NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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May 8, 1984

Docket No. 50-423
B11166

Director of Nuclear Reactor Regulation
Attn. Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) B. J. Youngblood to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit No. 3, dated January 16, 1984.

(2) B. J. Youngblood to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit No. 3, dated May 31, 1983.

(3) W. G. Counsil to B. J. Youngblood, Submittal of Revised Responses to PSB Mechanical Series Questions, dated April 6, 1984.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Summary/Submittal of Revised Responses to PSB Mechanical Series Questions

Enclosure 3 of Reference (1) requested additional information on many of the responses to questions asked in Reference (2). Reference (3) provided a portion of the requested additional information. Attached is a status of all requested information within Enclosure 3 of Reference (1) as discussed during our April 25, 1984 meeting with the PSB Mechanical reviewer. Additionally, revised responses, as indicated within the status listing, are attached along with any corresponding FSAR back-up pages. The remaining revised responses will be submitted the week of May 7, 1984.

If you have any questions, please contact our licensing representative directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL
By Northeast Nuclear Energy Company Their Agent

W. G. Counsil
Senior Vice President

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STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

Status of PSB Mechanical Requests for Additional Information

Question	Status	Remarks
430.57	Closed	Submitted in Reference 1(1)
430.58	Closed	Attached
430.59	Closed	Attached
430.60	Open	Will be submitted the week of May 7, 1984
430.61	Closed	Attached
430.62	Open	Will be submitted the week of May 7, 1984
430.63	Closed	Attached
430.64	Closed	Attached
430.66	Open	Will be submitted the week of May 7, 1984
430.67	Closed	Submitted in Reference 1(1)
430.68	Closed	Submitted in Reference 1(1)
430.70	Closed	Submitted in Reference 1(1)
430.71	Closed	Submitted in Reference 1(1)
430.73	Open	Will be submitted the week of May 7, 1984
430.74	Closed	Attached
430.76	Open the	Submitted in Reference 1(1). Will be resubmitted week of May 7, 1984.
430.77	Closed	Attached
430.79	Reviewer Undecided	Submitted in Reference 1(1)
430.83	Open	Will be submitted the week of May 7, 1984
430.84	Open	Will be submitted the week of May 7, 1984
430.85	Open	Will be submitted the week of May 7, 1984
430.87	Closed	Submitted in Reference 1(1)
430.88	Reviewer Undecided	Reference statement and FSAR change will be submitted the week of May 7, 1984
430.94	Closed	Submitted in Reference 1(1)
430.99	Closed	Attached
430.100	Closed	Submitted in Amendment 6
430.102	Reviewer Undecided	Attached
430.103	Closed	Submitted in Reference 1(1)
430.105	Reviewer Undecided	Attached
430.107	Open	Submitted in Reference 1(1). Will be submitted the week of May 7, 1984.
430.108	Closed	Submitted in Reference 1(1)
430.109	Open	Submitted in Reference 1(1). Will be resubmitted the week of May 7, 1984
430.111	Closed	Submitted in Reference 1(1)
430.114	Open	Will be submitted the week of May 7, 1984
430.118	Closed	Submitted in Reference 1(1)
430.121	Closed	Submitted in Reference 1(1)
430.122	Closed	Submitted in Reference 1(1)
430.124	Closed	Submitted in Amendment 6
430.127	Closed	Submitted in Reference 1(1)
430.128	Closed	Attached
430.129	Closed	Attached
430.131	Open	Will be submitted the week of May 7, 1984

Question	Status	Remarks
430.133	Open	Will be submitted the week of May 7, 1984
430.134	Open	Will be submitted the week of May 7, 1984
430.139	Closed	Submitted in Reference 1(1)
430.148	Closed	Submitted in Amendment 5
430.149	Closed	Attached

Reference (1) W. G. Counsil to B. J. Youngblood, Submittal of Revised Responses to PSB Mechanical Series Questions, dated April 6, 1984.

NRC Letter: May 31, 1983 1.8

Question Q430.58 (SRP Section 8.3) 1.11

Periodic testing and test loading of an emergency diesel generator in a nuclear power plant is a necessary function to demonstrate the operability, capability, and availability of the unit on demand. Periodic testing coupled with good preventive maintenance practices will assure optimum equipment readiness and availability on demand. This is the desired goal. 1.12 1.13 1.14 1.15 1.16

To achieve this optimum equipment readiness status, the following requirements should be met: 1.17

1. The equipment should be tested with a minimum loading of 25 percent of rated load. No load or light load operation will cause incomplete combustion of fuel resulting in the formation of gum and varnish deposits on the cylinder walls, intake and exhaust valves, pistons and piston rings, etc., and accumulation of unburned fuel in the turbocharger and exhaust system. The consequence of no load or lightload operation are potential equipment failure due to the gum and varnish deposits and fire in the engine exhaust system. 1.19 1.20 1.21 1.22 1.23 1.24

2. Periodic surveillance testing should be performed in accordance with the applicable NRC guidelines (R.G. 1.108), and with the recommendations of the engine manufacturer. Conflicts between any such recommendations and the NRC guildelines, particularly with respect to test frequency, loading, and duration, should be identified and justified. 1.25 1.26 1.27 1.28

3. Preventive maintenance should go beyond the normal routine adjustment, servicing, and repair of components when a malfunction occurs. Preventive maintenance should encompass investigative testing of components which have a history of repeated malfunctioning and require constant attention and repair. In such cases consideration should be given to replacement of those components with other products which have a record of demonstrated reliability, rather than repetitive repair and maintenance of the existing components. Testing of the unit after adjustments or repair have been made only confirms that the equipment is operable and does not necessarily mean that the root cause of the problem has been eliminated or alleviated. 1.29 1.31 1.32 1.33 1.34 1.35 1.36

4. Upon completion of repairs or maintenance and prior to an actual start, run, and load test, a final equipment check should be made to assure that all electrical circuits are functional, i.e., fuses are in place, switches and circuit breakers are in their proper position, no loose wires, all test leads have been removed, and all valves are in the proper position to permit a manual start of the equipment. After the unit has been satisfactorily started and load 1.37 1.38 1.39 1.40 1.41

tested, return the unit to ready automatic standby service and under the control of the control room operator. 1.42

Provide a discussion of how the above requirements have been implemented in the emergency diesel generator system design and how they will be considered when the plant is in commercial operation, i.e., by what means will be above requirements be enforced. 1.44 1.45 1.46

Response: 1.48

1. The manufacturer's recommendations, which state that during testing, the machine should be loaded to a minimum of 20 percent of rated load, will be implemented. Also, the diesel will be loaded to greater than 50 percent of rated load for every 24 hours of low-load operation (including no-load troubleshooting) to prevent deposit formation. 1.50 1.53 1.54

2. Regulatory Guide 1.108 forms the basis for the diesel surveillance testing program. Engine manufacturer recommendations are implemented as appropriate except where they conflict with those guidelines. Refer to FSAR Table 1.8-1 which addresses conformance to Regulatory Guide 1.108. 1.55 1.56 1.57

3. NNECo has procedural commitments to perform reviews of equipment failures. Based on these reviews, design changes are considered which would improve reliability. 1.59 1.60

Reporting and management review of potential reportable occurrences and other conditions reportable to the NRC are documented via the Plant Incident Reporting (PIR) system in accordance with Administrative Control Procedures. This system provides for reporting of significant equipment failures or conditions of interest to management and includes required implementation of corrective action as well as action to prevent problem recurrence. 2.2 2.3 2.4 2.5

In addition, the NUSCo Nuclear Safety Engineering unit has responsibility to perform an independent operating experience assessment and feedback function (refer to FSAR Section 13.1.1). This assessment includes review of such items as Inspection and Enforcement Bulletins, Licensee Event Reports, PIRs, etc. 2.6 2.7 2.8 2.9

4. Maintenance is performed in accordance with Maintenance and Operations Department Procedures which conform to Administrative Control Procedures. These procedures, as applicable, define such requirements as work control procedures, Technical Specification review and applicability, and necessary pre-start checks (valve lineups, breaker, and ~~functional~~). These procedures require verification/testing to ensure that equipment can meet its license requirements prior to being declared operable. In addition, these procedures also require operations review to 2.11 2.13 2.14 2.15 2.17

ensure maintenance controls are implemented. Refer to FSAR Sections 13.5.1.3 and 13.5.2. 2.18

NRC Letter: May 31, 1983 1.8

Question Q430.59 (SRP Section 8.3) 1.11

The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its controls and monitoring instrumentation. This equipment is generally panel mounted and in some instances the panels are mounted directly on the diesel generator skid. Major diesel engine damage has occurred at some operating plants from vibration induced wear on skid mounted control and monitoring instrumentation. This sensitive instrumentation is not made to withstand and function accurately for prolonged periods under continuous vibrational stresses normally encountered with internal combustion engines. Operation of sensitive instrumentation under this environment rapidly deterioriates calibration, accuracy, and control signal output. 1.12 1.13 1.14 1.16 1.19 1.20 1.21 1.22

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area. If the floor is not vibration free, the panel shall be equipped with vibration mounts. 1.23 1.24 1.25 1.26

Confirm your compliance with the above requirements or provide justification for noncompliance. 1.27

Response: 1.28

Instrumentation and controls not specifically mounted on the engine or associated piping are located in the engine gauge panel, diesel generator control panel, and the relay and terminal box. 1.29 1.30

The engine gauge panel is mounted on the engine end of the skid using vibration isolating mounts, and it contains nonsafety-related gauges and switches. 1.31 1.32

The diesel generator is mounted on its own pedestal which is structurally independent from the floor on which the control panels, 3EGS*PNLA and B, are mounted. The control panels are free standing and welded to I-beams which are structurally mounted to the diesel generator enclosures floor slab. The design is intended to prevent a vibration path from the diesel generator pedestal to the control panel floor. 1.33 1.34 1.35 1.37

The relay and terminal box, mounted on the generator end of the skid, contains control relays and the solid-state speed switch. These devices are not considered sensitive instumentation subject to setpoint drift due to vibration. In addition, the relay and terminal box mounted low on the skid will further minimize any continuous vibrational stresses. 1.38 1.40 1.41 1.42

Engine mounted controls will be ~~qualified~~ evaluated for the vibration environmental condition ~~during~~ determined during preop tests. If eqt. is found unsuitable for this environment it will be removed from the skid by the first refueling outage or replaced with instr. suitable for this environment.

NRC Letter: May 31, 1983 1.9

Question Q430.61 (Section 9.5.2) 1.12

The description of the intraplant and interplant (plant to offsite) communication systems is inadequate. Provide a detailed description for each communication system listed in Section 9.5.2.2 of the FSAR. The detailed description shall include an identification and description of each system's power source, a description of each system's components (headsets, handsets, switchboards, amplifiers, consoles, handheld radios, etc.), location of major components (power sources, consoles, etc), and interfaces between the various systems. 1.13 1.14 1.15 1.16 1.18

Response: 1.19

Refer to revised FSAR Section 9.5.2.2 for the response to this question. 1.20 also, Refer to the Millstone Site Emergency Plan for Current system layout, Connections & Locations of Emergency Communication equipment

NRC Letter: May 31, 1983 1.8

Question Q430.63 (Section 9.5.3) 1.11

Expand the lighting section of the FSAR to include a discussion of how lighting will be provided for those areas listed in requests 430.60 and 430.62 and illuminated by the emergency dc lighting system only, in the event of a sustained loss of offsite ac power (in excess of 8 hours and up to 7 days), or provide the rationale why lighting is not required in these areas. Include in your discussion what, if any, other areas would require lighting during a sustained loss of ac power, and how it would be provided. 1.12 1.14 1.16 1.17

Response: 1.18

Refer to revised FSAR Section 9.5.3.2 and the responses to NRC Questions 430.60, 430.62, 430.65, 430.66, and 280.15. This question assumes use of a dc lighting system only in the event of a sustained loss of offsite ac power. This assumption does not take into account the availability of the essential ac lighting system powered from Class 1E motor control centers and automatically energized upon loss of offsite ac power via the emergency generators. 1.19 1.20 1.21 1.22

The dc lighting system powered by 8-hour battery packs automatically energized upon loss of normal ac power and the essential ac lighting system provides adequate lighting for the subject areas. 1.23 1.23/1

The ability to maintain the plant in a stable condition for up to 7 days without ac power (total ac blackout) is not a design basis for Millstone 3. Similarly, the maintenance of approved levels of installed lighting up to 7 days without ac power is not part of the design basis or intent of this unit. 1.23/2* 1.23/3 1.23/4 1.23/5

*Portable battery ~~packs~~ power lanterns are availabe to supplement eight hour battery pack powered lights as required.

NRC Letter: May 31, 1983 1.9

Question Q430.64 (Section 9.5.3) 1.12

Sections 8.3.1 and 9.5.3 of the FSAR do not indicate how, during accident and transient conditions, the essential ac lighting system is connected to the emergency diesel generator bus. Identify whether the connection is manual or automatic. 1.13 1.14 1.15

Response: 1.16

The essential ac lighting system is powered from Class 1E motor control centers (refer to FSAR Section 9.5.3.2(2)). The motor control centers are not removed from the emergency generator bus (FSAR Table 8.3-1) on loss of power (LOP), loss-of-coolant-accident (LOCA), or safety injection signal (SIS). There is no need for automatic or manual connection after LOP, LOCA, SIS, or any combination of the three. 1.17 1.19 1.20 1.21

NRC Letter: May 31, 1983 1.8

Question Q430.74 (Section 9.5.4) 1.11

In Section 9.5.4.3, you state that diesel fuel oil is available from local distribution sources. Identify the sources where diesel quality fuel oil will be available and the distances required to be travelled from the sources(s) to the plant. Also discuss how fuel oil will be delivered onsite under extremely unfavorable environmental conditions. 1.12 1.13 1.15

Response: 1.16

Refer to revised FSAR Section 9.5.4.3 for the response to this question. 1.17

of a potential fire. Operator action is required to interrupt the power supply to the transfer pumps.

Fire suppression for each of the fuel oil tank vaults is provided by a total flooding carbon dioxide system that is actuated by heat detectors. A discharge by either carbon dioxide system will be annunciated in the main control room.

There is a complete and separate fuel oil storage and transfer flow path for each emergency generator, each of which is located in a separate fire area. A fire in either flow path will not affect the operability of the other system from performing its designed task.

9.5.4.3 Safety Evaluation

As a result of the redundancy incorporated in the system design, the EFG system will provide its minimum required safety function under any one of the following conditions:

1. Loss of offsite power coincident with failure of one emergency generator;
2. Loss of offsite power coincident with maintenance outage or failure of one emergency generator fuel oil transfer pump associated with each emergency generator, and
3. Loss of offsite power coincident with maintenance outage or failure of either emergency generator fuel oil storage tank.

Each of the emergency generator fuel oil storage tanks is sized to store sufficient diesel fuel oil for a minimum of 3-1/2 days of continuous operation of an emergency generator at rated load. An interconnection with three normally locked-closed valves is provided between the two emergency generator fuel oil transfer pump discharge headers to facilitate the use of either tank to supply either emergency generator. One pump on each tank is arranged to allow transfer from the A electrical bus to the B electrical bus, or visa versa, by means of a 480 volt, seismically qualified Class 1E transfer switch manually operated under administrative control, thus providing a 7 day supply of fuel for one emergency generator. Fuel oil can be delivered to the site within 24 hours from terminals in New Haven, Connecticut or obtained from offsite storage facilities of the Applicant, thus assuring that the onsite supply can be maintained.

Each of the emergency generator fuel oil day tanks is sized to store 550 U. S. gallons of diesel fuel oil, in accordance with National Fire Protection Association (NFPA) Standards (Section 3.1). This storage capacity provides for approximately 1-1/2 hours of continuous operation of the emergency generator at rated load. When water is removed or when draining of a day tank becomes necessary, a 1 inch drain line with a normally locked closed valve located at the bottom of each tank is used. The oil is drained to a portable container and removed from the emergency diesel generator enclosure. The portable container is

(B)

Diesel fuel oil meeting ASTM 0975-1977 requirements is provided by regular and emergency fuel oil suppliers. Emergency fuel oil suppliers can deliver fuel to the site within 24 hours after being contacted. Plant Safety Technical Specifications ensure that within 4 hours after an LOP or postulated accident occurs action will be taken to notify suppliers of a need for fuel oil. Four regular fuel suppliers in three different locations include: Mobil Oil (New Haven, CT and Providence, RI); Amerada-Hess (New Haven); Guy's Oil Service (Niantic); and Lehigh Oil Company (Norwich). Four emergency fuel suppliers located in three different places include: Mobil Oil; Lehigh Oil; Wyatt, Inc (New Haven) and Gulf Oil (Norwich). All of these firms, both regular and emergency, can provide oil using 8000± gallon fuel trucks. The New Haven based firms (Mobil, Wyatt) can also supply fuel oil by railway tank car, if necessary.

Rail routings exist which would not be subject to the detrimental effects of floods. The railroads also can clear snow from tracks as required. Land routes for trucks have proved dependable regarding the ability to keep them clean even after heavy snowstorms. Since fuel can be obtained overland through varied

suppliers at ~~different~~ orientations (west, north, and east) ~~from~~ the site via Routes 1, 95, or ~~5a~~, adequate fuel availability despite the potential of flooding is assured. The site access road will not become unusable during floods, and is cleaned frequently during snowstorms. Consequently, adequate provisions exist to obtain fuel from offsite sources even in unfavorable conditions, and extend fuel supplies for an operating single diesel generator to 7 days and beyond, as conditions require.

NRC Letter: May 31, 1983

uestion Q430.77 (Section 9.5.4)

n the FSAR, you state the primary fire protection system for the iesel generator fuel oil storage vaults is a CO_2 system. The CO_2 is non-safety related system, and is not qualified for seismic events. he system is seismically supported. Show that spurious actuation of he CO_2 fire protection system will not affect diesel generator vailability and operability.

tesponse:

Spurious actuation of the CO_2 fire protection system in the fuel oil storage vaults will not affect diesel generator availability or operability.

The fuel oil pump and motors will not be affected by this type of event.

All instruments located within the fuel oil tank vaults do not perform safety-related functions, and their failure will not affect the availability or operability of the diesel generators.

In addition, a winter blend of fuel oil will be used to prevent the degradation of fuel oil at low ambient temperatures.

NRC Letter: May 31, 1983 1.9

Question Q430.99 (Section 9.5.5) 1.12

Recent Licensee event reports have shown that tube leaks are being 1.13
experienced in the heat exchangers of diesel engine jacket cooling 1.14
water systems with resultant engine failure to start on demand.
Provide a discussion of the means used to detect tube leakage and 1.15
corrective measures that will be taken. Include jacket water leakage 1.16
into the lube oil system (standby mode), lube oil leakage into the
jacket water (operating mode), jacket water leakage into the engine 1.17
air intake and governor systems (operating or standby mode). Provide 1.18
the permissable inleakage or outleakage in each of these conditions
which can be tolerated without degrading engine performance or 1.19
causing engine failure. The discussion should also include the 1.20
effects of jacket water/service water systems leakage.

Response: 1.21

Refer to revised FSAR Section 9.5.5.2 and revised FSAR Table 9.5-10 1.22
for the response to this question.

NRC Letter: May 31, 1983

Question Q430.102 (SRP Section 9.5.6)

Provide a discussion of the measures that have been taken in the design of the standby diesel generator air starting system to preclude the fouling of the air start valve or filter with moisture and contaminants such as oil carryover and rust.

Response:

Dessicant type air dryers and after-coolers will be installed downstream of each starting air compressor, between the compressor discharge and the check valve on the inlet of the air receiver tanks. These components will be installed during or before the first scheduled refueling outage.

NRC Letter: May 31, 1983

Question Q430.105 (SRP Section 9.5.6)

A study by the University of Dayton (NUREG/CR-0660) has shown that accumulation of water in the starting air system has been one of the most frequent causes of diesel engine failure to start on demand. Condensation of entrained moisture in compressed air lines leading to control and starting air valves, air start motors, and condensation of moisture on the working surfaces of these components has caused rust, scale, and water itself to build up and score and jam the internal working parts of these vital components thereby preventing starting of the diesel generators.

In the event of loss of off-site power the diesel generators must function since they are vital to the safe shutdown of the reactor(s). Failure of the diesel engines to start from the effects of moisture condensation in air starting systems and from other causes have lowered their operational reliability to substantially less than the desired reliability of 0.99 as specified in Branch Technical Position ICSB (PSB) 2, Diesel Generator Reliability Testing and Regulatory Guide 1.108, Periodic Testing of Diesel Generator Units as On-site Electric Power Systems at Nuclear Power Plants.

In an effort toward improving diesel engine starting reliability we require that compressed air starting system designs include air dryers for the removal of entrained moisture. The two air dryers most commonly used are the dessicant and refrigerant types. Of these two types, the refrigerant type is the one most suited for this application and therefore is preferred. Starting air should be dried to a dew point of not more than 50°F when installed in a morally controlled 70°F environment, otherwise the starting air dew point should be controlled to at least 10°F less than the lowest expected ambient temperature.

Revise your design of the diesel engine air starting system accordingly, describe this feature of your design. Also expand your FSAR to discuss the procedures that will be followed to ensure the dryers are working properly and the frequency of checking/testing.

Response:

Dessicant type air dryers plus compressor after-coolers, as described in the response to Question 430.102, will be installed prior to the end of the first scheduled plant refueling outage. Estimates show that the material package and engineering will not be completed until December 1984 to support air dryer installation. System modifications initiated at that time would impact start-up and testing activities which will occur after system turnover, scheduled for July 1984, as well as systems dependent on Diesel Generator operability. Therefore, unless scheduling delays occur, air dryer installation is not anticipated to occur until the first refueling outage.

The following technical reasons for deferred air dryer installation are offered:

1. Air receivers will be blown down each day, once per shift.

2. The starting air system includes an in-line strainer between the starting air receivers and ~~before~~ the air start solenoid valves capable of removing particles greater than 1/32" diameter. The air start solenoids are Circle Seal solenoids with stainless steel bodies and oil resistant seats. They require only a small quantity of low velocity air to function. They can operate even partly plugged and would still permit the air start valves to open.

3. The smallest passages of the air start valves are well in excess of 1/32". The valves are considerably different than those found on Colt-Fairbanks Morse Type OP engines. This improved type of air start valve is less succeptible to malfunction due to debris in the air being admitted to it.

4. Debris accumulation downstream of the air start valve but before the air start distributor is precluded by a 80 micron (nominal) in-line air filter.

5. The engine contains two completely parallel and independent air supply paths from each compressor, air receiver tank, and solenoid start valve, to two fully redundant air start distributors. In the event small debris in either separate receiver tank fouled an air start line, the other redundant air start path would be available for engine starts.

6. Debris accumulation during the time frame when the air start system is put into service until the first scheduled refueling outage occurs should be minimal. It is minimized both by frequent blowdown and in-line filters, which will be changed out periodically.

NRC Letter: May 31, 1983

Question Q430.128 (Section 9.5.8)

Provide the results of any analysis that demonstrates that the function of your diesel engine air intake and exhaust system design will not be degraded to an extent which prevents developing full engine rated power or cause engine shutdown as a consequence of any meteorological or accident condition. Include in your discussion the potential and effect of fire extinguishing (gaseous) medium, recirculation of diesel combustion products, or other gases that may intentionally or accidentally be released on site, on the performance of the diesel generator.

Response:

The response to this question will be submitted at a later date.

Refer to revised FSAR Section 9.5.8.2 and the response to NRC Question 430.133 for the response to this question.

NRC Letter: May 31, 1983

Question Q430.129 (Section 9.5.8)

Discuss the provisions made in your design of the diesel engine combustion air intake and exhaust system to prevent possible clogging, during standby and in operation, from abnormal climatic conditions (heavy rain, freezing rain, dust storms, ice and snow) that could prevent operation of the diesel generator on demand.

Response:

Refer to revised FSAR Section 9.5.8.3 for the response to this question.

NRC Letter: May 31, 1983 1.8

Question Q430.149 (Section 10.4.4) 1.11

In Section 10.4.4 of the FSAR you stated that during refueling shutdowns, the turbine bypass valves and turbine bypass system controls will be inspected and tested for proper operation. They will also be periodically tested for partial opening. We find this inspection program partially acceptable. Since the operation of the turbine bypass system eliminates the need to rely solely on safety systems which are required to meet the redundancy and power source requirements of GDC 34 and to mitigate the consequence of certain steam line break accident conditions, the turbine bypass system should be tested (full stroking of the valve) on a frequent basis, but no less than once every three months. Modify your inservice inspection program accordingly. 1.12 1.13 1.14 1.15 1.16 1.18 1.19 1.20 1.21

Response: 1.22

Since the turbine bypass system will be observed in operation frequently during normal plant operation, it has been determined that no additional testing is necessary. This operational testing will be conducted every startup and shutdown as well as during unscheduled power reductions, plant trips, etc. Since the bypass valves are isolable only for maintenance via manual valves, more frequent periodic testing cannot be accomplished. Once every 18 months, at a minimum, functional testing of the turbine bypass control system will be conducted. 1.23 1.25 1.27 1.29 1.31

The design of Millstone 3 contains multiple means of removing decay heat at temperatures above 350°F. These means include the following steam release mechanisms: 1.32 1.33

Main steam safety valves - There are five main steam safety valves per steam generator. Each valve is capable of passing 9.7×10^5 lb/hr of steam. These valves require no power to operate and start lifting at 1,185 psig. 1.36 1.37 1.38

Main steam pressure relieving valves - There is one main steam pressure relieving valve per steam generator. Each valve is capable of passing 9.7×10^5 lb/hr of steam. These valves are air operated. Lift point is dependent on control system setpoints. 1.40 1.41 1.42 1.43

Main steam pressure relieving bypass valves - There is one main steam pressure relieving bypass valve per steam generator. Each valve is capable of passing 9.7×10^5 lb/hr of steam. These valves are motor operated and controlled by operator action. Power supplies are redundant. 1.44 1.46 1.47 1.48

Turbine bypass system - There are a total of nine turbine bypass valves in three banks of three. Each valve is capable of passing 9.7×10^5 lb/hr of steam. These valves are air operated. Lift point is dependent on control system setpoints. 1.49 1.50 1.52

The turbine bypass system is expected to release steam during normal plant operation to mitigate the effects of steam demand transients. It will be the normally used system for startups and shutdowns. 1.54 1.55 1.56

FSAR

BACKUP

PAGES

operation and maintenance of the unit. Multiple communication systems are provided to ensure the capability to notify the necessary personnel of the presence of an unsafe condition so that corrective measures can be taken. Physical and electrical independence is maintained between the systems.

These communication systems provide effective communications between plant personnel in key operating vital areas during the full spectrum of accident or incident conditions (including fire) under maximum equipment operating noise levels. The design is based on previously reviewed plants with satisfactory operating experience. The communications systems for fire fighting meet the requirements of Regulatory Guide 1.120.

9.5.2.2 System Design

9.5.2.2.1 Intraplant Communications

Intraplant communications consist of the following systems:

1. Plant switching network (plant switch or PBX and connected telephones and data equipment) Southern New England Telephone Co. (SNETCo).
2. Voice paging system
3. Maintenance jack system.
4. Fuel handling carrier phone system.
5. Sound-powered telephone system.
6. Multi-frequency UHF repeater system.
7. Multiple telemetering systems for station data.

A description of these systems follows.

Plant Switching Network

The plant switching network is a telephone system consisting of standard telephones, multi-line telephones, and a Dimension 2000 switch. Dimension 2000 is capable of handling 1,500 to 2,000 lines.

Dimension 2000 and its associated telephones allow communication throughout the plant by dialing the appropriate four-digit extension number. Communication onsite, offsite, or with Emergency Operations Facility (EOF) is accomplished by dialing the appropriate tie line code(s). Presently, there are five tie lines to the EOF.

The plant switching network is ac powered. Emergency power is available through standby batteries and a dc to ac inverter.

430.61

430.61

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The plant switching network is directly coupled to the telephone company's message network (refer to the discussion of the message network under Section 9.5.2.2.2) and the voice paging system.

Voice Paging System

The intraplant voice paging system provides communications from the control room to all buildings and control areas within the unit. In addition, through interconnections with the SNETCo switching network, this system provides communication from one control area to any other. Isolation is provided between the two systems which have different operating voltages and impedances. The intraplant voice paging system is an independent system using separate amplifers and speakers at each paging station. Public address loudspeaker stations are provided in all buildings which comprise the plant and in the outside areas surrounding the plant. Access to voice paging speakers is provided and initiated by dialing a code number from any plant dial telephone. The control room has priority access to the public address system. This access bypasses the plant switching network.

The voice paging system consists of loudspeaker stations, amplifiers, a telephone interface, two page override handsets, and a multitone generator. Its power source is a nonvital bus, powered by inverter INV-5 (Figure 8.3-2).

The loudspeaker stations are suitable for operation in conjunction with the loudspeaker amplifiers. Horn-type speakers have accessories suitable for mounting on horizontal or vertical structural surfaces. Mounting hardware permits orientation of horn-type speakers in both azimuth and elevation and locks them in the desired position. Voice coil terminals of all drivers are marked for polarity.

The amplifiers are suitable for operation on a 120 V (±10 percent), 60 Hz, single-phase supply. Level control is provided to regulate amplifier output and to prevent overdriving at any stage. Rated output of unit loudspeaker amplifiers is not less than 12 W. The output transformers for the loudspeaker amplifiers have taps for 8 and 16 ohms.

Each handset station includes a handset, a hookswitch, amplifier, terminal facilities, page/party springloaded selector switch, and 6 feet of self-coiling cord. The handsets include a magnetic receiver and a low impedance noise cancelling transmitter. These handsets are located in the control room and at the auxiliary shutdown panel, and include an override control for paging.

The multitone generator provides a signal source to the paging system producing five distinctive tones. These tones are: steady, pulse, siren, warble, and yelp. The tone generator transmits the designated evacuation alarm signal (yelp) over the paging system upon activation. The alarm tone overrides the paging system to ensure audibility throughout the plant.

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Maintenance Jack System

The maintenance jack system, which is utilized for calibration and maintenance, consists of amplifiers, headsets, handsets, and a network of plug-in jack stations with five-party selector switches located throughout the plant. Its power source is a nonvital bus powered by inverter INV-5 (Figure 8.3-2).

Jack stations are mounted on control panels or in separate enclosures. Each station contains a six-position selector switch (position for each of the five channels and an off position) and a receptacle to receive the plug unit of the headset or handset. Those jack stations that are mounted in separate enclosures have a provision to cover the receptacle when the station is not in use.

Headsets and handsets contain speaker(s), a microphone assembly, 6 feet of retractable cord, and a plug suitable to mate with the receptacle of the jack stations.

A system amplifier (located in Emergency Switchgear Room 2, control building, elevation 4 feet-6 inches) consists of five independent amplifiers each capable of driving a channel.

The maintenance jack system does not interface with any other communication system.

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Fuel Handling Carrier Phone System

The fuel handling carrier phone system consists of an amplifier, jack plug stations, and handsets. Its power source is a nonvital bus powered by inverter INV-5 (Figure 8.3-2).

Jack stations are mounted in separate enclosures. Each station contains a receptacle to receive the plug unit of a handset, as well as provisions to cover the receptacle when the station is not in use. The jack stations are of single channel design.

Handsets include a speaker, a microphone assembly, 6 feet of retractable cord, and a plug to mate with the receptacle of the jack stations.

The amplifier (located in the auxiliary building, elevation 43 feet-6 inches) is a single-party type component, capable of driving the single channel.

The jack stations are located on the spent fuel pool bridge, manipulator crane, five in the containment at various elevations, and four in the fuel building.

The fuel handling carrier phone system does not interface with any other communication system.

Sound-Powered Telephone System

The sound-powered telephone system consists of a master station, a switchbox, and 8 substations with handsets. The system is self-powered.

Each substation includes a hand-held telephone with a push-to-operate button located on the handset, a handset holder, and a wall-mounted cast aluminim case containing a manually-operated magneto generator for call signaling and an audible call-signal device.

The master station, in addition to the equipment furnished with a substation, includes a selector switch (for calling substations individually) and a switchbox containing eight 6-pole switches for disconnecting any faulted substation cable in the system. 430.61

The master station is located in the auxiliary shutdown panel area (control building, elevation 4 feet-6 inches). Substations are located in the emergency generator enclosures, the emergency switchgear rooms, the main control room, the charging pump control cubicle, engineered safety features building, and the service water pumphouse.

The sound-powered telephone system does not interface with any other communication system.

Multi-Frequency UHF Repeater System

A UHF repeater system is dedicated to plant operations and maintenance activities. In the event of repeater failure, a "talk-around" feature can be accessed from the control room radio console and will allow communications to continue without the repeater. The radio console is able to access similar but separate UHF radio repeater systems at Millstone Units 1 and 2, as well as site security. 430.61

Telemetering Systems 430.61

Telemetering equipment to assist load dispatching is also provided in the control room.

9.5.2.2.2 Intrasite and Offsite Communications 430.61

The intrasite and offsite communication systems consist of the following:

1. Plant switching network - SNETCo.
2. Message network - SNETCo (offsite Bell dial telephone system).
3. Evacuation alarm systems.
4. Microwave system. 430.61

heard throughout the site. The emergency tone overrides any voice paging. 4.39

Microwave System 4.42

Northeast Utilities (NU) microwave system provides all three generating units at the Millstone site with an extremely reliable telecommunications medium. The microwave system links the Millstone site to other key facilities within the NU franchised service area as well as other utility companies throughout New England. 4.44 4.45 4.48 4.49

The microwave system uses low power radio signals that operate in frequency bands established for industrial users by the Federal Communications Commission. These frequency allocations fall in the 2,000 and 6,000 MHz industrial microwave frequency bands. Frequency modulation techniques are used to place the information that is being sent on the microwave radio. The amount of information that NU may place on its microwave system is set by Federal Communications Commission Rules and Regulations (Part 94) to be equivalent to 480 voice telephone channels. A voice channel is interpreted as a balanced four-wire circuit (2 wires for send and 2 wires for receive) which passes audio signals in the voice frequency range (300 Hz to 3,400 Hz) and has output and input impedances of 600 ohms. Also included with each voice channel is another nonvoice circuit which is referred to as an out-of-band signaling channel. The purpose of this channel is to reproduce contact type signals such as a phone being dialed or a telephone handset being lifted from the phone hookswitch. 4.50 4.51 4.52 4.53 4.54 4.55 4.56 4.57 4.59 5.1 5.2 430.61

The type of telecommunciations traffic that is placed on the microwave system is the same type that would normally be placed on a dedicated, 4-wire, data grade telephone circuit. This would include some of the following uses. 5.3 5.4 5.5

1. Dial repeating tie trunks or "tie lines" that connect the telephone PBX at one location wihin the NU system to a similar PBX at another location. 5.7 5.8

2. Automatic ring down circuits for use as "hot line" dedicated phones; where lifting a phone at one end will cause the phone on the other end of the circuit to ring. 5.9 5.10

3. Radio control circuits that provide control of remotely located radio transmitters from key areas within the Millstone complex. This includes radio control circuits which provide one-way control as required by radio paging transmitters as well as control circuits that provide two-way control for standard mobile radio operation. 5.11 5.12 5.13 5.14

4. Data circuits that connect one computer with another or allow data gathering equipment to communicate with a central "host" computer. These circuits use data rates up to and including 9,600 baud with a very high degree of reliability. 5.15 5.16 5.17

5. Data circuits that carry analog data also can benefit from the greater reliability offered by the microwave system. This type of telecommunications traffic includes telemetering of important analog quantities and reporting alarms that are remote from the Millstone site.

6. Data circuits, which are used for protective relaying signals, provide the electric generating and transmission system with protection from catastrophic failure.

The microwave system also provides very high-speed data channels that are capable of transmitting and receiving data at a rate of up to 56,000 bits per second. This data rate uses the equivalent space of 12 voice channels on the microwave system but is very valuable when large blocks of data have to be transferred from one computer to another. This very high-speed data circuit is available only on the microwave system. The telephone company does not offer an equivalent service.

The microwave equipment at the Millstone site interfaces with the remainder of the NU microwave telecommunications system through an active microwave repeater site located in Haddam, Connecticut. The Millstone site and all other microwave sites within the NU system are designed to function in the most hostile of weather conditions. The microwave antenna and tower equipment is designed to remain fully operational with a 40 pound per square foot wind load and a 1/2 inch of radial ice. This is equivalent to loading that results from a sustained 100 mile per hour wind with all system component dimensions exaggerated by the 1/2 inch of ice at all points plus the additional weight generated by the formation of ice 1/2 inch thick. The survival rating for equipment is, in actuality, greater than the rate corresponding to conditions described above.

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Additionally, all sites are fenced and equipment is operated from 24 or 48 V dc power which is provided by high quality lead-calcium batteries which are float charged by industrial-grade ac powered battery chargers. The batteries are sized to provide complete power requirements for the microwave equipment for a period of 12 hours. The batteries are backed up by a diesel generator at the Millstone site and other company buildings and by propane fueled generators at the remote microwave sites.

The microwave system provides the Millstone site with an additional telecommunications network which is completely separate from the offsite telephone system. The use of two diverse systems to share the telecommunications requirements of the Millstone site results in enhanced telecommunications reliability because a failure of either system will not completely interrupt offsite telecommunications traffic. The microwave system will also allow Millstone to access a modern telephone PBX located approximately 50 miles from the site at the NU headquarthers in Berlin, Connecticut. In an emergency situation, NU personnel would be able to displace less critical microwave channels with the additional traffic from the Millstone site.

Emergency Notification System 5.56

This system is a direct NRC hotline telephone that will connect the Millstone 3 control room with the NRC operations moritoring facility in King of Prussia, Pennsylvania. The system consists of an autcmatic ringdown phone mounted on the 400 panel at Millstone 3. This phone is connected to a dedicated AT&T long-line and is independent of the station PBX. A dedicated ac power supply with backup power capabilities provides signaling and ringing power. The system is equipped with a failure lamp for indications of circuit problems. 5.58 5.59 6.1 6.2 6.3 6.4

Multiple Dedicated Automatic Ringdown Telephones 6.7

This system consists of auto-ringdown phones from the Millstone 3 control room to: the Connecticut State Police, the Waterford Police, the Berlin Emergency Operations Center (Room N101), the site Emergency Operations Facility, and the site Technical Support Center. All the auto-ringdown phones receive their power for singaling and ringing from SNETCo's New London office via individual hard wire pairs. All circuits are independent of the station PBX. as part of the emergency Communication system, the locations & connections 6.9 6.11 6.12 6.13 6.14 6.15

CONVEX Dispatch Loop of the automatic ringdown telephones are illustrated in the Millstone Site Emergency plan (Figures 6.18

The CONVEX dispatch loop (also known as the State Wide Dispatch Loop and the Full Period Phone System) is a dedicated party line system which is provided by the telephone company. The CONVEX dispatch loop provides telecommunications service from the load control dispatch center (CONVEX) to the generation and substation facilities. Each location that is served by the CONVEX dispatch loop uses the following telephone components: 6.20 6.21 6.23 6.25 430.6 7A thru 7d)

1. A speaker amplifier with volume control is used to monitor voice traffic on the loop. 6.27

2. A signaling tone operated by a pushbutton is provided to gain the attention of the person monitoring the loop. 6.28

3. A telephone-style handset is used to provide two way communications. 6.29

The telephone equipment utilized in this system is powered by reliable direct current sources such as lead calcium station batteries. This power is supplied at some locations with telephone battery power and at other locations with NU station battery power. 6.31 6.32 6.33 6.34

Control Room Intercom System 6.37

The control room intercom system provides a communication link between the control rooms of Units 1, 2, and 3. The intercom operates independently of the plant switching network and voice paging systems. 6.39 6.41

Multiple Radio Systems

The multiple radio systems include the following communication systems: 430.61

1. Onsite paging, handheld, and mobile UHF radio repeater operations and maintenance (O&M) system.
2. Onsite handheld and mobile UHF radio repeater security system.
3. CONVEX Command Control Network (CCN).
4. Waterford police system.
5. Tri-town UHF radio system.
6. State police system.
7. Local NU operating company system.
8. VHF radio paging system.

A dedicated radio remote control console is provided in the Millstone 3 control room for communications with all associated onsite as well as offsite radio facilities (as outlined above). Its power source is a nonvital bus powered by INV-5 (Figure 8.3-2). Normally, all radio systems, except the unit's O&M system, are quiet to the unit operator unless selected by the operator for monitoring or operation. Tone alert, except on the O&M system, is provided to enable remotely located radio dispatchers to contact the control room operator. 430.61

The radio console (400 panel) installed in the Millstone 3 control room consists of four individual bays secured together as a consolidated unit. The total length of the equipment is 92 inches with a height of 43 3/4 inches and an overall depth of 29 1/2 inches. The console is an equipment enclosure housing audio amplifiers (T/R modules), tone generators (encoders), tone decoders, and dual power supplies. Additionally, two outboard bays contain telephone equipment which operate independently of the console power supplies. The console generates low level audio and dc voltages only, for the single purpose of controlling remotely located base station radios.

The radio control center equipment is mounted in single width housings with a beveled front, projected writing surface and panel turret. 430.61

The power supplies and termination panels for the control consoles are located in the lower portion of the equipment housings. Provisions are included on the rear-hinged termination panel for securing cable entries. The two inner bays contain the heart of the console radio control system. These two bays can be considered as left center and right center as viewed from the operator side of the

console. The left side of the console contains the controls for police, site security, tri-town, operations/maintenance radios, and master control module. The emergency alert paging system occupies the right half of the console. The radio control panel is mounted directly in front of the radio dispatcher's position. This provides the interface functions required between the operator and the console (microphone, speakers, volume controls, push to talk switches). 7.21 7.22 7.23 7.24 7.25 7.26

The microphone is a moving coil, dynamic unidirectional, that is uniform with frequencies of 80 to 13,000 Hz. The microphone is adjustable vertically and horizontally to accommodate different operators and is internally rubber-vibration-isolated to avoid physical damage. 7.27 7.28 7.29

The console contains two power supplies - a low voltage supply and a high voltage supply, each with an input voltage of 120 V ac. The low voltage supply provides +24 V dc and is capable of handling up to 24 radio channels. It includes a nominal +13.8 V dc ±10 percent regulator which, in conjunction with an overcurrent protection circuit, can provide a maximum continuous output current of 1 amp. The power supply has an output current capability of 8 amps. The high voltage supply provides +175 V dc for keying up to 24 dc controlled radios. 7.30 7.32 7.33 7.34 7.36

The console contains 15 audio amplifiers (T/R modules) with expansion capability of 15 future modules. One T/R module is used with each radio control channel. The module contains both logic circuits and receive/transmit audio circuits. The logic circuits include channel select, keying, busy, and priority functions. The receive audio circuits include speech processing (using an audio compressor circuit), muting, audio gating, and a voice enabled call indicator. The transmit audio circuits include a preamplifier, tone mixing amplifier, gating circuits, and a transmit audio line driver. 7.37 7.38 7.39 7.40 7.41 7.42 7.43 7.44 430-41

There are three tone generators (encoders) with external pushbutton operator controls located in the console. A touch tone encoder allows standard touch code 2-frequency tone codes to be transmitted from the communications console. It can be used wherever a coded signal is required for selective calling or data transmissions. The encoder front panel includes a LED indicator which alerts the operator that the transmission of a code can proceed. A programmable timing circuit automatically resets the encoder and unkeys the transmitter if the tone sequence is not entered within a predetermined time. The encoder and transmitter automatically reset if the operator fails to complete a code entry. All codes generated by the encoder are compatible with standard touch tone equipment. A two-tone sequential tone generator allow encoding pocket pagers and fixed receive monitors. The operating controls and indicators are located on the front panel of the unit. The encoder has 16 push buttons, a four-digit call code display, a call indicator, and a talk indicator. A code is manually punched into the encoder keyboard and the sequence is automatically sent whenever desired. The transmitter stays on the air for a predetermined amount of time after the code 7.45 7.46 7.48 7.49 7.51 7.52 7.53 7.54 7.55 7.56 7.57 7.58 7.59

transmittal terminates in order for a voice message to be sent out to the desired pager or monitor. 7.60

The remaining tone generator is the auto page encoder module. This unit is an engineered hybrid using digitally synthesized tones and logic switching circuits. The encoder, once activated, will automatically select predetermined transmitters and send out a programmed tone sequence to alert pagers and fixed receive monitors. The unit works in unison with a tape deck containing a canned tape message selected by the operator. 8.2 8.3 8.4 8.5

The console contains eight touch tone decoders that activate indicator lights and a sonalert audible device. This alerts the operator of an incoming call on a particular channel. The audio circuits of the console are muted until activated by the decoder, and turned on to normal volume when a proper code sequence is decoded. The audio circuit and sonalart have to be manually reset ensuring that the operator will not miss an incoming call. 8.6 8.7 8.8 8.9 8.10

It should be noted that the Millstone 3 console (400 panel) is identical to those in Units 1 and 2. This provides an expanded backup system for the communications systems on the Millstone site. 8.11 8.12

O&M Radio 8.15 430.61

This system is controlled by the consoles in Units 1, 2, and 3. The system consists of a control/base station and a repeater relay station. Control/base station description and location is the same as CCN. The cable description and location is also the same as CCN. The antenna is a fiberglass enclosed, stacked collinear array omni-directional pattern, capable of a 5 dB gain. The antenna is direct ground lightning protected and has a wind survival of 100 mph. The antenna is capable of an 8 MHz bandwidth to satisfy the frequency requirement of the control/base station. The installed antenna weighs 4 pounds and is 80 inches in length. 8.18 8.20 8.21 8.22 8.23 8.24 8.25

The repeater relay station is installed in the Millstone 3 model shop. The station is fully solid-state, incorporating integrated circuits located on modular plug-in circuit boards. The station is protected for overcurrent conditions and power surges. The station is r-f activated and contains thermal protection on the power amplifier. The primary power source is 120 V ac. 8.26 8.27 8.28 8.29 8.30

Unheated temperature compensated plug-in oscillator modules are used for frequency control. The station has a continuous duty transmitter that can operate on full power. The station is connected to the antenna via a 7/8-inch jacketed semi-rigid coaxial cable. The antenna has an 11 dB gain with a forward controlled pattern. The antenna is 16 feet long and the reflector is 4 feet wide. The unit weighs 130 pounds and has a wind survival of 100 mph. The antenna is direct ground lightning protected. 8.31 8.32 8.33 8.34 8.35 8.36 8.37

Security Radio System 8.40

This radio system consists of one repeater/relay station and three 8.42
control/base stations. System control is from the radio consoles in 8.44
Units 1, 2, and 3, the security central and secondary alarm stations,
and the EOF. 8.45

The repeater/relay station is fully solid-state, incorporating 8.46
integrated circuits located on modular plug-in circuit boards. The 8.48
station is protected against lightning overcurrent conditions, and
power surges. The station is fully duplex and is r-f activated. It 8.50
contains thermal shutdowns on the power amplifier as well as high SWR
shutdown circuits for additional protection. The primary power 8.51
source is 120 V ac and draws little current. Unheated temperature 8.52
compensated plug-in oscillator modules are used for frequency
control. The station has a continuous duty transmitter that can 8.53
operate on full output power indefinitely.

The station is connected to the antenna via a 7/8-inch jacketed semi- 8.54
rigid coaxial cable. The antenna is a 5 dB gain, omnidirectional 8.55
collinear, housed in a white fiberglass shell. It provides a full 8.56
10 MHz bandwidth with an input power capability of 250 W. The 8.57 430.61
antenna is 80 inches long, weighs 8 pounds, and has a rated wind
survival of 100 mph. The antenna is direct ground lightning 8.58
protected.

The security control/base station is a compact two-way radio suitable 8.59
for desk top mounting. It fully utilizes the advantages of solid- 8.60
state circuits reliability, small size, ruggedness, and low
maintenance requirements. Efficient heat radiators to ensure safe 9.2
operating temperatures for the transmitter power amplifier stages and
the power supply regulator transistors extend from the rear of the 9.3
cabinet. The station's primary power source is 120 V ac, and is 9.4
protected from overcurrent conditions. The stations are connected to 9.5
the antennae, via a 1/2 inch jacketed semi-rigid coaxial cable. The 9.6
antennae at all three sites are 1 dB gain, omnidirectional fiberglass
enclosed collinear. They weigh 7 pounds and are 1.1 feet long. The 9.8
antennae have a wind survival of 150 mph and are direct ground
lightning protected.

Command Control Network (CCN) 9.11 430.61

The CONVEX CCN is a two-way radio system using tone alert signaling 9.13
to provide communications among the control room, the CONVEX load 9.14
dispatcher and other key NU operating facilities.

This system is controlled by the radio console in Units 1, 2, and 3. 9.16
The transmitter/receiver base station is installed in the Millstone 3 9.17
Warehouse No. 5 telecommunications room. It is installed in an 9.18
impact-resistant, 41-inch cabinet bonded to electrical ground. AC 9.19
voltage is the primary power source. The base station is fully 9.20 430.61
solid-state incorporating integrated circuitry, located on plug-in
modules or independent printed circuit boards. Highly reliable reed 9.22
switches are used for antenna switching. The base station produces 9.23

The system is controlled by the consoles in Units 1, 2, and 3 and base/control station and repeater relay station. The base/control station is located in the Warehouse No. 3 receiving office. It contains two transmit frequencies, the second frequency being "talk-around" in the event of a repeater relay station failure. The unit is installed in an impact resistant cabinet bonded to the electrical ground. The primary power source is 120 V ac with dual 13.8 V dc battery backup. The station is fully solid-state. The station is connected to the antenna via a 1/2-inch jacketed semi-rigid coaxial cable. The cable is 20 feet in length and is securely clamped to the warehouse bulkhead with stainless steel clamps. The cable consists of a copper clad center conductor surrounded by a low loss foam dielectric. A corrugated copper outer conductor encloses this and the entire cable is jacketed with black polyethylene. The antenna is rigidly mounted to the warehouse exterior wall. The antenna is a heavy duty, lightweight, two-stack collinear array designed to provide 5 dB of gain, broad bandwidth, and minimum pattern distortion. A binary cable harness is used to ensure equal in-phase power distribution to all radiating elements. The wind survival of the antenna is 125 mph, and all elements are operated at dc ground to ensure immunity from lightning damage.

The repeater relay station is installed at the base of the Millstone stack. It is enclosed in a weatherproof cabinet and is bolted to crossmembers on a raised wooden platform. The repeater is fully solid-state and has r-f control capabilities to turn the unit on and off. The cabinet is bonded to electrical ground and its primary power source is 120 V ac. The unit has 13.8 V dc battery backup that will energize 1 minute after primary power interruption. 430.1

The station is connected to the antenna via a 7/8-inch jacketed semi-rigid coaxial cable. The cable length is 150 feet and is securely clamped to the stack with stainless steel clamps. The cable consists of a copper clad center conductor surrounded by a low loss foam dielectric. A corrugated copper outer conductor encloses this and the entire cable is jacketed with black polyethylene. The antenna is rigidly mounted to the stack exterior wall. The antenna is a heavy duty, lightweight two-stack collinear array designed to provide 9 dB of gain, broad bandwidth, and minimum pattern distortion. A binary cable harness is used to ensure equal in-phase power distribution to all radiating elements. The wind survival of the antenna is over 125 mph, and all elements are operated at dc ground to ensure immunity from lightning damage.

State Police Radio System

The State Police two-way radio system uses two frequencies. One frequency is used for radio tests and short duration communications. The other frequency is used for communications over extended periods of time. Tone alert signaling is used to allow the State Police Radio Dispatcher to call the control room.

The system is controlled by the consoles in Units 1, 2, and 3. The station is a desk top style and is located in the Unit 1 control 430.61

room. The unit is fully solid-state and uses dedicated lines for control. The primary power source is 120 V ac.

THe station is connected to the antenna via RG-8 coaxial cable. The cable is fully flexible and consists of a braided copper center conductor, with a foam dielectric. A flexible copper sheath encloses the cable for shielding, and the entire cable is covered with black polyethylene. The antenna is mounted to the turbine hall roof and is a unity gain monopole with a folded radiating element. The antenna has direct grounded lightning protection and a wind survival of 100 mph. 430.61

CL&P Radio System

The CL&P two-way radio system allows the control room to access a utility radio system equipped with a large number of radio equipped vehicles.

This system is controlled by the radio console in Units 1, 2, and 3. The transmitter/receiver base station is installed in the Millstone 3 Warehouse No. 5 telecommunications room. It is installed in an impact-resistant 41-inch cabinet bonded to electrical ground. Ac voltage is the primary power source. The base station is fully solid-state incorporating integrated circuitry, located on plug-in modules or independent printed circuit boards. Highly reliable reed switches are used for antenna switching. The base station produces 13.8 V, dc to supply power, and draws little current. Unheated, temperature compensated plug-in oscillator modules are used for frequency control. The unit contains a continuous duty transmitter that can operate indefinitely on full power. There are five front-mounted metering receptacles for ease of maintenance troubleshooting. The station is remotely controlled by tone frequencies. The wire line controlling the station need not have dc continuity for operation.

The base station is connected to the antenna via a jacketed 1/2-inch diameter semi-rigid coaxial cable. The cable is installed in cable tray OTX 850N which is dedicated to communication cables only. The cable ultimately terminates at the antenna mount on the Unit 3 Warehouse No. 5 penthouse. The coaxial cable has the outer copper jacket bonded to ground before entry into the building. The coaxial cable has an impedance of 50 ohms and offers a combination of remarkable flexibility, high strength, and superior electrical performance. It includes a copper clad aluminum center conductor, low loss cellular polyethylene foam dielectric, corrugated copper outer conductor, and a protective black polyethylene jacket. The antenna is rigidly mounted to a permanent bracket secured to the parapet of the Warehouse No. 5 penthouse. It is a highly directional r-f radiating device with a power gain of 5 dB. 430.61

The antenna is a unity power gain omnidirectional antenna with a wind rating survival of 100 mph. The antenna uses a shunt-fed coaxial design in a rugged two-piece construction. The lower section is enclosed in a heavy wall (3.4 mm) fiberglass tube, and the upper

fiberglass whip fastens via a protected 1/2 inch x 20 inch threaded connector. The unit has dc ground lightning protection, and requires no ground plane elements. Antenna weight is 10 pounds.

VHF Radio Paging System

An automated VHF radio paging system is provided to allow the control room to notify state, local, plant, and NU personnel rapidly in the event of any abnormal condition at the site. This system controls multiple base station radios located throughout NU's franchised operating area.

This system is controlled by the consoles in Units 1, 2, and 3. Each console contains an auto-page encoder module. These units are an engineered hybrid using digitally synthesized tones and logic switching circuits in conjunction with a tape deck. The encoder can be used in the manual or automatic mode.

The automatic mode is used when it is desired to alert multiple pagers. A switch labeled "Level 1" and "Level 2" is provided to select two possible blocks of pagers. The level switch is wired to provide selection of Company pagers only in Level 1, and selection of Company, state, and local government pagers in Level 2.

To use the auto-page function, the console operator places a prerecorded standard eight-track tape into the tape slot on the encoder module. The level switch is placed on the desired page "level," and the emergency alert button is depressed. This activates the system. The automatic paging equipment will send the proper group call tones and play a 15-second taped message after stepping through each of five stretegically placed transmitters throughout Connecticut. The paging sequence is an industry standard system.

Three of the paging transmitters are controlled via the microwave system, and two are controlled by critical repair, dedicated phone circuits.

Each paging transmitter uses 4-wire tone control for activation, and is connected to the antenna via a 7/8-inch jacketed semi-rigid coaxial cable. The antennae are 5.25 dB gain with true omni-directional patterns. They are of extra rugged design with specially strengthened housings and support pipes to survive in very severe weather environments. The wind survival is 175 mph and it is direct ground lightning protected. The antenna weight is 53 pounds.

Administrative procedures will prevent handheld UHF radios from affecting the solid state reactor protection and/or ESF systems.

The cables in the communication systems are independent from those of other systems and are shielded or isolated from power cables and any other sources of line noise which could adversely affect the audibility of the systems. The communication systems use twisted, balanced audio pairs to further reduce the effects of longitudinally induced magnetic noise.

Outside air is drawn in through a sound-attenuated, screened, missile-protected wall opening and then through a filter of dry media and a silencer for each combustion air intake system.

On the outlet of the silencer, a manometer indicates the pressure in the duct at that point.

A pressure differential switch is installed across the air filter to measure the differential across the filter and alarm in the control room if the maximum allowable pressure drop of 3.5 inches water gage has been exceeded. Another pressure indicator is located at the inlet to the diesel engine for local indication.

Each emergency diesel exhaust system directs the diesel engine exhaust to the exhaust muffler through two Safety Class 3 pipes connected to expansion joints at the diesel engine outlet. A temperature element is located in each of the two outlet connections to monitor the exhaust gas temperature. The muffler is located in the ventilation exhaust plenum of each enclosure such that the emergency generator enclosure ventilation exhaust will carry away the heat released by the muffler.

The exhaust stack is connected to the muffler outlet expansion joint. The stack goes straight up after the ventilation exhaust plenum and releases the exhaust gas at an elevation of 71 feet to avoid any combustion gases from being drawn into the intake. The maximum pressure drop allowed and designed for across the emergency diesel exhaust system is 10 inches water gage. The exhaust system has been designed for postulated tornado missiles by inclusion of an exhaust bypass. The bypass consists of an access hatch located near the muffler in a tornado-protected enclosure (Figure 9.5-4). Should the plant receive a tornado alert, this access hatch is manually opened, providing a secondary exhaust path for the diesel exhaust gases. The entire combustion air intake and exhaust system is seismically designed.

Gases stored onsite, in containers having greater than 100 pound quantities, include nitrogen, carbon dioxide, hydrogen, and chlorine, as discussed in Sections 9.5.9.2, 9.5.1, 9.5.9.1, and 6.4, respectively.

Degradation of the emergency diesel generators will not occur due to the release, intentional or accidental, of any of these gases since the distance and intervening structures (service, control, and turbine buildings) between the gas storage area and the diesel combustion air intakes precludes significant concentrations from reaching the combustion air intakes. The location of the gas storage area is south of the containment structure as shown on Figure 1.2-2.

In addition, an analysis has been done to demonstrate that a potential fire hazard with carbon dioxide actuation in buildings adjacent to the diesel generator building will not degrade the functional capability of the emergency diesel generator.

Move lines 1.46 - 1.56 to follow line 1.13 on din 8ba

plus Insert A

Insert A

Insert A - cont'd

An analysis has been performed to determine whether the diesel generator operation could be affected due to CO_2 entrainment in the diesel combustion air intake. CO_2 at a maximum concentration of 50 percent issues from an opening at 20 feet above ground elevation in the 55-line wall of the control building as a result of suppressing a fire. The opening is a missile protected structure which will direct the emerging jet downward into the passageway between the control building and the emergency generator enclosure. Air is entrained prior to jet impact with the ground. The flow in this region is analyzed by a momentum jet model with an equivalent circular cross section. (Albertson et al 1950) At the point of impact the concentration is approximately 37 percent CO_2.

It is assumed that wind effects are limited to preventing a portion of the air-CO_2 mixture from escaping by flowing down the passageway away from the yard (emergency generator fuel oil storage area). This assumption produces the worst case condition of directing all the air-CO_2 mixture into the yard. A stabilized pool of the mixture will eventually occupy the semi-enclosed yard. A density-induced flow allows the air-CO_2 mixture to escape from the yard to an open area.

The propensity to locally entrain the air-CO_2 mixture into the superposed (upper) air layer and thence into the diesel generator air intake is analyzed by a selective withdrawal model. (Harleman 1969).

The results of the analysis show that the limiting withdrawal rate is larger than the maximum air inflow rate of the diesel engine air intake. Consequently, the air-CO_2 mixture in the yard will not be drawn into the air intake and will not affect the performance of the diesel generator.

References

Albertson, M.L., Dai, Y.B., Jensen, R.A., and Rouse, H., Diffusion of Submerged Jets. Trans. ASCE, Vol 115, 1950.

Harleman, D.R.F., Section 26 - Stratified Flow, from Handbook of Fluid Dynamics, ed. V.L. Otruter, 1969.

place in reference section

intercepts particulate matter before it reaches the diesel combustion chambers. Filter differential pressure is sensed by a differential pressure switch which actuates a high differential pressure alarm locally and in the control room alerting operators. Surveillance will be performed during diesel monthly availability testing (Section 8.3) to ensure diesel generator availability on demand. 430.129

INSERT lines 1.46 - 1.56 here plus Insert A

The point of exhaust of combustion gases to the atmosphere is 27-1/2 feet above the combustion air intake; therefore, oxygen content requirements for combustion are not restricted.

Insert B

The emergency diesel generator exhaust is also equipped with a normally open low point drain. Any frozen precipitation would be melted during the monthly diesel generator availability tests and drained through the diesel exhaust low point drain. Due to the large exhaust pipe diameter, it is not credible that any precipitation which collects and freezes, before it can pass through the drain line, will be sufficient to cause exhaust restriction. In addition, running of the diesel generator for availability testing will blow collected dust out of the exhaust. Therefore, clogging of the exhaust pipe with snow is not a problem. 430.129

The emergency generator diesel engines and all auxiliary systems are designed to start and operate at rated load during a tornado which results in a decrease in atmospheric pressure of 3 psi in 3 seconds. Damage to the diesel exhaust pipe by a postulated tornado missile has been considered. A tornado-protected access hatch will be manually opened during alerts, functioning as an exhaust bypass that will provide a secondary exhaust path in the event the primary path is damaged by a tornado missile.

The possibility of pipe whip does not exist in either emergency generator enclosure. All combustion air intake equipment and ductwork and the exhaust equipment and piping are seismically designed. There are no gas storage tanks in the vicinity of the emergency diesel generator enclosure which eliminates the possibility of any accidental gas release at the combustion air intake.

9.5.8.4 Inspection and Testing Requirements

The emergency generator combustion air intake and exahust system is tested and inspected at the same time as the emergency generator set (Section 8.3.2).

9.5.8.5 Instrumentation Requirements

The emergency diesel combustion air intake and exahust system operations parameters are monitored, indicated, recorded, and controlled as follows:

The combustion air intake and exhaust system is available when the diesel engine is started.

When air is drawn in through the filter and silencer, a manometer measures pressure drop.

INSERT B

(430.129)

Each emergency diesel generator exhaust pipe is a 40" diameter pipe which protrudes about 36" over the top of the Diesel Generator enclosure. The pipe is located toward the edge of the building. Typical snowfall snow depths would not exceed 36" in a 24-hour period. In addition the plant environmental report Volume 2, Section 2.3.1.9 indicates a maximum snowfall depth of 48" in 2 days. Based on past experience with the Millstone Units 1 and 2 Diesel Generators, (whose stacks are significantly smaller in diameter), snow accumulation in exhaust pipes has not been a problem. Since the exhaust pipes are located close to the edge of the building, drifting of snow into the pipes is not likely.

TABLE 9.5-10

COOLING WATER SYSTEM LEAKAGES

Type of Leakage		Means Used to Detect	Corrective Measures	Permissible Inleakage or Outleakage
1. Jacket water into lube oil system (standby mode)	a.	Lube oil moisture detector	Repair cooler leak and clean	Lube oil water content of 0.5 percent maximum
	b.	Visual inspections of lube oil sump tank (abnormal level) and color of oil (greyish of yellow-brownish tint if water is polluted)		
	c.	Periodic testing of the lube oil quality		
2. Lube oil into the jacket water system (operating mode)	a.	Periodic testing of the jacket water quality	Repair cooler leak and clean	Any significant lube oil leakage which results in visual detection in expansion tank sight glass
	b.	Visual inspection of expansion tank water		
3. Jacket water into the engine air intake and governor systems (operating or standby mode) lube oil	a.	Visual inspection of turbocharger jackets	Repair defective turbocharger or governor lube oil cooler	Lube oil water content of 0.5 percent maximum
	b.	Periodic testing of the governor lube oil quality		
4. Jacket water/service water systems	a.	Periodic testing of the jacket water quality	Repair leak in jacket water cooler or engine air cooler water heat exchanger	Any leakage which results in exceeding manufacturer's water quality limits
	b.	High level in the expansion tank		