LILCO, August 31, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322-OL-4
	)	(Low Power)
(Shoreham Nuclear Power Station, Unit 1)	)	
	)	

LONG ISLAND LIGHTING COMPANY'S POST-HEARING BRIEF IN SUPPORT OF APPLICATION FOR EXEMPTION

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DATED: August 31, 1984

SUBJECT INDEX

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I. PRELIMINARY STATEMENT

Nine days of evidentiary hearings and the conclusive findings made in the Order Granting in Part and Denying in Part LILCO's Motions for Summary Disposition on Phase I and Phase II Low-Power Testing (the July 24 Order) have established that operation of the Shoreham Nuclear Power Station (Shoreham) during the four phases of low power testing as proposed by LILCO in its Supplemental Motion for Low Power Operating License and Application for Exemption is not only safe, but is as safe as operation at 5% power would be at a plant with qualified onsite diesel generators. Additionally, the evidence has established that exigent circumstances exist supporting the grant of an exemption and that such an exemption would be in the public interest. In short, this Board should now issue a decision (1) authorizing issuance of a license for proposed Phases I and II of low power testing, and (2) resolving all

issues in LILCO's favor and recommending the issuance of a license to conduct Phases III and IV subject to resolution of any security contention which may be admitted. This Brief, in conjunction with LILCO's Proposed Findings of Fact, explains why the Board should issue such a decision.[1]

Importantly, the evidence demonstrates without contradiction that performance of low power testing as proposed by LILCO would be safe and would pose no danger to life or property. This is the standard set forth in 10 CFR § 50.12(a). No Intervenor witness even addressed the absolute safety of operation in terms of deterministic thermal and radiological acceptance criteria. Instead, they only attempted a comparison of certain attributes of qualified TDI diesels with selected individual portions of the AC power supply proposed by LILCO for low power testing. No Intervenor witness suggested that LILCO's proposed mode of low power operation presents any undue risk to the public. The absence of such a suggestion should be remembered as the Board addresses the "Shoreham Rule" contained in the Commission's May 16 Order. CLI-84-8.

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[1] No effort is made here to repeat all of the factual findings which should be made and which are detailed in LILCO's Proposed Findings of Fact. Instead, for brevity and convenience, this Brief will discuss the facts in general and conclusory terms with appropriate references to LILCO's proposed findings. Findings will be cited as (F. ___); the transcript will be cited as (Tr. ___).

That May 16 Order instructed LILCO to address:

> 1. The "exigent circumstances" that favor the granting of an exemption under 10 CFR 50.12(a) should it be able to demonstrate that, in spite of its non-compliance with GDC 17, the health and safety of the public would be protected. [footnote omitted].
>
> 2. Its basis for concluding 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 power source.

Commission Order at 2-3.

This Brief focuses first on the health and safety issues because of their primary importance.

II. HEALTH AND SAFETY ISSUES

A. "As Safe As"

Operation 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. The traditional deterministic approach employed for safety analyses in NRC proceedings demonstrates the ability of the plant in both

configurations to withstand postulated accidents and transients and remain within the specified operational limits. If those limits are met, a plant is deemed safe. Both LILCO's witnesses and those of the Staff testified that these limits are set conservatively and already incorporate a safety margin. Thus, for example, a plant could exceed the 2200° peak cladding temperature of 10 CFR §50.46 by 500° and still not encounter adverse public health and safety consequences. (F. 41).

Any plant must stay within the operational limits with or without onsite diesels. Since LILCO's proposed four phases of low power testing will be performed within these operational limits, even assuming the postulated accidents and transients in Chapter 15 of the Final Safety Analysis Report (FSAR), operation will be as safe as it would have been with a qualified onsite AC power source. Wayne Hodges of the NRC Staff put this in the best perspective when, in response to Suffolk County's cross-examination, he said "It's kind of like driving on a four-lane bridge, being in the outside lane near the edge as opposed to the inside lane. Is there less margin of safety?" (Tr. 1751).[2]

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[2] During closing argument, counsel for Suffolk County misleadingly claimed that Hodges testified that there was less margin of safety under the proposed mode of low power testing. (Tr. 3094). Hodges conceded that the temperature difference

(footnote continued)

The NRC Staff has opined that "as safe as" means "substantially as safe as" or "a comparable level of safety." LILCO agrees with this characterization of the standard. To a certain extent, LILCO believes this debate may be unnecessary. The regulations, and particularly 10 CFR § 50.46, set standards for safety. A plant with qualified diesels need only meet the standards; it need not meet them by any specified amount. Thus, a plant operating within those standards is safe. And, any two plants operating within those standards are equally safe regardless of the relative peak cladding temperatures that may be reached.[3] On the other hand, employing the "substantially as safe as" test may facilitate comparison of

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(footnote continued)

between 2200° F, the limit set in § 50.46, and the temperatures reached during LILCO's proposed mode of operation assuming a LOCA, would be less than the difference between 2200° and the temperatures actually reached if the TDI diesels were available. Hodges did not, however, find this difference significant inasmuch as anything under the 2200° limit is assumed to be safe. (Tr. 1751-52).

[3] Indeed, operation of the plant during low power testing within the § 50.46 limits is even safer than for full power operation for which the limits are designed. Low fuel burn-up during low power testing enhances safety in at least three ways. First, the amount of decay heat present in the core following shutdown is substantially reduced resulting in reduced cooling system requirements. Second, the amount of radioactivity that could be released upon fuel failure is substantially reduced. And, third, there is greater operator time to take corrective actions in the event failures occur. (F. 32).

the reliability of LILCO's proposed AC power sources with onsite diesel generators since there is no quantifiable standard by which to make any comparison.

Accordingly, analysis of the safety of the plant during low power testing as proposed by LILCO is a two-step process. First, the Board must determine how much time is available to restore necessary AC power following a postulated accident or transient in order to remain within specified limits. Second, the Board must determine that LILCO has the capability to restore power within those time limits.

B. Time Within Which AC Power Is Needed

1. Phase I: Fuel Load and Precriticality Testing

This Board's July 24 Order found that no core cooling will be required during Phase I fuel loading and precriticality testing.[4] Therefore, no AC power will be necessary to cool the core. July 24 Order at 10-11. By definition, LILCO's proposed operation of Shoreham during Phase I will be as safe as it

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[4] Fuel loading and precriticality testing involve placing fuel in the vessel and conducting various tests of reactor and support systems (F. 2). This testing is described in detail in LILCO's proposed findings. (F. 3-6).

would have been with qualified onsite diesel generators. If no AC power is needed, a change in -- or even the absence of -- the AC power source has no effect on the safety of operation.

2. Phase II: Cold Criticality Testing

As with Phase I, the facts concerning the need for AC power during Phase II cold criticality testing have been conclusively established by this Board's July 24 Order.[5] During cold criticality testing, none of the events analyzed in Chapter 15 could result in a release of radioactivity that would endanger public health and safety. Even in a LOCA, fuel cladding temperatures would not exceed applicable limits after months. Thus, there is no need to rely on any source of AC power during Phase II. July 24 Order at 11-13.

Again, since there is no reliance on AC power supplies for mitigation of any accident or transient, a change in those power supplies would have no effect on public health and safety. Accordingly, LILCO's proposed operation of the

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[5] Phase II cold criticality testing involves specified control rod withdrawal sequences that result in achieving reactor criticality at extremely low power levels, in the range of .0001% to .001% of rated thermal power. (F. 7). The nature of these tests are more particularly described in LILCO's proposed findings. (F. 7-8).

plant during Phase II will be as safe as performance of Phase II low power testing with qualified onsite diesel generators.

3. Phases III and IV: Reactor Heat-Up and Pressurization at Power Levels up to 1% of Rated Power and Low Power Testing from 1% to 5% of Rated Power

Though distinct, Phases III and IV are discussed together since they are bounded by the Phase IV time limits for restoration of AC power. Phase III involves reactor heat-up and pressurization. (F. 9). During this phase, the power level is taken in progressive steps to rated pressure and temperature conditions (approximately 1% of rated power). (F. 9).[6] During Phase IV, the power level is taken in progressive steps from 1% to 5% of rated thermal power. (F. 11).[7] Since LILCO demonstrates its ability timely to restore power under Phase IV conditions, it will be able timely to restore power under Phase III conditions where the amount of decay heat and fission products are lower. (F. 30).

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[6] Details concerning Phase III testing may be found in LILCO's proposed findings. (F. 9-10).

[7] Details concerning Phase IV of low power testing may be found in LILCO's proposed findings. (F. 11-14).

Two witness panels addressed the time within which power must be restored during Phases III and IV. LILCO presented the testimony of Dr. Atambir Rao, Senior Program Manager for Advanced Engineering and formerly Manager, Plant Safety Systems Engineering of General Electric, Eugene Eckert, Manager, Plant Transient Performance Engineering of General Electric, George F. Dawe, Supervisor of Project Licensing for Stone & Webster and Robert Kascsak, LILCO's Nuclear Systems Engineering Division Manager. (Tr. 232-38, 265-74). The NRC Staff presented the testimony of Wayne Hodges, Section Leader of the Reactor Systems Branch in the Division of Systems Integration and Theodore Quay, Section Leader in the Accident Evaluation Branch of Systems Integration. (Tr. 1740-43, 1782-84, 1796, 1799-1800). Both witness panels substantially concurred in their analyses. The Intervenors presented no testimony in this area.

Essentially all witnesses agreed that the 38 accidents and transients addressed in 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. (E.g., F. 18, 22, 31, 34, 36). Those that cannot occur need not be discussed here; they obviously pose no health and safety problem.[8] As to the remaining two categories, the

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[8] Reference to those events which cannot occur during Phases III and IV is found in LILCO's proposed findings. (F. 31).

LOCA presents the most limiting analysis. (F. 36).

For all events other than the LOCA, there will be 30 days or more to restore core cooling. (F. 34). Wayne Hodges believed that an indefinite amount of time would be available. (F. 33). He explained that if either the RCIC or HPCI system acts at least once during the first four days following such an event, heat losses to the ambient would equal the decay heat being generated before the fuel would ever uncover. In that event, a peak cladding temperature of 2200° F would never be reached. (F. 33). The LILCO witnesses agreed with this analysis and further explained that containment and suppression pool limits would not be exceeded for approximately 30 days given the heat capacity of passive heat sinks, such as steel and concrete. (F. 34).

Both HPCI and RCIC have adequate coolant makeup capability to provide required core cooling. (F. 34). Both are seismically qualified[9] and would operate automatically to cool the core. (F. 34). Neither depends on AC power. They are steam driven and utilize DC power supplies.[10] (F. 34). If

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[9] See infra p. 44 n. 38.

[10] LILCO's DC power supplies will last a minimum of 24 hours providing sufficient power for at least 2 more days of core cooling. Using an onsite portable generator and battery chargers, the DC power can be maintained indefinitely. (F. 34).

all AC power were lost, the reactor would immediately isolate and HPCI and RCIC would be available. (F. 34). Thus, absent a LOCA, AC power would not be needed for at least 30 days.

Following the most severe LOCA during Phase III, calculations indicate that more than 24 hours would be available to restore core cooling. (F. 38). These calculations were based upon approved 10 CFR Part 50, Appendix K models with some realistic assumptions[11] relating to the treatment of decay heat and natural convection heat transfer and the core power peaking factor. (F. 38; Tr. 304-06). Even calculations using the very conservative regulatory assumptions required by 10 CFR § 50.46 and Appendix K demonstrate that the operator would have more than 370 minutes before core cooling must be restored to prevent the core from exceeding the limits in 10 CFR § 50.46 for peak cladding temperature, local oxidation or core-wide oxidation. (F. 38).

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[11] The decay heat inventory used in this calculation was based on the lastest American Nuclear Society Standard 5.1 and took into account the actual anticipated operating history of the core during Phase III. (Tr. 304-05). The calculation was also based on a core power peaking factor of 3.38, which results from the actual control rod withdrawal pattern planned for use at Shoreham. (F. 38).

For a LOCA during Phase IV, four different calculations were made. Dr. Rao testified that more than three hours would be available following a LOCA during Phase IV using some realistic assumptions. (F. 39). Using the conservative regulatory assumptions required by 10 CFR § 50.46 and Appendix K and a core power peaking factor of 3.38, more than 86 minutes would be available before core cooling need be restored. (F. 39).

Wayne Hodges referred to two other calculations. Using the conservative Appendix K and § 50.46 models and assumptions and a core peaking factor of 5.0, 55 minutes would be available to restore power. (F. 39). The peaking factor of 5.0, however, is inappropriate since the control rod withdrawal pattern established for use during low power testing will limit the peaking factor to 3.38. (F. 38, 39). Using the very conservative Appendix K assumptions with a realistic assumption of power history for the core -- 5% power for an equivalent of 60 days, instead of 1000 days to reach equilibrium power history -- the calculated operator action time is 110 minutes. (Tr. 308, 1786).

It makes no difference whether the 55-minute or 86-minute limit is considered. As discussed below, LILCO will be able to restore AC power to mitigate a LOCA well within either

time frame. Moreover, these very conservative times pertain to restoration of AC power in order to stay below the 2200° F temperature limit set by 10 CFR § 50.46. As Wayne Hodges testified without contradiction, even if the 2200° F were exceeded at 5% rated power, nothing drastic would happen. There is data indicating that temperatures as high as 2700° F will not melt the fuel and will allow the fuel cladding to retain some ductility. (F. 41).

In sum, if following a LOCA, AC power can be restored within 55 or 86 minutes -- whichever conservative assumption one chooses -- and if AC power can be restored in approximately 30 days in the event of an accident or transient other than a LOCA, operation of the plant during Phases III and IV of the proposed low power testing will be as safe as operation would have been with qualified onsite diesel generators.[12]

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[12] The standby gas treatment system will not be necessary to mitigate any accidents or transients during Phase IV. (F. 45,46). Since there will be no fuel failures in the event of a LOCA, there will be no releases requiring mitigation by the standby gas treatment system. (F. 45). And, the smaller total fuel fission product inventory and the reduced fraction of that inventory having left the fuel pellets and entered the cladding gap will sufficiently reduce the fission products available for release from the fuel cladding to compensate for a loss of the standby gas treatment system in the event of a fuel handling accident without AC power available. (F. 46). Indeed, it is highly unlikely that LILCO would be moving fuel during low power testing. (F. 46). Quay noted that the consequences of a postulated fuel handling accident could further be mitigated by restricting the movement of irradiated fuel for a period of 40 days, though the Staff does not find such a restriction necessary. (Tr. 1798).

C. The Availability of AC Power

The evidence abundantly established that AC power will be available if and when needed. LILCO's ability to provide AC power within the time needed was explained by a number of well-qualified LILCO witnesses. Their testimony demonstrated the stability of LILCO's grid as fortified by numerous facilities designed to ensure that offsite AC power will not be lost in the first instance.[13] The evidence then detailed the capabilities, characteristics and reliability of enhancements to the offsite system -- the 20 MW gas turbine and the four EMD diesel generators at Shoreham -- which will automatically start to restore the availability of AC power to the plant upon the unlikely failure of all normal offsite sources concurrently. In addition to LILCO's testimony, the

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[13] GDC 17 establishes requirements for an onsite and an offsite electric power system. As used in GDC 17, the terms "onsite" and "offsite" refer not to physical location, but to the degree of qualification and nature of intended service of each system. The offsite system is the normal and preferred source of AC power and generally includes the utility's grid, including its transmission system and generating sources. For purposes of evaluating LILCO's Application for Exemption, all power sources are considered to be part of the offsite system, since no credit is taken for the onsite TDI diesel generators. To avoid confusion, that part of the offsite system located physically apart from the Shoreham site will be denoted as the "normal offsite system." The 20 MW gas turbine and EMD diesels, which are part of the offsite system, but physically located at the site, are called "enhancements to the offsite system."

Staff presented three knowledgeable witnesses familiar with the operation of gas turbines and EMD diesel generators and with the procedures which will be employed by LILCO to provide AC power. In contrast, the Intervenors presented but one witness panel concerning the technical capabilities of LILCO's AC power sources. Not only did that witness panel of Eley, Smith, Minor and Bridenbaugh completely ignore the characteristics of LILCO's normal offsite power sources, but they lacked the experience and qualifications to discuss knowledgeably the EMD diesels and the 20 MW gas turbine as more fully explained below.

1. The Reliability of LILCO's Normal Offsite Power System

Although a loss of offsite power must be assumed for analytical purposes, LILCO's normal offsite system is designed to make such an event extremely unlikely. Indeed, many facets of LILCO's normal offsite power system exceed those required by GDC 17. Thus, it is less likely that LILCO would suffer a loss of offsite power than would a plant operating with qualified onsite and offsite power sources satisfying the minimum requirements of GDC 17.

Each of LILCO's four major steam generating stations is equipped with a backup blackstart gas turbine to provide starting power under blackout conditions. (F. 50).[14] Additionally, LILCO's ability to deliver power to Shoreham is not limited to its own generating capacity. The LILCO system has three interties to the New York Power Pool and one to the New England Power Exchange. Despite all this capacity, if frequency on LILCO's grid should drop below a specified level, LILCO has automatic load shedding procedures allowing it to balance between loads and available generation to prevent cascading outages on the system. (F. 52).

As a result, the LILCO grid has an excellent reliability record. Only once since the Northeast Blackout of 1965 has power been lost to any substantial portion of the grid. (F. 53). That one outage occurred prior to many improvements to LILCO's system such as the installation of numerous blackstart gas turbines. (F. 53). Even following that outage, however, power was restored to the Shoreham area in just over one hour. (F. 53). Today, with additional

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[14] "Blackstart" means that when a loss of power exists, the system operator can start a power source from a local or remote location. (F. 48). "Deadline" means that the power source recognizes through its own circuitry that there has been a loss of power and automatically starts without operator activation. (F. 49). Thus, "deadline blackstart" means that the power source will start automatically upon a loss of power.

blackstart power sources and expedited procedures making restoration of power to Shoreham top priority of the system operator, power could be restored to Shoreham in minutes. (F. 57-60).

Enhancing LILCO's ability to assure a continuous supply of AC power to Shoreham are deadline blackstart gas turbines at locations virtually surrounding Shoreham. At Holtsville, approximately 15 miles southwest of Shoreham, there are ten gas turbines, two of which had deadline blackstart capability before April, 1984 and three others of which were scheduled to have blackstart capability installed by April, 1984. (F. 57). Any one of the five blackstart gas turbines at Holtsville would suffice to supply power to Shoreham. (F. 57). That power could be routed over a number of different circuits. (F. 57). During tests under simulated conditions, restoration has been accomplished from Holtsville in six minutes following a loss of offsite power. (F. 57).[15]

Approximately 27 miles east of Shoreham, LILCO has a 14 MW gas turbine with blackstart capability at Southold. (F. 58). Power can be restored to Shoreham from Southold in

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[15] To assure this capability, LILCO has committed to demonstrate bi-weekly the starting ability and the ability of the system operator to restore power to Shoreham within fifteen minutes from Holtsville. (F. 67).

approximately ten minutes. (F. 58). Yet another blackstart gas turbine is located approximately 35 miles from Shoreham at East Hampton. (F. 59). Power from East Hampton can be restored to Shoreham in approximately 15 minutes. (F. 59).[16] Finally, a 16 MW blackstart gas turbine located at Port Jefferson, approximately 11 miles west of Shoreham, can provide power to Shoreham in approximately 25 minutes. (F. 60).

Thus, LILCO's substantial and diverse generating capacity makes it extremely unlikely that the offsite power system would ever be without sufficient power to route to Shoreham. The diversity and reliability of LILCO's transmission system ensures that the power generated will get there.

LILCO has seven circuits serving the Shoreham area and two switchyards. (F. 54, 55). This far exceeds the requirements of GDC 17 for two offsite circuits travelling on a common right of way to a single switchyard. (F. 56). Four separate 138 KV transmission lines serve the 138 "" switchyard at Shoreham, approximately 1300 feet south of the plant. (F.

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[16] The gas turbines at Southold and East Hampton will be tested bi-weekly as to their ability to start and accept load. Additionally, annual tests will be performed to demonstrate LILCO's ability to provide power to Shoreham from Southold and East Hampton. (F. 68, 69).

54). These four circuits enter the 138 KV switchyard on two separate and independent rights of way. (F. 54). And, the 138 KV switchyard consists of two sections which can be electrically isolated from each other should problems develop in one section. (F. 54). Each section receives two of the four 138 KV circuits, one from each right of way. (F. 54). Additionally, three 69 KV circuits feed the Wildwood Substation, approximately one mile south of Shoreham. (F. 55). They enter the Wildwood Substation through two separate rights of way. (F. 55). From Wildwood, a single 69 KV circuit enters the 69 KV switchyard at the site. (F. 55). That 69 KV line, serving the reserve station service transformer (RSST), has been placed underground in the vicinity of the 138 KV line to the normal station service transformer (NSST). (F. 55). Independence of supply between the NSST and the RSST is, therefore, maintained and the likelihood of a simultaneous loss of supply to both transformers by a common event is minimized. (F. 55). Further adding to the reliability of these transmission lines,[17] there is a 69 KV circuit bypassing the 69

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[17] These transmission lines, like LILCO's entire transmission system, are designed to withstand winds in the range of 100 to 130 m.p.h., in excess of the National Electrical Safety Code requirements. (F. 61). LILCO's system has not been adversely impacted by tornados or earthquakes in the last 20 years. (F. 62). Nor has it been adversely impacted by hurricanes in the last ten years, although these may have been outages to individual lines. (F. 62).

KV switchyard and its associated circuit to the RSST and running directly from the overhead RSST from the 69 KV line from Wildwood to the RSST. Thus, power could be restored to RSST from the 69 KV circuit without having to repair any underground cable and bypassing the 69 KV switchyard. (F. 55).

Further minimizing the possibility of a loss of the normal offsite transmission system during low power testing, LILCO has committed to initiate steps to place the plant in a cold shutdown condition in the event of any of the following:

> (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;
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> (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;
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> (e) an indication of seismic activity of .01g on the Shoreham seismic monitors;[18]

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[18] 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

(footnote continued)

> (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 8 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 an alarm set point.

(F. 64). LILCO's procedures direct immediate commencement of a controlled shutdown upon notification from the system operator that any of these conditions exist. (F. 65).

Significantly, evidence concerning LILCO's normal offsite system, largely from the testimony of William G. Schiffmacher, LILCO's Manager of Electrical Engineering, was uncontradicted. Indeed, the Intervenors' witnesses unjustifiably ignored the normal offsite system. It is facile

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(footnote continued)

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 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.

to say, as did Suffolk County, that the normal offsite power system will be the same regardless of the availability of the TDI diesels. In assessing the safety of Shoreham's operation during the proposed low power testing, this Board is not limited to some sterile equation. It must be concerned with the availability of AC power to operate necessary plant systems. The source of that power is immaterial. LILCO's ability to provide AC power from so many generating sources over so many transmission paths lessens the likelihood that the AC power sources physically located at Shoreham will ever be needed. This capability should not be ignored.[19]

2. Offsite Enhancements at Shoreham

In the unlikely event that power from LILCO's normal offsite system becomes unavailable, LILCO has two offsite power generation sources at the site, either of which is capable of providing sufficient AC power to operate necessary plant systems if accidents or transients occur during the proposed low power testing. These enhancements to the offsite system include a 20 MW Pratt and Whitney gas turbine located in the 69

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[19] The greater the normal offsite reliability, the greater the assurance that AC power will be available and, concomitantly, the less dependence there will be on the AC power sources at the site.

KV switchyard and four 2.5 MW General Motors EMD diesel generators located virtually next to the reactor building. (F. 72,78). Considered together, these enhancements provide additional capability and redundancy to ensure the availability of AC power.

a. The 20 MW Gas Turbine

The 20 MW gas turbine was described by William Gunther and William Schiffmacher of LILCO and Edward Tomlinson and John Knox of the NRC Staff. It is a deadline blackstart gas turbine sufficient to meet Shoreham's emergency needs. (F. 72).[20] Conservatively, the gas turbine can start and begin to power core cooling equipment within the Shoreham plant in ten minutes. (F. 76). Realistically, it should only take five minutes for the gas turbine to provide sufficient power to operate the core cooling equipment. (F. 76).[21] It will be tested bi-weekly for starting reliability and monthly for load carrying capability.[22] (F. 74).

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[20] It provides power to plant electrical systems through the RSST. (F. 72).

[21] During 1982-83, a comparable unit at East Hampton successfully started 82 times out of 84 attempts, for a reliability of 97.6%. (F. 73). The unit at Shoreham has been refurbished since being relocated to Shoreham to enhance its reliability. (F. 73).

[22] The 20 MW gas turbine operates on fuel oil supplied from a 1,000,000 gallon storage tank located at Shoreham. (F. 75).

(footnote continued)

Suffolk County's witnesses proffered nothing to impugn the reliability of the 20 MW gas turbine.[23] Indeed, Suffolk County's testimony concerning the 20 MW gas turbine was presented by witnesses with little technical qualifications who failed to consider the 20 MW gas turbine as part of an integrated system together with the EMD diesel generators and, in any event, failed to give any affirmative testimony that the 20 MW gas turbine was unreliable. Only Gregory Minor and Dale Bridenbaugh discussed the 20 MW gas turbine. (Tr. 2612-18).[24] Before becoming a principal in MHB, which spends approximately 50% to 80% of its time annually testifying and preparing testimony (Tr. 2426-27), Minor was an engineer with General Electric whose experience was limited to instrumentation and control systems. (Tr. 2424). His engineering experience did

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(footnote continued)

There is adequate storage capacity for 20 days of operation at maximum output. As a technical specification requirement, the NRC Staff will require LILCO to maintain a minimum stored volume of fuel for seven days of operation at maximum continuous output. (F. 75). LILCO will also provide a 9,000 gallon fuel oil tank truck on site at all times on a standby basis. (F. 75).

[23] New York State presented no technical witnesses.

[24] The other members of that panel, Eley and Smith, did not sponsor the gas turbine testimony. Both testified that they had no prior experience in operating or maintaining a gas turbine. (Tr. 2418, 2423).

not encompass gas turbines or transmitting electricity from gas turbines to the bus. (Tr. 2424-26). Significantly, Minor has never been responsible for operating any type of power generation equipment, except for a summer job in which he participated in testing generators at hydroplants. (Tr. 2427-28). And, he has never been responsible for the operation or design of a gas turbine. (Tr. 2428). Similarly, Dale Bridenbaugh, another principal in MHB, has never been a gas turbine operator; nor has he designed a gas turbine. (Tr. 2429-30). And, he has had no responsibility for overseeing the installation of a gas turbine (Tr. 2429) and no experience with Pratt and Whitney turbines (Tr. 2430-31).[25] Consequently, neither Bridenbaugh nor Minor had sufficient qualifications to evaluate the reliability of the 20 MW gas turbine, its operation, its maintenance or the procedures concerning its use or testing.

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[25] Interestingly, despite the County's protests in April that insufficient time was allotted for discovery, analysis and formulation of opinions, Bridenbaugh had no opinions concerning the gas turbine as of June 27 when he was deposed and had at that time performed no analysis of the gas turbine. (Tr. 2431). The 19 intervening days before testimony was filed was less time than was available between the filing of LILCO's Supplemental Motion for Low Power Operating Licensing on March 20 and the commencment of hearings on April 24.

Much of Minor's and Bridenbaugh's opinions concerning the 20 MW gas turbine dealt with their view that it did not satisfy the single failure criterion. (See, e.g., Tr. 2617). Thus, they spoke of its exposure to missiles, its lack of alarms and the like. Yet, they failed to consider the 20 MW gas turbine as just a part of LILCO's enhanced offsite AC power supply at the site. Nothing in their testimony indicated that any failure of the 20 MW gas turbine would affect the EMD diesels. To postulate the unavailability of AC power to the site, however, one would have to postulate a failure of both the 20 MW gas turbine and four EMD diesels.[26] In short, Minor and Bridenbaugh attempted to distort the proper analysis by focusing individually on the 20 MW gas turbine. Nowhere in their testimony did they focus upon LILCO's ability to provide AC power using all power sources available.

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[26] During closing argument, counsel for Suffolk County contended that a true single failure criterion had been applied because the 20 MW gas turbine and the EMD diesels shared the normal switchgear room and, accordingly, might be subject to a common seismic event or fire. (Tr. 3092). In this context, it is important to remember that a seismic event need not be postulated with a LOCA and, accordingly, more than 30 days would be available for restoration of AC power in that event. See infra p. 41. Similarly, a design basis accident such as a LOCA need not be postulated with a fire. (10 CFR Part 50, Appendix R; see Staff Exhibit LP-2, SSER 6, ff. Tr. 721, at 8-8). Moreover, it is important to recall that the cable serving the EMDs and the 20 MW gas turbine enter the normal switchgear room 40 feet apart and power separate buses. (Tr. 1886). Additionally, the capability will exist to bypass the normal switchyard room. See infra p. 43 n.37.

Finally, Minor and Bridenbaugh did not find any infirmities in the 20 MW gas turbine. They questioned the surveillance testing program for the gas turbine and characterized it as "too easy." (Tr. 2614). Yet, their opinion was evidently based upon LILCO's draft procedures and not upon the testing requirements delineated in SSER 6. Minor and Bridenbaugh also asserted the alleged insufficiency of alarms and controls for monitoring operation of the 20 MW gas turbine. In addition to such controls' or alarms' lack of impact on the operation of the EMDs, Minor and Bridenbaugh apparently failed to recognize that in an emergency, the 20 MW gas turbine would be run despite any alarms. Similarly, their concern with not being able manually to start the 20 MW gas turbine appears misplaced. (Tr. 2616). The 20 MW will start automatically upon sensing a loss of voltage. If it does not, the plant operator will use the EMDs which will also have started automatically. (F. 120, 122). Nevertheless, as a practical matter, it takes but seven minutes for someone from the control room to walk to the gas turbine which could then be started manually. (Tr. 2928).[27]

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[27] Minor and Bridenbaugh also opined, without qualification, that the gas turbine could not withstand the safe shutdown earthquake at Shoreham. (Tr. 2616). This conflicts with the testimony of Professor Meyer, Suffolk County's witness, who testified that the gas turbine is probably capable of withstanding the stipulated safe shutdown earthquake loads. (Tr. 2787). Minor was a member of the panel testifying with Meyer.

b. The EMD Diesel Generators

LILCO has also installed at Shoreham four 2.5 MW deadline blackstart EMD diesel generators. (F. 78). Any one of these diesel generators is sufficient to power two redundant ECCS subsystems, either of which is sufficient to cool the core following operation at up to 5% power. (F. 79). Thus, in most respects the EMD diesel generators are "quadrupally redundant." (Tr. 1155-56). These diesels are routed directly into the plant's 4 KV buses, bypassing both the RSST and the NSST. (F. 78). They start deadline and are ready to accept load within ten minutes. (F. 78). Conservatively, they will be able to power the plant's emergency systems within 30 minutes of a loss of offsite power. (F. 78). Realistically, the process should take only 15 minutes. (F. 78).

Testimony concerning the reliability of the EMDs was presented by five exceptionally qualified witnesses. William Schiffmacher, LILCO's Manager of Electrical Engineering, was responsible for purchasing the EMDs and oversaw the effort to research the reliability of those machines prior to purchase. (Tr. 326-27, 462-63). Thomas Iannuzzi, Manager of Engineering at the Power Systems Division (PSD) of Morrison & Knudsen is responsible for direct supervision of project engineers, designers and document control personnel required to design and

build diesel and turbine generator systems for utility, military and emergency applications. (Tr. 1041-42, 1160-62, 1185-86). Kenneth Lewis, Technical Service Manager of PSD, is responsible for all of PSD's service activities which includes maintenance of EMD diesel generator sets at numerous nuclear facilities. (Tr. 1043-44, 1163-65, 1187). As importantly, Lewis was responsible for servicing the Shoreham EMDs since 1981 when they were owned by New England Power Company. (Tr. 1169). Finally, Staff witnesses Knox and Tomlinson have had extensive experience with EMD power sources, both in the nuclear industry and otherwise. (Tr. 1896-1899, 2338-41). Indeed, Tomlinson testified about his extensive experience with EMD diesel engines on ships when he was with the National Oceanic and Atomspheric Administration. (Tr. 1896-1899).

These competent witnesses testified that EMD diesel engines and generators have been widely used in industry, including nuclear plants. (F. 83, 92). While the EMD diesel generators installed at Shoreham do not strictly comply with all technical requirements for qualified nuclear grade diesels, the engines and the generators on the Shoreham diesels are identical to those in use at nuclear plants. (F. 84, 87). Though auxiliary equipment is different, the system and design parameters are the same. (F. 86). Iannuzzi and Lewis were aware of no catastrophic failures of the type of auxiliary

equipment in use at Shoreham. (F. 86). Their extensive experience with EMD diesel generators makes it likely that they would be aware of any failure that had occurred. And, unlike qualified nuclear diesels necessary for full power operation which must reach their rated speed in a matter of seconds, the EMDs do not have to "fast start." This reduces excessive wear on the engine and reduces stress on the auxiliary package. (F. 87).

Iannuzzi and Lewis, who design, install, test, evaluate and service diesel generators at nuclear sites, described a number of criteria by which they would judge the reliability of diesels. The EMDs at Shoreham acquit themselves well in every category. Their design has been proven through operating history. (F.89-90). The EMD 645E4 engines are widely used and well accepted in industry. (F. 89). Particularly, the engines and generators on the Shoreham EMDs are identical to those in nuclear service at several plants including Sequoya, Watts Bar, Browns Ferry, St. Lucie 1 and 2, Washington Public Power Supply System, Davis Bessie, Nine Mile Point 1, Connecticut Yankee, Beaver Valley, Turkey Point, Surry and others. (F. 89). Thus, the application of the EMDs at Shoreham is consistent with their design and intended purpose for emergency duty and for use as peaking units. (F. 92).

Iannuzzi further testified that PSD has audited EMD's manufacturing process and that EMD has been qualified as a supplier of equipment for PSD's nuclear program. (F. 91). Additionally, personal experience with EMD engines and replacement parts has proven them generally to be manufactured properly and highly reliable. (F. 91, 99).

The maintenance history of the Shoreham units also attests to their reliability. Since 1978, the engines have been maintained under a contract which meets or exceeds the manufacturer's requirements. (F. 93).[28] Though the witnesses acknowledged certain previous maintenance problems, such as cracked cylinder heads and smoking turbochargers, the problems were discovered and corrected. (F. 93; Tr. 1174-75). Most importantly, these witnesses, whose personal knowledge dates back to 1981, knew of no shutdowns for repairs while the EMDs were being used as peaking units. (F. 94).

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[28] The only instance in which recommended maintenance had not been performed concerned the failure to replace the viscous dampers on three of the four units as recommended by the manufacturer. Lewis testified, however, that even a failure of the viscous dampers would not cause the units to shut down. They could run approximately 150 hours after such a failure. Moreover, there is no evidence of any problem with the three original-design viscous dampers still in place. Lewis was not aware of any such damper in the industry that had actually failed. (F. 93).

Likewise, the starting reliability of the EMDs is excellent. The Shoreham EMD diesel generators use an electric starting system. (F. 82, 100). The four units share a common battery. (F. 82). Each of the four units has its own independent starting motors, however. (F. 82). At least two EMD diesel generators in nuclear service use electric starters essentially identical to those on the EMDs at Shoreham. (F. 102). Moreover, in 1967, EMD reported a success rate of 29,136 starts in 29,362 attempts on electric starting units of this model for a 99.23% success rate. (F. 101). The Shoreham diesels have started 279 times out of 279 attempts; though four times they were shut down by the operator.[29] (F. 103). Consequently, the reliability of the EMDs compares favorably to the 92% to 99% industry reliability experience for qualified nuclear diesel generators. (Tr. 2356). [30] Iannuzzi and Lewis concluded that the likelihood that all four diesels will start and operate in an emergency situation is very high and that,

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[29] Three of those times one unit was manually shut down to repair minor difficulties. A fourth time, a single diesel tripped and then automatically restarted. (F. 103). Depending on how these four events are counted, the Shoreham EMDs have a starting reliability in the range of 98% to 100%. (F. 103).

[30] Iannuzzi credibly acknowledged that the added features for fast starting found on qualified nuclear diesel generators might tend to improve their starting reliability. (Tr. 1157-58). At the same time, however, fast starting may cause excessive wear on the diesels' auxiliary package. (F. 87).

therefore, the likelihood that one of the four will start and operate in an emergency situation is virtually assured. (F. 104).

Again, the testimony of Suffolk County's witnesses suffered from a lack of witness qualifications and a failure to consider the system as a whole. That testimony of Eley, Smith, Minor and Bridenbaugh concerning the EMD diesels failed to provide any credible evidence that the EMDs are unreliable and deserves little weight. In contrast to the vast experience with EMD diesels of Iannuzzi, Lewis, Knox and Tomlinson, neither Minor nor Bridenbaugh had any diesel generator experience. Neither had ever been responsible for designing, operating or maintaining a diesel generator. (Tr. 2175-80, 2424, 2427, 2428). While Smith and Eley had experience with marine diesel generators, neither had any experience with EMD diesel generators, TDI diesel generators or any other diesel generator in nuclear service. (Tr. 2419-20, 2422-23).[11]

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[11] Indeed, Smith had done no work concerning this proceeding until approximately June 20. (Tr. 2417). Eley had no opinions concerning the EMD diesels as of June 7. (Tr. 2423). The quick derivation of their opinions prior to the July 16 filing of testimony contrasts sharply with the length of time Eley swore he would need to study the diesels and reach opinions in his Affidavit submitted to this Board on April 24.

As with the 20 MW gas turbine, the main thrust of Suffolk County's witnesses concerning the EMDs was their purported failure to satisfy the single failure criterion. The witnesses listed a number of ways in which the EMDs allegedly were susceptible to a single failure. Yet, on cross-examination, Eley and Smith admitted that the alleged deficiencies did not affect the 20 MW gas turbine. (F. 106). They could not point to a common failure that would incapacitate both the 20 MW gas turbine and the EMD diesel generators and acknowledged that they were postulating double failures, beyond what a qualified onsite power source would have to meet. (Tr. 2460, 2462, 2464, 2466, 2468, 2482, 2484).

Even their attempt to isolate alleged infirmities in the EMD diesel generators was unpersuasive. For example, Eley and Smith opined that the EMDs lacked fire protection. (Tr. 2592). Yet, they had no knowledge of the operating experience with EMDs in the industry and whether any fires had ever been encountered. (Tr. 2419, 2422-23, 2486; see also F. 110). In contrast, Lewis testified that fires are very rare on EMD diesel generators. (Tr. 1183). Additionally, Smith and Eley failed to consider design differences, such as low pressure fuel lines, in the EMDs which make fires less likely. (Tr. 2485-86). Similarly, Smith opined that fire fighting around the EMDs might lead to water being sucked into the air intakes,

thereby preventing operation of the machines. (Tr. 2592-93). Yet, he conceded that these machines had been used as peaking units in New England and were designed to be used outside in all types of inclement weather, including rain storms. (Tr. 2490).

The County's witnesses also expressed concern about the single fuel line serving the EMDs. (Tr. 2588-89). They acknowledged, however, that the EMDs could be fueled through an alternate fill on the 402 engine. (Tr. 2476). Moreover, they expressed concern about turbochargers on EMD diesels. (Tr. 2611-12). On cross-examination, they admitted that the turbocharger documents on which they had relied discussed marine turbochargers. (Tr. 2519-23). They further acknowledged that the problem with turbochargers arose when the diesel engines were lightly loaded, thus causing excessive wear on the gear train driving the turbochargers at lighter loads. (Tr. 2520-21). If the EMD diesel generators are tested in excess of 50% load, as is required by SSER 6, there will be no threat to the turbochargers. (F. 97).

Smith and Eley further opined that the lack of control room alarms and monitors for the EMDs might affect their reliability. (Tr. 2600, 2605). Nevertheless, they said the TDI diesels would not be shut down in an emergency even if

an alarm sounded. (Tr. 2498). They did not know whether the EMDs would be run in an emergency despite alarms. (Tr. 2498). They further acknowledged that the lack of alarms on the EMD diesels would not have any affect on the operation of the 20 MW gas turbine. (Tr. 2500). And, most importantly, these EMD diesel generators had been run unattended by New England Power Company. (Tr. 2490). At least since 1981, the EMDs had experienced no unscheduled shutdowns. (F. 94). Obviously, therefore, the lack of alarms is not a significant concern.

Another of the concerns expressed in Suffolk County's prefiled testimony was the necessity for operators manually to manage the load of the EMDs from the EMD control cubicle. (Tr. 2605-06). Yet, the EMDs have automatic load adjusting systems. If one of the machines went into reverse current and tripped off, the other machine would pick up load being carried from the shutdown diesel. (F. 114).

Nor was the concern of Eley and Smith about the maintenance records of these machines convincing. Prior to this consulting job for Suffolk County, neither Eley nor Smith had experience in maintaining or operating EMD diesels. (Tr. 2419, 2422). Moreover, their testimony was based on a few isolated instances prior to 1981 when Lewis first gained personal knowledge of the diesels. In any event, given the

inspection these machines have undergone, the surveillance testing that will be required and their limited anticipated use, there can be no serious concerns about their reliability.

Finally, Eley and Smith expressed some concern about testing procedures. (Tr. 2597-99). When queried, however, they acknowledged that the testing requirements imposed by the NRC Staff in SSER 6 include all facets of the EMDs' operation. (Tr. 2495). They had no knowledge of testing requirements for qualified nuclear diesels and, therefore, could not compare the proposed EMD testing. (Tr. 2495).

c. Procedures

As demonstrated above, the EMD diesel generators and the 20 MW gas turbine have sufficient capacity, capability and reliability. The evidence also proved that there are adequate procedures for the use of these supplemental offsite power sources. A loss of offsite power will cause both of them to start, as well as the TDI diesel generators. (F. 120). If the TDI diesel generators do not provide power, the plant operator will then contact the system operator to determine the nature of the loss of offsite power and the prognosis for restoring power to the site. (F. 122). LILCO's procedures then require the plant operator to utilize power from the gas turbine if it

has come on line as expected within two to three minutes. (F. 122). If the gas turbine has not come on line, the operator follows the procedure for utilizing the EMD diesels which will have automatically started and synchronized. (F. 122).

Importantly, the NRC Staff has reviewed LILCO's procedures. James Clifford testified that they are feasible and suggested changes where needed. (F. 119). Obviously, those changes will have to be implemented by LILCO under the Staff's supervision.[32]

In addition to formulating feasible procedures,[33] LILCO has trained its personnel concerning the use of the

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[32] During cross examination, Suffolk County attacked Clifford's qualifications because he did not know the reasons for certain steps in the procedures. (Tr. 1823-30). Such knowledge is not critical to his testimony. Having been presented with the procedures, Clifford merely analyzed their feasibility from an operational standpoint given the conditions then existing. He found them to be feasible with the recommended changes. (F. 119). The technical adequacy of LILCO's proposed use of the enhanced power sources was analyzed by Staff witnesses Knox and Tomlinson. (Tr. 2351-53).

[33] In addition to plant procedures, there are also written procedures for the LILCO system operator to restore power to Shoreham. (F. 121). There is no need, however, to establish formal, detailed procedures since the system operator has been directed that his first priority is to restore power to Shoreham. He will then route power to Shoreham through the fastest and best means available to him and will do so based on the circumstances facing him in the event of an outage. (F. 121). Such routing of power is a routine process for the system operator. (Tr. 504).

supplemental power sources. (F. 126). Training has been provided and will continue to all six operating crews, consisting of a description of the power sources, training on procedures and a walk through. (F. 126).

Supplementing such training, on July 2, 1984, tests were conducted and witnessed by NRC Staff personnel and Suffolk County personnel to demonstrate the procedures to restore power to emergency loads using the EMD diesels and the 20 MW gas turbine. All four diesels started on loss of power. Despite minor problems with one diesel's failure to synchronize, two RHR pumps were started and operated at rated flow conditions throughout the demonstration.[34] (F. 127). Rated flow on one RHR pump was achieved in 8 minutes and 12 seconds and an another within 9 minutes, well within the 30-minute acceptance criterion. (F. 127). Similarly, the gas turbine performed as expected. (F. 129). Its output breaker closed in 2 minutes and 31 seconds after its start signal and an RHR pump was at rated flow within 3 minutes and 50 seconds of the loss of power. (F. 127).

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[34] Two minor modifications to the EMDs have been made to eliminate the possibility of a trip as a result of resetting a unit fault as happened during the July 2 demonstration. These modifications had been identified prior to the demonstration but scheduled for implementation after the demonstration. (F. 128).

In sum, the evidence establishes conclusively that LILCO's sources of AC power have the capacity, capability and reliability to provide AC power within the times necessary. There is extremely high assurance that AC power will be available from LILCO's normal offsite power system, the 20 MW gas turbine or the EMD diesels -- most likely from all of these sources. As a result, the limits specified in 10 CFR § 50.46 will not be exceeded and operation of the plant will be as safe as it would have been with qualified onsite diesel generators.

3. Seismic Resistance

Much was said about the resistance of these AC power sources to the safe shutdown earthquake (SSE). Yet, as the Staff's witnesses testified without challenge, it is not necessary to postulate the simultaneous occurrence of a LOCA and an earthquake. (F. 141). The plant's coolant piping is designed to withstand the SSE. Since an earthquake should not, therefore, cause a LOCA, the two events are independent. The probability that both will occur simultaneously is simply too remote. (F. 141).

Absent a LOCA, more than 30 days is available to restore AC power. (F. 137). During that 30 days, there is substantial likelihood that LILCO could repair its AC power

sources.[35] For example, LILCO could restore a mile of the 69 KV transmission line in 24 hours. (F. 139). Spare parts for the RSST and NSST are available on site and entire transformers could be completely replaced within several days. (F. 139). Repair of portions of transformers would take much less time. For example, six insulators could be replaced within four to six hours. (F. 139).

Moreover, the NRC has determined, based upon discussions with the Army Corps of Engineers and with FEMA, that an additional source of AC power could be available from the Army's nontactical generator program. (F. 138). In short, there is substantial assurance that power would be available within 30 days either from an alternate source or by repairing one of LILCO's many sources. As a result, the seismic resistance of any of LILCO's AC power sources is not a material issue.

Nevertheless, the evidence showed that the EMD diesels and, to some extent, the 20 MW gas turbine, have substantial seismic resistance. The manufacturer of the 20 MW

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[35] While earthquakes have caused damage to some equipment in substations, transmission systems have fared well under seismic conditions. (Tr. 433, 444-45). In fact, NRC research has shown that it is unlikely that an earthquake would cause a complete loss of AC power. (Tr. 1894-95).

gas turbine has provided assurance that the machine would remain structurally sound during a design basis seismic event at Shoreham and would be available after the event to perform its desired function. (F. 143). Suffolk County witness Meyer gave credence to these assurances, though he performed no independent analysis. (Tr. 2787).

Additionally, based on studies by Ahmed Meligi of Sargent & Lundy and Robert Wiesel and John Christian of Stone & Webster, it has been established that the Shoreham EMD diesel generators themselves can withstand and remain operable following the loads associated with a SSE. (F. 145-48). Similarly, analysis demonstrated that the support structure for the diesel engines would prevent sliding or overturning during the SSE. (F. 150-51). The switchgear cubicle for the EMDs could resist sliding or overturning at a ground input of up to 0.13g. (F. 152). And, soils around the EMDs can withstand up to 0.13g without liquefaction. [36] (F. 154). Suffolk County's seismic witnesses, Meyer and Roesset, agreed with these analyses concerning the EMD diesels. (Tr. 2793-94).

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[36] Christian pointed out that this does not mean that liquefaction will occur above 0.13g. It only means that liquefaction cannot be predicted with confidence not to occur. (F. 154).

The ability of the 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. (F. 155). Moreover, although Shoreham uses a safe shutdown earthquake of 0.2g, the procedures now set forth in 10 CFR Part 100, Appendix A for determining design basis earthquakes, would only require an SSE of 0.13g. (F. 155). In other words, if the NRC's current 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.[37]

III. EXIGENT CIRCUMSTANCES

The Commission's May 16 Order directed that LILCO show exigent circumstances favoring the granting of an exemption. Footnote 3 of the Order explained that requirement by stating that "[a] finding of exceptional circumstances is a discretionary administrative finding which governs the availability of an exemption." Commission Order at 2-3. The

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[37] In the event of an earthquake affecting the normal switchgear room, LILCO would also be able to employ the alternate procedure to tie in the EMDs directly to an emergency switchgear room. As stated by William Schiffmacher, this routine alternate tie-in has been conceptually designed and will be available by the time Phase III commences. (F. 156-57).

Commission then instructed this Board to take into account "the equities of each situation." Commission Order at 2-3. It further suggested what equities ought to be considered:

> 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 and the safety significance of the issues involved.

Commission Order at 2-3.

Each of these "equities" weighs heavily in favor of granting the requested exemption.

A. Stage of the Facility's Life

The Shoreham plant is complete and ready for fuel load.[38] According to the uncontradicted testimony of William

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[38] The only testimony about incomplete items concerned matters not needed until Phases III and IV when AC power actually will be required. For example, the alternate tie-in for the EMD diesel generators and emergency switchgear room has not yet been completed. (F. 157). William Schiffmacher testified, however, that this is a routine tie-in which could be completed within four weeks of granting a license. (F. 157, 160). Wayne Hodges of the NRC Staff also testified that some modifications to the HPCI system were now in progress to improve its seismic resistance. (F. 161). Phase III of the low power test program is the earliest time when the HPCI system would be needed for core cooling.

Gunther, the final pre-fuel load checks could be completed within two to three weeks of granting a low power license. (F. 158). Shoreham is, therefore, ready to move forward to the next logical step, that is, low power testing.

B. Financial or Economic Hardships

Anthony Nozzolillo, LILCO's Manager of Financial Analysis and Planning Department, established without contradiction that LILCO now suffers financial hardships which might be alleviated somewhat by the granting of this exemption.[39] (F. 166). When cross-examined by Suffolk County's counsel, Nozzolillo described some of LILCO's financial problems. Thus, he did not know if LILCO could borrow $378,000,000 in today's market because of its financial condition. (Tr. 1377). Similarly, he did not know if LILCO would be able to pay a dividend on its common stock in 1985. (Tr. 1378). He conceded that various rating services have decreased the ratings of LILCO's bonds. (F. 163). Similarly, LILCO has stated that it has no access to external funds, that it may suffer a cash

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[39] Though the conclusions reached by Richard Kessel, head of the Consumer Protection Board of New York State, were not material to this proceeding, it is clear from those portions of his testimony which were not stricken that he, too, believed that LILCO suffers financial hardships. (See Tr. 2914, 2916).

shortfall when a September 1 bond payment is due and that it has ceased making payments on Nine Mile Point Unit Two. (Tr. 1379-81, 1385). As stated by Nozzolillo, LILCO's ability to raise additional cash is dependent on its access to outside markets which, in turn, is dependent upon resolution of the Shoreham issue. (F. 164-166).

Nozzolillo then unequivocally observed that the granting of this exemption might signal the financial markets that the Shoreham issue was beginning to be resolved:

> Q: Do you have any opinion as to whether the granting of this exemption would affect the uncertainties concerning LILCO's financial future?
>
> A: I tried to state it before. Obviously, the sooner the financial market gets a signal that the Shoreham issue has been resolved, the sooner the Company would gain access to the capital markets, in my opinion. So it would be a positive signal to the markets out there that the Shoreham issue has been resolved.
>
> So the sooner we get it, the better it is financially.
>
> Q: Well, can you relate that more specifically to the request for exemption which is pending before this Licensing Board in this proceeding? In other words, do you think the granting of this exemption would send that kind of signal?
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> A: Yes. I would say if the three month figure is correct, that would send them that kind of a signal.

(Tr. 1395; F. 165, 166).

C. Internal Inconsistencies in the Regulations

The Commission recognized the public's, LILCO's and the NRC's interest in promoting rational regulation. Thus, inconsistencies in the NRC's regulations play a role in balancing the equities attendant to a determination of exigent circumstances. Here is a case in which the regulations are inconsistent and the treatment of the applicant under the regulations is inconsistent from the NRC's treatment of other licensees.

A lengthy discourse is unnecessary concerning the inconsistency between 10 CFR § 50.57(c) providing for interim low power licensing and the General Design Criteria which do not expressly permit a consideration of the operating conditions. The NRC Staff initially asserted that the General Design Criteria, and specifically GDC 17, should be harmonized with § 50.57(c). This Board agreed with the need to harmonize the regulations which were otherwise ambiguous and inconsistent. Thus, in its Memorandum and Order Scheduling Hearing on LILCO's Supplemental Motion for Low-Power Operating License of April 6, 1984, this Board allowed LILCO to go forward pursuant to its Supplemental Motion for Low Power

Operating License. Obviously, the Commission later ruled that GDC 17 was not to be interpreted in view of the operating level proposed and that, at least with respect to Phases III and IV, LILCO would need an exemption to test at low power without qualified onsite diesel generators. Despite the May 16 Order, the regulations remain ambiguous and inconsistent. As importantly, their application is pointless here where strict interpretation of GDC 17 has been shown to be unnecessary to protect public health and safety.[40]

Additionally, strict application of GDC 17 and the treatment of LILCO's exemption request may be inconsistent with the treatment normally afforded such requests. LILCO is advised and believes that the NRC processes approximately 80 exemption requests a year. Generally, petitioners for those exemptions are not required to satisfy the exigent circumstances requirement.[41] Many requests for deferral of the

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[40] Indeed, as this Board noted during the evidentiary hearings and during closing arguments on August 16, there has been some public suggestion that the situation created by the May 16 Order is so confused that the NRC has limited application of that Order to Shoreham. The Staff apparently agrees. (Tr. 3052).

[41] A review of notices of exemptions shows a lack of any discussion of public interest considerations or exigent circumstances. E.g., Consumers Power Co. (Big Rock Point Plant), Exemption, 49 Fed. Reg. 11269, 30611, 30613 (1984); Boston Edison (Pilgrim Nuclear Power Station), Exemption, 49

(footnote continued)

enforcement of a particular general design criterion or other requirements are not even treated as exemptions, but are handled as license conditions. These so-called "schedule exemptions" are no different from that requested by LILCO. LILCO seeks nothing more than to defer full compliance with GDC 17 until after low power testing.

Further, this unique application of an ultra-strict exemption standard is not warranted in view of the first-time pronouncement by the Commission that the General Design Criteria are not to be harmonized with § 50.57(c) allowing low power licensing and in view of the extensive length of these proceedings. As Brian McCaffrey testified, this licensing proceeding has been under way for more than eight years. (F. 178). Formal ASLB hearings commenced on May 4, 1982. (F. 182). As of June, 1984, there were a total of nearly 15,000 pages of written testimony and 400 exhibits in these proceedings. (F. 185). There have been over 180 days of prehearing conferences and hearings, with more than 310

(footnote continued)

Fed. Reg. 28483 (1984); Nebraska Public Power District (Cooper Nuclear Station), Exemption, 49 Fed. Reg. 28487 (1984); Toledo Edison Co. and The Cleveland Electric Illuminating Co. (Davis-Besse Nuclear Power Station, Unit No. 1), Exemption, 49 Fed. Reg. 31352 (1984). Apparently, the prevailing practice has been to grant an exemption where it poses no undue risk to the public health and safety.

witnesses taking the stand. There have been more than 34,000 pages of transcripts and 2,900 pages of decisions. (F. 185). To date, the licensing process has cost LILCO more than $33,000,000. (F. 185).

Given these costs, given the inconsistencies in the regulations and given the unique treatment apparently being afforded LILCO, the equities weigh heavily in terms of granting the requested exemption since it has been proved that there are no adverse health and safety ramifications.[42]

D. LILCO's Good Faith Effort to Comply with GDC 17

There can be little doubt, both from the evidence and from common sense, that LILCO has made a good faith effort to comply with GDC 17. Indeed, LILCO seeks here only a limited temporary exemption. For full power operation, it will comply with GDC 17.

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[42] For example, both Catawba and Grand Gulf have unresolved questions about TDI diesel generators and have received low power and full power licenses, respectively. See Catawba Nuclear Station, Unit No. 1 Issuance of Facility Operating License, 49 Fed. Reg. 30611 (1984); "NRC Approves Grand Gulf-1 for Full Power Operation," Nucleonics Week, Vol. 25, No. 31 (Aug. 2, 1984).

Brian McCaffrey testified at length concerning the extent of LILCO's efforts to comply with GDC 17. In general, LILCO purchased diesels from TDI based upon specifications designed to comply with GDC 17. (F. 169). When problems with those TDI diesels were discovered, extensive efforts were undertaken to ensure that the diesels would perform reliably. (F. 170). In March, 1983, LILCO formed its Diesel Generator Operational Review Program to review problems. (F. 170). After the crankshaft failure in August, 1983, LILCO quickly engaged Failure Analysis Associates for an extensive evaluation of the diesels. (F. 171). In November 1983, LILCO established a comprehensive diesel recovery program, including disassembly, inspection, repair and reassembly of the diesels, failure analysis, establishment of a Design Review and Quality Revalidation Program (DRQR) and expanded qualification testing. (F. 172-173). LILCO subsequently helped form the TDI Owners Group and assumed a leadership role. (F. 174). Thus, LILCO has gone to great lengths to ensure that its TDI diesel generators are qualified and comply with GDC 17.

In a second major effort to comply with GDC 17, LILCO has undertaken, as a precaution, to procure and install at Shoreham three Colt Industries diesel generators. (F. 175). All three Colt diesels have been delivered to the site. (F. 176). Engineering work for their installation is essentially

complete and construction is well under way. (F. 176). The total cost for this effort is now estimated at approximately $93,000,000. (F. 177).

And, finally, the Board should not overlook LILCO's efforts to assure that adequate AC power for core cooling will be available during low power testing. LILCO has purchased and installed the EMD diesel generators at the Shoreham site and has also provided the 20 MW gas turbine at the Shoreham site. (F. 72, 78).

The Intervenors' attempted refutation of LILCO's claim of good-faith effort consisted largely of cross-examination questioning isolated decisions or procedures implemented by LILCO. This type of hindsight analysis, oblivious to the extensive and expensive effort to provide adequate onsite diesel generators, proves nothing about LILCO's good faith.[43] "Good faith" does not mean "perfect." It is virtually nonsensical to believe that LILCO expended the sums

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[43] In closing argument, Suffolk County's counsel indicated that there was nothing "extraordinary" about LILCO's efforts to comply with GDC 17. (Tr. 3071-74). The Commission's May 16 Order did not require that the applicant exhibit extraordinary efforts to comply with the regulation, only "good faith" efforts. Nevertheless, given LILCO's purchase of two separate diesel generator sets for full power, the complete disassembly, inspection, failure analysis and reassembly of one of those sets, and the purchase of an additional diesel generator set for use at low power, its effort in fact is extraordinary.

at issue here without any good faith intent to comply with the regulation.

E. Public Interest in Adherence to Regulations

The Commission directed that one of the equities to be considered was the public interest in adherence to the Commission's regulations. There has been no competent evidence that the public has any interest in this case in adherence to the Commission's regulations. To the contrary, the evidence has established that operation as proposed by LILCO will be safe and will pose no health risk and that the public will benefit if the exemption is granted.

During closing argument, Suffolk County suggested that its mere presence opposing the granting of the exemption, along with that of New York State, indicates the public interest in adherence to the regulations. (Tr. 3056-57). Yet, Suffolk County and New York State are here as parties, not as the finder of fact. They simply have presented no evidence indicating why the exemption would be contrary to the public interest.

The only admitted testimony even attempting to address any "public interest" reasons for the Intervenors' opposition to the granting of the exemption came from Richard Kessel. Kessel opined that it was not in the public interest to permit contamination of Shoreham before uncertainties surrounding its future operation are resolved. (Tr. 2912). Yet, this Board and the Commission have repeatedly ruled that such a consideration is not germane. E.g., Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1) CLI-84-9, 19 NRC ___ (June 6, 1984); Long Island Lighting Company, (Shoreham Nuclear Power Station, Unit 1) CLI-83-17, 17 NRC 1032 (1983); Tr. 2145-2148. Second, Kessel opined that operation of Shoreham will result in a decline of the quality of LILCO's service to its customers because of its financial condition. (Tr. 2913-14). Yet, Kessel established no competence to discuss the quality of service and this Board ruled earlier in the proceeding that the decline in the quality of service, even if it existed, was not a material consideration. (Tr. 2146). Moreover, Kessel's opinion in this regard is contingent upon his belief that acceleration of low power testing will increase its costs, a conclusion for which he knows no underlying facts and has no expertise. (Tr. 2914). Finally, Kessel opined that it was "inconsistent with the public interest" to allow a financially weakened utility to

operate a nuclear facility. (Tr. 2916). Again, however, this Board and the Commission have repeatedly held that financial qualifications for operation are not relevant. E.g., Order Regarding Discovery Rulings, June 27, 1984. Indeed, the Brenner Board recently issued an Order denying Suffolk County's request for a waiver to allow admission of a contention concerning financial qualifications. See Memorandum and Order Denying Suffolk County and the State of New York Petition for Exception from Regulations Precluding Financial Qualifications Contention and Motion for Certification to the Commission, Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), LBP-84-30 (Aug. 13, 1984).

F. Safety Significance of the Issues Involved

With respect to Phases I and II of the proposed low power testing, this Board has already conclusively found that no AC power is needed to provide core cooling in the event of a postulated accident or transient. (July 24 Order). No diesel generators are, therefore, needed. Consequently, there is absolutely no safety significance to the requested exemption. Indeed, the language of the May 16 Order leaves considerable ambiguity as to whether an exemption is even required for these two phases of operation.

For Phases III and IV, the availability of AC power is a significant safety concern. Fortunately, as discussed above, this concern has been resolved and it has been proved that operation of the plant as proposed by LILCO during Phases III and IV will be safe and as safe as operation with qualified onsite diesel generators. Significantly, no witness suggested that operation of Shoreham at low power under the proposed conditions presents any undue risk to the public. The only matter in dispute is whether the "as safe as" standard is met. In sum, while theoretically compliance with GDC 17 during Phase III and IV presents a significant safety issue, factually there is no significant safety concern given LILCO's enhanced offsite power system.

IV. PUBLIC INTEREST IN GRANTING THE EXEMPTION

Although not specifically addressed in the Commission's May 16 Order, 10 CFR § 50.12(a) also authorizes consideration of whether the requested exemption is "otherwise in the public interest." In addition to the exigent circumstances discussed above, the evidence shows three other areas in which the public might be benefited by the granting of this exemption. The first, increased training, results from the additional time which will be available for conducting low

power testing. (F. 186-190). The others, reduction of dependence on foreign oil and economic benefits, result from the potential that early low power testing may result in earlier commercial operation. (F. 191-217). Although there are clearly uncertainties as to whether these latter two benefits will accrue to the public, there is no corresponding adverse consequence. Therefore, the possibility of gaining these benefits weighs in the public interest.

A. Additional Training Benefits

As William Gunther testified, "[b]eyond the normal training benefits gained during low power testing, LILCO intends to give the operators additional training during the low power test program." (Tr. 846; F. 186). For example, LILCO will repeat operations during Phase II to allow each shift to perform various activities. (F. 188). Also, LILCO will have sufficient time to allow all reactor operators to perform many of their ten annual reactivity control manipulations. (F. 187). And, all crews will have the experience of taking the reactor critical (F. 188) and additional reactor heatups will be performed at the conclusion of Phase IV. (F. 189).

Moreover, LILCO will have additional flexibility in its low power testing as a result of the more relaxed schedule. (F. 190). Normally, low power testing would be conducted as the first part of the power ascension program leading to commercial operation. Here, there will be no push to commercial operation; testing above 5% power must await completion of TDI litigation and emergency planning litigation. Thus, if additional training is needed, it can be accomplished without impinging upon the commercial operation date. Similarly, if problems are uncovered during testing, they can be resolved thoroughly, without time pressure and without delaying commercial operation. Such opportunity obviously is in the public interest.

B. Earlier Reduction
of Dependence on Foreign Oil

If low power testing is completed earlier as a result of this exemption commercial operation might be achieved at least three months earlier. Reaching commercial operation earlier would allow earlier displacement of oil-fired generating capacity. (F. 207). This, in turn, would allow an earlier reduction of LILCO's dependence on foreign oil, as well as a fuel savings of approximately $50,000,000 over the three-month period. (F. 217).[44]

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[44] Anthony Nozzolillo testified that the savings in oil over the three-month period of commercial operation will be

(footnote continued)

There can be little doubt that it is important to reduce dependence on foreign oil. The Board can almost take judicial notice that this is a national policy. (See F. 204). Richard Kessel, head of the New York State Consumer Protection Board, confirmed that a primary objective of the New York State Energy Master Plan is to reduce the State's dependence on foreign oil. (F. 203). Indeed, Kessel went to great lengths to explain the measures which New York State has implemented to try to reduce its dependence on foreign oil. (Tr. 2889-91; F. 203).

Yet, LILCO remains heavily dependent on foreign oil. All of LILCO's power plants now in operation are oil-fired.[45] (F. 191). Approximately 90% of the oil burned at these plants comes from foreign sources. (F. 193). As Cornelius Szabo

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(footnote continued)

approximately $50,000,000. (F. 217). This evidence was not refuted. Suffolk County witnesses Madan and Dirmeier attempted to offset this savings by stating that the plant would be taken out of service three months earlier if it began commercial operation three months earlier and, therefore, there would be a three month earlier return to dependence on oil in 2015. Their testimony cannot be given much weight, however, for the reasons discussed below at pp. 65-67.

[45] Natural gas can be burned when available during the warmer months at the E.F. Barrett and Glenwood steam generator units and at E.F. Barrett internal combusion units. The total capacity of all dual-fired units, however, is less than one-quarter of the total LILCO system capacity. (F. 191).

explained, even the availability and price of the domestic oil, which is largely low sulfur residual oil, is affected by events related to foreign oil. (F. 194-195). The United States has little leverage in controlling world oil markets and in insulating itself from disruptions in the world oil markets. (F. 194). Moreover, the dependence on foreign oil is likely to increase since there has been a trend accelerating since the beginning of this decade to convert residual oil to other higher valued products, such as gasoline and diesel oil. (F. 192, 194).

Once Shoreham goes into commercial operation, it will displace approximately seven million barrels of oil a year, assuming that no gas is available and no power is being generated from Nine Mile Point 2. (F. 205). Otherwise, the savings will be in the neighborhood of four to five million barrels of oil a year. (F. 205). The availability and price of this oil is subject to great uncertainty. While it is difficult to predict what events will occur in 1985, the public -- LILCO's customers, the State of New York, and the Nation as whole -- will benefit by insulating themselves earlier from these uncertainties.

C. Economic Benefit to LILCO's Customers

The evidence also established that LILCO's customers might receive an economic benefit in terms of present worth of revenue requirements if Shoreham reaches commercial operation three months earlier as a result of the requested exemption.[46] (F. 209). This benefit will be on the order of $8,000,000 to $45,000,000, assuming that Shoreham receives conventional rate treatment.[47] (F. 210). If, on the other hand, a rate moderation plan were to be effected, the $8,000,000 benefit would increase to approximately $45,000,000. (F. 211).

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[46] The economic benefit was computed in terms of present worth of revenue requirements because in analyzing expenditures that occur in different years, the only method of comparison is to use a common period or common point. And, under normal circumstances, revenue requirements determine the customers' rates. (F. 212).

[47] LILCO's economic benefit analysis compared a July 1, 1985 commercial operation with a commercial operation of October 1, 1985. (F. 213). The range of benefits results from analyzing two different synchronization dates in connection with the July 1, 1985 commercial operation date. (F. 214). If the plant is synchronized for federal income tax purposes in 1984, the benefit, assuming conventional ratemaking, would be in the neighborhood of $45,000,000. (F. 214). If the plant is synchonized after December 31, 1984, the benefit will be in the $8,000,000 range. (F. 214). Even if these dates were changed, the savings resulting from a three-month spread would be on the same order of magnitude. (F. 213).

The elements comprising the economic benefit include fuel savings and a lower total investment. (F. 216). As discussed above, a three-month earlier commercial operation will result in a $50,000,000 savings in fuel, or $16.7 million per month. (F. 217). Also, the sooner the plant reaches commercial operation, the lower the ultimate cost of the facility. (F. 216). A lower total investment translates into lower annual revenue requirements for return on net investment, depreciation, associated federal income taxes and gross revenue taxes, all of which comprise the revenue requirements on which rates are set. (F. 216).

Suffolk County's economic witnesses, Madan and Dirmeier, testified at length.[48] They performed no independent economic analysis, expressed no independent opinions and had no independent knowledge of the facts underlying Nozzolillo's analysis. (Tr. 1967-68). Instead, they attempted to "test the assumptions or . . . conclusions" reached by Nozzolillo. (Tr. 1967). Upon cross-examination, it became clear that these witnesses had not addressed Nozzolillo's analysis in fact, but had addressed an earlier computer run upon which LILCO's evidence was not based. Accordingly, Madan's and Dirmeier's putative evidence had no relevance.

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[48] Their prefiled testimony was never moved into evidence, never admitted and not bound into the transcript of these proceedings.

Essentially, Madan and Dirmeier disagreed with the postulated $8,000,000 to $45,000,000 benefit in three respects. First, they believed that synchronization for tax purposes was unlikely to occur in 1984. (Tr. 1930, 1983-84). It is true that Shoreham will not achieve synchronization during low power testing when the plant is not connected to the grid. Nevertheless, unpredictability in other Shoreham licensing proceedings make a 1984 synchronization date possible, though uncertain. (F. 215).

Second, Suffolk County's witnesses claimed there was a $28,000,000 "mismatch" in Nozzolillo's analysis. (Tr. 1932-34, 1983-84, 1992-2004). Solely based on that erroneous perception, they contended that early commercial operation would lead to public detriment. Yet, on cross-examination, it appeared that the County's witnesses had, among other matters, made a substantial mistake in examining the pertinent computer printouts. They contended that the three-month difference in pre-commercial operation investment in Shoreham did not equal the three-month difference in post-commercial operation expenditures, but should have. (Tr. 1997). Before commercial operation, all expenditures, including expenses and capital items, are capitalized. (Tr. 1998, 2002). After commercial operation, however, expenses and capital investment are treated differently. Expenses may be recovered immediately in the rate

base, while capital expenditures are capitalized. (Tr. 1998). In their analysis, Madan and Dirmeier attempted to compare total capitalization before commercial operation solely with post-commercial operation expenses. (Tr. 2006-13). As Dirmeier conceded, their analysis failed to take into account "bricks and mortar" after commercial operation.[49] (Tr. 2007). This failure occurred despite their direct testimony that Madan and Dirmeier had studied the appropriate computer run and that it did not change their opinion. (Tr. 2012, 2032).

Similarly, Dirmeier and Madan did not agree that the remainder of the difference could be attributable to an actual difference in pre- and post-commercial operation expenditures. (Tr. 2041-53). Yet, they had no independent facts upon which to base this opinion. As importantly, Madan expressed the incredible opinion that there would be no change in the level of pre- and post-commercial operation expenses. (Tr. 2046-47). He did not believe, for example, that consultant fees might be reduced after commercial operation or that the longer LILCO

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[49] Though Dirmeier conceded this error in analysis he tried to escape the impact of his mistake by contending that perhaps some of the other numbers were different. (Tr. 2012-22). Nevertheless, when cross-examined about all of the other numbers used in his comparison and Nozzolillo's analysis, Dirmeier acknowledged that they were identical. (Tr. 2018-20). He had simply failed to study carefully the computer run on which Nozzolillo's analysis was based.

kept consultants at the plant, the more expensive their bills would be. (Tr. 2047-48). Perhaps the most incredible of his answers came when he was asked whether his opinion would apply to the length of licensing proceedings. Madan replied that the cost of licensing proceedings would be the same regardless of their length. (Tr. 2052-53). Such a view does not credibly refute LILCO's business records, upon which Nozzolillo based his analysis, showing a difference between pre- and post-commercial operation expenses.

Third, Madan and Dirmeier postulated that Nozzolillo should have analyzed the years 2000 to 2015. (Tr. 1933-34, 1983-84). Yet, an analysis of their testimony indicates that those years would have added approximately $6,200,000 to the benefit postulated by LILCO. Madan and Dirmeier admitted that lower revenue requirements for the years 2000 to 2015 would be worth $14,000,000 in present worth benefits to the ratepayers. (Tr. 2055-56). They opined that this extra $14,000,000 benefit would be offset by an increase in fuel costs at the end of Shoreham's useful life. Yet, this opinion was based on several improper assumptions. In the first place, it unreasonably assumed that Shoreham will be replaced in the year 2015 by an oil-burning facility of the same efficiency as those now used by LILCO. (See Tr. 2060-61). It is now unlawful to construct base load oil-fired generation plants. (F. 208; Tr. 2062).

Next, the witnesses blindly assumed that the plant would be in service for the same number of hours regardless of when it went into operation. (See Tr. 2057-58). Yet, neither witness had any experience in decisionmaking as to when plants would be taken out of service. They could not know, for example, whether a utility's practice would be to remove plants from service during off-peak times. (Tr. 1922). Finally, to determine the fuel offset, Suffolk County's witnesses deceptively assumed that the cost of oil would increase at a rate of 13% a year. (Tr. 2065-66). Nozzolillo's analysis did not, however, increase other expenses at the rate of 13% per year. Instead, it used a 6% inflation rate. (Tr. 2066-67). Using the formula conceded by Madan and Dirmeier as proper to compute the fuel offset using a 6 1/2% escalation rate, (Tr. 2069-70).[50] the total fuel offset would be only $7.8 million, resulting in a $6,200,000 net benefit for the years 2000-2015.

In sum, millions of dollars of economic benefit will accrue to LILCO's customers if early commercial operation occurs because this exemption is granted. That is a public interest consideration which should not be overlooked.

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[50] Though LILCO used a 6% escalation rate, Madan and Dirmeier assumed it was 6 1/2% during their cross-examination. (Tr. 2067).

V. CONCLUSION

Since the evidence establishes that operation of Shoreham as proposed by LILCO during Phases I through IV of low power testing will be as safe as operation of a plant with qualified diesel generators at 5% power, since the equities weigh heavily in favor of granting this exemption, thus satisfying the exigent circumstances requirement, and since there are several public interest considerations warranting that the exemption be granted, this Board should issue a decision as soon as practicable (1) authorizing issuance of a license for Phases I and II of low power testing, and (2) finding that a license to conduct Phases III and IV of the proposed low power testing should be issued as soon as any proper security contentions are resolved favorably to LILCO.

With respect to Phases I and II, it has been established conclusively that no AC power is needed. The AC power sources provided by LILCO are not needed during these phases. Thus, security of those power sources is not an issue awaiting resolution and there is no reason to forestall issuance of a Phase I and II license pending possibly lengthy security litigation.[51]

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[51] "In a similar situation to that posed by LILCO, the Staff recently granted an exemption from GDC 17 to Duke Power Company

(footnote continued)

With respect to Phases III and IV, the Board should issue a decision finding in LILCO's favor and recommending the issuance of a license subject to the resolution of security contentions, if any. While LILCO does not agree that any security contentions should be admitted, it recognizes that resolution of that question must be addressed before the issuance of a license. Nevertheless, this process will be considerably expedited if the Board will issue a decision on all issues now before it, thus allowing the review of that decision to be completed concurrently with any necessary security litigation.

Respectfully submitted,

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DATED: August 31, 1984

(footnote continued)

to permit fuel loading and precriticality testing at the Catawba facility." NRC Staff Response to LILCO's Motion for Directed Certification of the Licensing Board's Order Ruling on LILCO's Motions for Summary Disposition of Phases I and II, August 17, 1984 at p. 5 n.4.