. The ability of the GM EMD diesels and switchgear to withstand, at a minimum, an earthquake of 0.13g is significant because that level of earthquake exceeds the operating basis earthquake for Shoreham of 0.1g (Christian, Tr. 995). Moreover, although Shoreham uses a safe shutdown earthquake of 0.2g, the procedures currently used for determining design basis earthquakes for nuclear power plants set out in 10 CFR 100, Appendix A, would only require an SSE of 0.13g. In other words, if the NRC's existing standard procedures for relating earthquake intensities to peak ground acceleration had been applied to Shoreham, which they were not, Shoreham would have an SSE of 0.13g (Christian, Tr. 995).

97. The capability will exist to connect the EMD switchgear directly to Emergency Switchgear Room 102, through a cable routing independent of, and bypassing, the normal feed and normal switchgear room. Power can then be provided to the other Emergency Switchgear rooms from Room 102. This will provide added assurance of AC power availability in the event the normal switchgear room is unavailable. Installed raceway for the alternate feed will either be supported to withstand a seismic event, or installed after a seismic event. Conceptual design has been completed and feasibility has been verified. Final engineering and construction of pre-installed portions will be done if a low-power license exemption is granted, prior to commencing the Phase III testing program (Gunther, Schiffmacher, Tr. 813-15;

Schiffmacher, (Tr. 818-20, 832-37, 842, 863-65; Gunther, Tr. 832, 862-63; Knox, Tomlinson, Tr. 1890).

98. LILCO has committed to completing selected portions of this alternate tie-in prior to commencement of Phase III of the low-power testing program. Other elements of the modification will be installed after a seismic event if this tie-in is needed (Schiffmacher, Tr. 865).

99. LILCO has not qualified the EMD diesels for a seismic event (Schiffmacher, Tr. 349). The proposed TDI diesels are fully qualified (Minor, Tr. 2800).

100. If an SSE knocked out the 138 KV and 69 KV systems there would still be three independent 3.5 MW seismically qualified systems available. Under the same conditions, for the enhanced system there would remain only the EMD diesels (Meyer, Rousset, Minor, Tr. 2801-02).

101. The EMD diesels, not being seismically qualified, also might not be able to survive an SSE due to potential for failure of the fuel line or the concrete block walls of the nonemergency switchgear room or from soil liquefaction (Meyer, Rousset, Minor, Tr. 2802).

102. It is not necessary to assume the simultaneous occurrence of a LOCA and a seismic event. The piping systems are designed to withstand seismic loads in combination with other loads. Therefore, seismic loads will not cause a piping failure causing a LOCA. Thus, a LOCA and an earthquake are independent events. As both an earthquake and a LOCA are low probability events, their combination is an extremely low probability event (Hodges, Tr. 1763, 1794).

103. LILCO's evidence showed that it can restore a mile of the 69 KV transmission line in 24 hours (Tr. 510, Schiffmacher).

104. The RCIC system is seismically qualified. Modifications are being made to the HPCI to ensure that all portions of it are also qualified. Both systems are steam-driven and utilize DC power supplies which will last at least 24 hours. There is onsite a portable generator that can be used to maintain the DC power well beyond the 24 hours (Tr. 309-11, Rao et al.; Tr. 1766-67, Hodges; Staff Ex. 2 (SSER 6), ff Tr. 721, at 15-7).

105. The Shoreham nuclear plant is physically completed and is being maintained in a condition that would allow fuel loading within two to three weeks of the grant of a low-power license. The major requirement prior to fuel loading is the installation of neutron sources into the reactor vessel. These sources will be shipped upon receipt of a license and will be installed within two to three weeks, and final pre-fuel load testing will be completed during that period so that fuel loading activities may commence (Gunther, Tr. 866).

106. LILCO's exemption request is a short-term interim measure to allow fuel loading and low-power testing prior to completion of the litigation concerning the reliability of the TransAmerica Delaval, Inc. (TDI) diesel generators. Shoreham will be provided with fully qualified diesels prior to full-power operation (McCaffrey, Tr. 1704-05).

107. Prior to the crankshaft failure on one of the TDI diesel generators in August, 1983, LILCO included in Shoreham's design three

emergency diesel generators intended to meet all applicable regulatory requirements for onsite power sources. LILCO purchased three diesel generators from TransAmerica Delaval, Inc. (TDI), requiring that these machines be manufactured in accordance with approved specifications (McCaffrey, Tr. 1705). To ensure that TDI produced a machine that met the performance rating required in the FSAR and specifications, LILCO provided a specification which called for certain performance standards and assured through a preoperational test program that the machines were capable of running at the performance rating (McCaffrey, Tr. 1440-41, 1467-68). LILCO utilized its own and its architect/engineer's quality assurance program to oversee TDI's quality assurance programs (McCaffrey, Tr. 1459-60, 1468-69).

108. The preoperational test program identified problems needing correction. LILCO responded by correcting individual problems and by initiating a Diesel Generator Operational Review Program in March, 1983 to review problems and make recommendations to improve reliability of the TDI diesel generators (McCaffrey, Tr. 1706-08, 1492-93).

109. Within a few days of the failure of the crankshaft of diesel generator 102 in August, 1983, LILCO engaged the services of Failure Analysis Associates (FAA) to conduct a comprehensive investigation into the cause of the failure (McCaffrey, Tr. 1708, 1470-71). That effort included:

(a) inspection of the crankshafts on DG 101 and 103 for indications of similar problems;

(b) complete metallurgical analysis of the failed crankshaft;

(c) strain gauge and torsiograph testing of one of the remaining original crankshafts to determine actual stresses on the shaft;

(d) complete disassembly and inspection of all three diesel engines to replace the original crankshafts with crankshafts of an improved design and to assess any damage to the engines as a result of the crankshaft problem; and

(e) design analysis using finite element modeling/ model superposition analysis to ascertain dynamic torsional response of the original crankshafts (McCaffrey, Tr. 1708-09).

110. At a November 1983 meeting with the NRC Staff, LILCO further undertook a comprehensive diesel generator recovery program consisting of four phases:

(a) disassembly, inspection, repair and reassembly of each diesel;

(b) failure analysis of defective components;

(c) design review and quality revalidation (DRQR) program; and

(d) expanded qualification testing (McCaffrey, Tr. 1531, 1709-10).

111. The DRQR program is a detailed review of the design and quality of the TDI diesel engines including an assessment of the design of important components in the diesels which verifies important quality attributes for the requisite engine components. It has involved over 120 people from LILCO, Stone & Webster, Failure Analysis Associates, Impell and other consultants (McCaffrey, Tr. 1710).

112. LILCO has also undertaken to procure and install at Shoreham three diesel generators manufactured by Colt Industries. These machines are of the type in use at other nuclear power plants and are designed to satisfy the requirements of GDC-17. Stone & Webster has been retained to design a new building for the Colt diesels, to design support systems and to analyze how to integrate the system into the existing plant (McCaffrey, Tr. 1712-13). The procurement of and engineering for the Colt diesels were pursued on an expedited basis. Construction of site facilities for the Colt diesel generators started in November, 1983, after the August, 1983 failure of the crankshaft in diesel generator 103. All three Colts have now been manufactured and delivered to Shoreham. Engineering work for the installation of the Colts is essentially complete and construction work is well underway, and construction and testing are scheduled for completion in May, 1985 (McCaffrey, Tr. 1713-14).

VI. CONCLUSIONS OF LAW

Based upon the entire evidentiary record in this proceeding and upon the opinion and findings of fact set forth above, the Board makes the following conclusions of law:

1. The evidence establishes that no fission products will be released from the fuel if AC power is restored to the plant within 55 minutes in the event of a LOCA, and that there is adequate assurance that in the event of a simultaneous LOCA and loss of offsite AC power, power would be restored from either the gas turbine or the EMDs within 55 minutes. Thus, the Board finds that the alternate AC sources proposed for use at Shoreham at five percent power provide a level of protection comparable with a fully qualified onsite source of emergency AC power. The Board therefore concludes that reliance by LILCO on the proposed alternate sources meets the "as safe as" standards set forth by the Commission in CLI-84-8 (19 NRC 1154).

2. In view of the Board's conclusion that the Commission's "as safe as" test is met, the Board finds that the proposed exemption for low-power testing would not endanger life or property, within the meaning of 10 CFR §50.12(a).

3. The terms "common defense and security" as used in 10 CFR §50.12(a), mean the common defense and security of the United States (10 CFR§50.2(i); Section 11g of the Atomic Energy Act, 42 U.S.C. §2014(g)). The Commission has held that the terms refer principally to "the

safeguarding of special nuclear material; the absence of foreign control over the applicant; the protection of Restricted Data; and the availability of special nuclear material for defense needs" (Florida Power & Light Co. (Turkey Point Units 3 and 4), 4 AEC 9, 12 (1967)). The United States Court of Appeals for the District of Columbia Circuit further stated that "the internal evidence of the [Atomic Energy] Act is that Congress was thinking of such things as not allowing the new industrial needs for nuclear materials to preempt the requirements of the military; of keeping such materials in private hands secure against loss or diversion; and of denying such materials and classified information to persons whose loyalties were not to the United States" (Siegel v. Atomic Energy Commission, 400 F.2d 778, 784 (D.C. Cir. 1968)). The Board concludes that LILCO's exemption request has no impact upon and will not endanger the common defense or security of the United States.

4. After taking into account and balancing the equities identified by the Commission in footnote 3 of CLI-84-8 (19 NRC 1154, 1156), the Board finds that there are exceptional circumstances that warrant the granting of an exemption under the provisions of 10 CFR §50.12(a).

5. Based upon a balancing of the equities identified in CLI-84-8, footnote 3, supra, the Board finds that the Application For Exemption filed by LILCO and the evidence adduced in support thereof demonstrate the "exigent circumstances" that favor the granting of an exemption and

show that, in spite of its noncompliance with GDC-17, the health and safety of the public would be protected (CLI-84-8, 19 NRC 1154, 1155).

6. Based upon a finding that the Application For Exemption meets the "exigent circumstances" test set forth by the Commission, the Board concludes that the Application meets the "otherwise in the public interest" provision of 10 CFR §50.12(a).

7. The Board thus resolves all issues involved in the hearing on this proceeding in favor of authorizing the exemption requested by LILCO.

VII. ORDER

The Director of Nuclear Reactor Regulation is authorized, upon making the findings on all applicable matters specified in 10 CFR §50.57(a), to issue to the Applicant, Long Island Lighting Company, a license or licenses to authorize low-power testing (up to five percent of rated power) of the Shoreham Nuclear Power Station, Unit 1.

The Commission provided in its Order of May 16, 1984, that "Any initial decision authorizing the grant of an exemption shall not become effective until the Commission has conducted an immediate effectiveness review" (CLI-84-8; 19 NRC 1154, 1156). Accordingly, this Initial Decision is transmitted directly to the Commission for its immediate effectiveness review.

The Appeal Board has held in the instant proceeding that in none of the orders entered by the Commission did it "announce that it was removing us entirely from the appellate review chain" (ALAB-787, at page 3 of the slip opinion). The Appeal Board further stated at page 4:

> "But, as noted above, all that the Commission 'reserved' in CLI-84-8 was its conduct of an immediate effectiveness review of any Section 50.12(a) exemption that the Licensing Board might grant to the applicant. It is clear from the terms of 10 CFR 2.764(g) that Commission immediate effectiveness reviews have no bearing upon the exercise by an appeal board of the general appellate review authority in 10 CFR Part 50 proceedings that is conferred by 10 CFR 2.785(a). Rather, if the Commission desires to preclude or to limit the exercise of that authority in a particular Part 50 proceeding, it must -- and does -- say so expressly."

Any party may take an appeal from this Initial Decision by filing a Notice of Appeal within ten (10) days after service of this decision. Each appellant must file a brief supporting its position on appeal within thirty (30) days after filing its Notice of Appeal (forty (40) days if the Staff is the appellant). Within thirty (30) days after the period has expired for the filing and service of the briefs of all appellants (forty (40) days in the case of the Staff), a party who is not an appellant may file a brief in support of, or in opposition to, any such appeal(s). A responding party shall file a single, responsive brief only, regardless of the number of appellants' briefs filed. [See,

in particular, 10 CFR §2.762, as amended effective December 19, 1983, 48 Fed. Reg. 52282, 52283 (November 17, 19840.]

THE ATOMIC SAFETY AND LICENSING BOARD

Glenn O. Bright, Member
ADMINISTRATIVE JUDGE

Elizabeth B. Johnson, Member
ADMINISTRATIVE JUDGE

Marshall E. Miller, Chairman
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland

this 29th day of October, 1984.