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July 16, 1984

United States Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. George W. Knighton, Chief
Licensing Branch 3
Office of Nuclear Reactor Regulation

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
Response to NRC Questions

Gentlemen:

Attached are additional revised responses to Power Systems Branch Mechanical Section questions. These responses were revised to satisfy reviewer's concerns provided informally during a meeting with DLC staff. Since all review results to date have been provided only on an informal basis during this review and no draft SER was provided, future NRC concerns in this area must be submitted to DLC formally and must provide a precise definition of the specific issue remaining to be resolved and its regulatory basis. This information will provide DLC with the necessary material to provide suitable responses in an efficient manner to support NRR review and the licensing schedule.

Also attached is a response to Question 311.9 concerning the probability analysis for the relocated Mobil pipeline. The attached material is presently planned for inclusion in FSAR Amendment 8.

DUQUESNE LIGHT COMPANY

By E. J. Woolever
E. J. Woolever
Vice President

GLB/wjs
Attachment

cc: Mr. H. R. Denton, Director (NRR) (w/a)
Mr. D. Eisenhut, Director Division of Licensing (w/a)
Ms. M. Ley, Project Manager (w/a)
Mr. E. A. Licitra, Project Manager (w/a)
Mr. G. Walton, NRC Resident Inspector (w/a)

B001 1/1 Aperture Card Dist Drawings (orig Encl) TO: Reg Files

GLB/wjs
NR/NRC/RSP/QSTN
Attachment

bcc: J. J. Carey (w/o attachment)
G. I. Rifendifer "
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T. J. Lex (W) "
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NCD File "

NRC Letter: May 21, 1984 1.9

Question 311.9 (Section 2.2.3) 1.10

Amendment No. 6 of the Beaver Valley Unit No. 2 FSAR provides a 1.11
probability analysis of the relocated Mobil Oil gasoline pipeline 1.12
based on the failure rate of nuclear reactor grade pipes that is
referenced on page 2.2-20 of the FSAR. 1.13

Since petroleum product pipelines are subjected to different 1.14
environmental conditions, and are constructed of different materials 1.15
and to different specifications than reactor grade piping, we do not
believe that you use of this probability reference is valid. 1.16

Please provide a pipeline failure analysis based on accident 1.17
statistics from the National Transportation Board for pipelines of 1.18
the same materials and methods of welding as was in the relocated
Mobil Oil Company pipeline.

Response: 1.19

The use of the WASH-1400 (Appendices III and IV) pipe failure rate 1.20
data in Section 2.2.3 is valid for the probabilistic failure modeling 1.21
of the Mobil Pipeline. It is valid because the failure rate data 1.23
reported in Table III 2-1 of Appendices III and IV of WASH-1400 is
derived from generic industry sources, which includes the nuclear 1.24
industry.

When the WASH-1400 report was prepared in the early 1970s, there were 1.25
few failure rate data available from the operation of nuclear power 1.27
plants. The authors of WASH-1400 acknowledged this situation. The 1.29
authors of the WASH-1400 report clearly indicate the sources of the
failure rate data in the following paragraph taken from page III-3 of 1.30
the report:

"The failure rates and demand probabilities used in the study were 1.31
derived from handbooks, reports, operating experience, and nuclear 1.32
power plant experience. The date sources involved Department of 1.33
Defense data (Navy, Airforce, etc.), NASA data, and general
industrial operating experience as well as nuclear power plant data. 1.35
The assessment process entailed an amalgamation of this information 1.36
to obtain final ranges which described regions in which the data had 1.37
a high probability of lying."

Engineering literature is replete with examples where the failure 1.38
rate data from WASH-1400 has been used for this type of probabilistic 1.40
risk assessment of non-nuclear pipeline systems. For example, a 1.41
report entitled "LNG Terminal Risk Assessment Study for Los Angeles
California," prepared by Science Applications Inc., has used failure 1.43
rate data from WASH-1400 to evaluate the risk to the general public 1.44
from a natural gas processing and delivery facility located at Los 1.45
Angeles Harbor.

The installation procedures and operation of pipelines used for 1.46
transporting flammable liquids and gases are governed by the Code of 1.48
Federal Regulations (CFR). Welds in such pipelines are inspected 1.49
using nondestructive test procedures following CFR 195.234. Also, 1.51
CFR Sections 195.238 and 195.242 require the installation of external
coatings and cathodic protection on pipelines in order to mitigate 1.53
corrosion. These regulatory practices are designed to reduce the 1.54
failure rates of pipelines. The Mobil Pipeline near BVPS-2 was 1.55
installed and is operated according to the applicable regulations. 1.56
Because the Mobil Pipeline is a new installation, the application of 1.57
failure rate data of existing piping taken from WASH-1400 provides a 2.1
conservative estimate of the failure probability. The development of 2.2
failure rates for buried pipelines using data from the U.S.
Department of Transportation would not necessarily improve the 2.4
accuracy of the analysis. Because the data would have to be reduced, 2.5
selecting only cases with pipe materials, corrosion protection, and 2.6
length of service similar to the Mobil Pipeline, only a limited 2.8
amount of directly applicable data is likely to result. This would 2.9
create large uncertainties in probabilistic failure modeling. 2.10

The information above provides justification for the use of pipe 2.11
failure rate data from WASH-1400 for the probabilistic failure 2.12
analysis of the Mobil Pipeline. The analysis demonstrated that a 2.13
rupture of the pipeline in the vicinity of BVPS-2 is a low- 2.14
probability event and therefore unlikely. However, a number of 2.15
accident scenarios were postulated to evaluate the consequences
should the pipeline rupture. The accident scenarios and their 2.16
consequences are discussed in response to FSAR Questions 311.6 and
311.7. The results of the analyses show that the pressures and fire 2.17
radiation resulting from gasoline explosions are not a safety concern 2.18
to the BVPS-2 structures.

NRC Letter: September 19, 1983 1.9

Question 430.54 (Section 8.3) 1.13

Periodic testing and test loading of an emergency diesel generator in 1.14
a nuclear power plant is a necessary function to demonstrate the 1.15
operability, capability and availability of the unit on demand.
Periodic testing coupled with good preventive maintenance practices 1.16
will assure optimum equipment readiness and availability on demand. 1.17
This is the desired goal. 1.18

To achieve this optimum equipment readiness status the following 1.19
requirements should be met:

1. The equipment should be tested with a minimum loading of 1.21
25 percent of rated load. No load or light load operation 1.22
will cause incomplete combustion of fuel resulting in the
formation of gum and varnish deposits on the cylinder walls, 1.23
intake and exhaust valves, pistons and piston rings, etc.,
and accumulation of unburned fuel in the turbocharger and 1.24
exhaust system. The consequences of no load or light load 1.25
operation are potential equipment failure due to the gum and
varnish deposits and fire in the engine exhaust system. 1.26

2. Periodic surveillance testing should be performed in 1.31
accordance with the applicable NRC guidelines (R.G. 1.108),
and with the recommendations of the engine manufacturer. 1.32
Conflicts between any such recommendations and the NRC 1.33
guidelines, particularly with respect to test frequency,
loading and duration, should be identified and justified. 1.34

3. Preventive maintenance should go beyond the normal routine 1.35
adjustments, servicing and repair of components when a
malfunction occurs. Preventive maintenance should encompass 1.37
investigative testing of components which have a history of
repeated malfunctioning and require constant attention and 1.38
repair. In such cases consideration should be given to 1.39
replacement of those components with other products which
have a record of demonstrated reliability, rather than 1.40
repetitive repair and maintenance of the existing
components. Testing of the unit after adjustments or 1.41
repairs have been made only confirms that the equipment is
operable and does not necessarily mean that the root cause 1.42
of the problem has been eliminated or alleviated.

4. Upon completion of repairs or maintenance and prior to an 1.43
actual start, run, and load test a final equipment check
should be made to assure that all electrical circuits are 1.44
functional, i.e., fuses are in place, switches and circuit
breakers are in their proper position, no loose wires, all 1.45
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 tested, return the unit to ready automatic standby service and under the control of the control room operator.

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 the above requirements be enforced (SRP 8.3.1, Parts II and III).

Response:

Periodic testing and/or testing after troubleshooting or repair of the emergency diesel generators (EDG) is performed in accordance with the appropriate Station Operating and Surveillance Procedures. Loading of the emergency diesel generators for test purposes is performed at no less than 25 percent and no greater than 100 percent of rated load. Refer to the response provided for Question 430.25 for the applicable time periods when the emergency diesel generator is permitted to operate at no load conditions.

Surveillance testing and inspection of the emergency diesel generators is performed at the required intervals in accordance with the appropriate formalized Maintenance Surveillance Procedures and Operations Surveillance Test program. (Refer also to the response provided for Question 430.25).

The Maintenance Program requires review of all completed work requests for repeat malfunctions. An equipment failure trend analysis is performed to identify components that should be examined for possible replacement by more reliable items. This activity includes reviews of LERs, other plant common experiences, and communication with vendors to establish root causes and replacement criteria. The NPRDS program is also used to document equipment failures and maintenance problem areas.

A threefold approach is utilized to ensure equipment is properly returned to service following a maintenance outage. All safety-related work involving disassembly, repair, and reassembly is done with prepared procedures to ensure that all equipment repairs reestablish initial conditions (wires reconnected, etc). All equipment outage requests are controlled utilizing the station clearance procedures, which document the steps necessary to both remove and then return the equipment to service. The equipment clearance procedures itemize the specific fuses, switches, breakers, valves, etc., that must be realigned to return the emergency diesel generator electrical and mechanical systems to service. Finally the maintenance work request (MWR), which was used as the work authorization and control document, identifies the testing required to declare the equipment operable. When the MWR is prepared, applicable post-maintenance testing requirements, such as operations

NRC Letter: September 19, 1983 1.9

Question 430.55 (Section 8.3) 1.13

The availability on demand of an emergency diesel generator is 1.14
dependent upon, among other things, the proper functioning of its 1.15
controls and monitoring instrumentation. This equipment is generally 1.16
panel mounted and in some instances the panels are mounted directly
on the diesel generator skid. Major diesel engine damage has 1.18
occurred at some operating plants from vibration induced wear on skid
mounted control and monitoring instrumentation. This sensitive 1.20
instrumentation is not made to withstand and function accurately for
prolonged periods under continuous vibrational stresses normally 1.21
encountered with internal combustion engines. Operation of sensitive 1.22
instrumentation under this environment rapidly deteriorates
calibration, accuracy and control signal output. 1.23

Therefore, except for sensors and other equipment that must be 1.24
directly mounted on the engine or associated piping, the controls and 1.25
monitoring instrumentation should be installed on a free standing
floor mounted panel separate from the engine skids, and located on a 1.26
vibration free floor area. If the floor is not vibration free, the 1.27
panel shall be equipped with vibration mounts.

Confirm your compliance with the above requirement or provide 1.28
justification for noncompliance (SRP 8.3.1, Parts II and III). 1.29

Response: 1.30

Controls and monitoring equipment, which are not required to be 1.31
directly mounted on the engine or associated piping, will have their 1.32
vibration levels monitored during the diesel generator testing period
to ascertain if these vibration level values are within the 1.33
acceptable vibration level vaules furnished by the vendor.

Should these vibration values exceed the vendor's recommended values, 1.34
then the subject equipment will be removed from the engine skid and 1.35
mounted in a free-standing or wall-mounted seimsically qualified
configuration.

NRC Letter: September 19, 1983

Question 430.56 (Section 9.5.2)

The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

1. Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe cold plant shutdown.

2. Indicate the maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.

3. Indicate the type of communication systems available at each of the above identified working stations.

4. Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:

    a. Page party communications systems, and

    b. Any other additional communication system provided that working station.

5. Describe the performance requirements and tests that the above onsite working stations communication systems will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions (SRP 9.5.2, Parts II and III).

Response:

1. The working station on the plant site where it may be necessary for plant personnel to communicate with the main control room or the emergency shutdown panel area during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe, cold plant shutdown is tabulated in Table Q430.56-1.

2. The in-plant station is located in a totally enclosed area which contains electrical panels and other switching devices required for a safe shutdown of BVPS-2. No increase in noise levels is expected in this area during transient or accident conditions.

The estimated maximum ambient sound level that could exist at the 1.56
working station is tabulated in Table Q430.56-1.

The estimated maximum sound level that could exist at task areas 1.57
(specific event-related tasks) which are identified in 1.58
Table Q430.56-2 are tabulated in Table Q430.56-3.

3. The types of communication systems available at each of the above 2.2
working stations are tabulated in Table Q430.56-1. 2.4

4. As indicated in item 2 above, the maximum expected noise level in 2.5
these areas under all plant conditions will be below 75 dBA. 2.7
Effective communications can be expected for noise levels of 90 2.8
dBA for the loudspeaker portion of the page party communication 2.9
system. The handset portion of this system would be effective 2.10
under higher noise levels. Effective handset communications can 2.11
be expected for the fixed radio and PAX telephone systems for 2.12
noise levels of 87 dB (flat response scale). Effective 2.13
communications can be expected using the double ear-cup headsets
of the calibration jack system for noise levels up to 110 dBA. 2.14

Estimated maximum sound levels that could exist at work stations 2.16
listed in Table Q430.56-1 while permitting effective 2.17
communication are tabulated in Table Q430.56-1.

Estimated maximum sound levels that could exist at task areas 2.18
(specific event-related tasks) which are identified in
Table Q430.56-2 while permitting effective communication are 2.19
tabulated in Table Q430.56-4.

Preoperational testing of the page party system, calibration jack 2.20
system, and PAX telephone system will verify that effective 2.21
communications can be established from all work stations and task
areas.

5. The performance requirements and tests are outlined in test 2.23
specifications for the communications systems, TSP No. 2-TSP-COS- 2.24
40A.A through TSP No. 2-COS-40A-H, and includes insulation 2.25
resistance tests of all power and communications cables and
operability tests for paging and voice telephone communications. 2.26

Refer to Section 14.2.12.57.1, which addresses testing that 2.28
verifies adequate communications coverage and reliability as 2.29
required by Regulatory Guide 1.108. 1.68

TABLE Q430.56-1

COMMUNICATION SYSTEM TYPE*

Working Station	(Effective Communication Sound Level-dBA) Voice Paging	Calibration Jack	PAX Telephone	Estimated Maximum Ambient Sound Levels (dBA)
Main control room (Control bldg-El 735'-6")	Yes (90)	Yes (110)	Yes (87)	60-65
Working station where it may be necessary for plant personnel to communicate with the main control room or emergency shutdown panel area				
Alternate shutdown panel (Auxiliary Bldg-El 755'-6")	Yes (90)	Yes (110)		60-65

NOTE:

*Effective communication sound levels are based on using a double ear-cup headset.

TABLE Q430.56-2

TASK AREAS/COMMUNICATION SYSTEMS

Task Area	Elev	Fire Area	Page Party	Calibration Jack	PAX Telephone
Control Bldg	707-6	CB-1	Yes	Yes	Yes
	725-6	CB-2	Yes	NA	NA
	735-6	CB-3	Yes	Yes	Yes
Auxiliary Bldg	710-6	PA-3	Yes	Yes	Yes
	735-6	PA-3	Yes	Yes	Yes
	755-6	PA-4	Yes	Yes	Yes
	773-6	PA-5	Yes	Yes	Yes
	755-6	PA-6	Yes	Yes	No
	755-6	PA-7	Yes	Yes	No
Service Bldg	730-6	SB-1	Yes	Yes	Yes
	730-6	SB-2	Yes	Yes	Yes
Diesel Generator Bldg	730-6	DG-1	Yes	Yes	Yes
	730-6	DG-2	Yes	Yes	Yes
Cable Vault and Rod Control Area	735-6	CV-1	Spkr only	Yes	No
	735-6	CV-2	Yes	Yes	No
	755-6	CV-3	Yes	Yes	Yes
	773-6	CV-5	Yes	Yes	Yes
Main Steam Valve Area	773-6	MS-1	Yes	Yes	Yes
Safeguards Area	718-6	SG-IN	Yes	Yes	Yes
	718-6	SG-IS	Yes	Yes	Yes
	741-0	SG-IN	Yes	Yes	Yes
	741-0	SG-IS	Yes	Yes	Yes
Fuel Bldg	752-5	FB-1	Spkr only	Yes	No
	766-4	FB-1	Yes	Yes	No
Reactor Bldg	692-11	RC-1	Yes	Yes	Yes
	718-6	RC-1	Yes	Yes	Yes
	738-10	RC-1	Yes	Yes	Yes
	767-10	RC-1	Yes	Yes	Yes

TABLE Q430.56-3

TASK AREAS/SOUND LEVELS

Task Areas	Elev (ft-in)	Fire Area	Estimated Maximum Sound Level (dBA)
Control Bldg	707-6	CB-1	60-65
	725-6	CB-2	60-65
	735-6	CB-3	60-65
Auxiliary Bldg	710-6	PA-3	80-90
	735-6	PA-3	75-80
	755-6	PA-4	80-85
	773-6	PA-5	80-85
	755-6	PA-6	75-80
	755-6	PA-7	75-80
Service Bldg	730-6	SB-1	75-80
	730-6	SB-2	75-80
Diesel Generator Bldg	730-6	DG-1	100-105
	730-6	DG-2	100-105
Cable Vault and Rod Control Area	735-6	CV-1	75-80
	735-6	CV-2	75-80
	755-6	CV-3	70-75
	773-6	CV-5	75-80
Main Steam Valve Area	773-6	MS-1	100-105
Safeguards Area	718-6	SG-1N	95-100
	718-6	SG-1S	95-100
	741-0	SG-1N	85-95
	741-0	SG-1S	85-95
Fuel Bldg	752-5	FB-1	85-90
	766-4	FB-1	85-90
Reactor Bldg	692-11	RC-1	90-05
	718-6	RC-1	100-105
	738-10	RC-1	100-105
	767-10	RC-1	90-95

TABLE Q430.56-4

TASK AREAS/EFFECTIVE COMMUNICATION
SOUND LEVELS

Task Area	Elev (ft-in)	Fire Area	Page Party	Calibration Jack*	PAX Telephone
Control Bldg	707-6	CB-1	90	110	87
	725-6	CB-2	90	NA	NA
	735-6	CB-3	90	110	87
Auxiliary Bldg	710-6	PA-3	90	110	87
	735-6	PA-3	90	110	87
	755-6	PA-4	90	110	87
	773-6	PA-5	90	110	87
	755-6	PA-6	90	110	NA
	755-6	PA-7	90	110	NA
Service Bldg	730-6	SB-1	90	110	87
	730-6	SB-2	90	110	87
Diesel Generator Bldg	730-6	DG-1	90	110	87
	730-6	DG-2	90	110	87
Cable Vault and Rod Control Area	735-6	CV-1	90	110	NA
	735-6	CV-2	90	110	NA
	755-6	CV-3	90	110	87
	773-6	CV-5	90	110	87
Main Steam Valve Area	773-6	MS-1	90	110	87
Safeguards Area	718-6	SG-1N	90	110	87
	718-6	SG-1S	90	110	87
	741-0	SG-1N	90	110	87
	741-0	SG-1S	90	110	87
Fuel Bldg	752-5	FB-1	90	110	NA
	766-4	FB-1	90	110	NA
Reactor Bldg	692-11	RC-1	90	110	87
	718-6	RC-1	90	110	87
	738-10	RC-1	90	110	87
	767-10	RC-1	90	110	87

Note:

*Double ear-cup headset

NRC Letter: September 19, 1983 1.9

Question 430.57 (SRP 9.5.2) 1.13

Discuss the protective measures taken to assure a functionally 1.14
operable onsite and offsite communication system. The discussion 1.16
should include the consideration system. The discussion should 1.17
include the considerations given to component failures, loss of
power, the severing of communication lines or trunks as a result of 1.18
an accident or fire, and any sharing with the Unit 1 communication
systems and their power sources (SRP 9.5.2, Part II). 1.19

Response: 1.20

A fire or accident in a localized area of the plant, individual trunk 1.21
line, or duct line will not substantially impact the capability of 1.22
the integrated communication system to provide effective
communication between plant personnel. The integrated communication 1.23
system is comprised of separate and independent systems. Component 1.24
failures in one of these systems will have a limited effect on that
system and no effect on other communication systems. 1.25

Localized loss of normal plant power would have limited effect on the 1.26
overall plant communication capabilities due to diesel generator and 1.27
battery backing of the various systems.

The page party and calibration jack systems are powered from the 1.28
essential bus, which is backed by the plant onsite, nonsafety-related 1.29
diesel generator. The PAX telephone and fixed radio systems are 1.31
powered from a BVPS-1 48 V dc dedicated communication battery/charger
system. The microwave radio system is powered from a BVPS-1 48 V dc 1.33
dedicated switchyard battery/charger system.

The page party systems for BVPS-1 and BVPS-2 are totally separate and 1.34
independent, with a capability to merge or isolate the two systems. 1.35
The PAX telephone system and the radio systems serve BVPS-1 and BVPS- 1.36
2.

A fire or accident in the control building or cable tunnel will have 1.37
a limited effect on the calibration jack system and no effect on the 1.38
page party system. A cold shutdown can be achieved by operator 1.39
action at the alternate shutdown panel in the auxiliary building. A 1.40
cut off switch located at the alternate shutdown panel will isolate
the calibration jack and page party trunk lines to the control 1.41
building from all other plant work stations. Plant work stations 1.43
and task areas are tabulated in Tables Q430.56-1 and Q430.56-2,
respectively.

A fire or accident in any other localized plant area that may cause 1.44
the severing of communication lines may impact the capability of 1.45
using the calibration jack and page party systems. The PAX telephone 1.46

system would be affected only in that localized plant area where the accident occurred.

The PAX telephones and hand-held portable radios may be used to 1.47
provide functionally operable onsite and offsite communications while 1.48
achieving and maintaining a cold shutdown.

NRC Letter: September 19, 1983 1.9

Question 430.58 (Section 9.5.2) 1.13

The description of the intraplant and interplant (plant to offsite) 1.14
communication systems is inadequate. Provide a detailed description 1.15
for each communication system listed in Section 9.5.2.2 of the FSAR.
The detailed description shall include an identification and 1.16
description of each system's power source, a description of each 1.17
system's components (headsets, handsets, switchboards, amplifiers,
consoles, handheld radios, etc), location of major components (power 1.18
sources, consoles, etc) and interfaces between the various systems
(SRP 9.5.2, Parts II and III). 1.19

Response: 1.20

These are the descriptions, in greater detail, of the intraplant and 1.21
interplant (plant-to-offsite) communications systems 1.22

Intraplant Communcations Systems 1.23

The intraplant communications consist of the following systems: page 1.25
party system, calibration jack system, radio system, and private
automatic exchange (PAX) telephone system. 1.26

Page Party System 1.28

In addition to the information provided in Section 9.5.2.2.1.1, the 1.29
page party system (PPS) consists of amplifiers, handset stations, 1.30
loudspeakers, and special components, such as alarm tone generators, 1.31
merge/isolate cabinets, and various controls. Two communication 1.32
consoles house page party equipment, one located in the main control
room and one located in the Shift Supervisor's office. Control 1.34
switches are provided at these consoles to enable use of the BVPS-2
PPS. In addition, handsets and loudspeakers are located at the 1.35
onsite working stations (refer to the response provided for Question 1.36
430.56, Amendment 4) and throughout the plant areas of BVPS-2. 1.37
Controls for merging or isolating the BVPS-1 and BVPS-2 page party 1.38
systems are located at the communication console in the main control 1.39
room, at the auxiliary shutdown panel in BVPS-1, and at the alternate 1.40
shutdown panel (ASP) of BVPS-2.

The PPS is powered from the essential bus panels 5D and 6D, which are 1.41
located on the 707 feet-6 inches elevation of the control building. 1.42
The essential bus is fed from 480 V unit substation 2-5, which is 1.43
ultimately backed by the onsite, nonsafety-related diesel generator. 1.44

Calibration Jack System 1.46

In addition to the description in Section 9.5.2.2.1.2, the 1.47
calibration jack system is a separately installed system. Jacks are 1.50

located throughout all areas of the plant and, in particular, are
provided on the communication console in the main control room, the 1.51
ESP area of BVPS-2, the Class 1E switchgear area, and the essential 1.52
bus inverter and rectifier area of BVPS-2.

The major components of the system are headset/amplifiers, system 1.53
power supplies (one for each of two channels), phone jacks, and a 1.54
paging interface network.

In order to facilitate arranging communications on the jack system, a 1.55
tie is provided to the PPS to enable paging via any headset/amplifier 1.57
set connected at any jack location in the system.

The calibration jack system is powered from the essential bus panel 1.58
2-6D, which is backed by the onsite nonsafety-related diesel 2.1
generator.

<u>Radio System</u> 2.3

The radio system is shared with BVPS-1 and is described in Section 2.4
9.5.2.2.1.3. An additional remote console is provided at the 2.6
emergency shutdown panel (ESP) area of BVPS-2 at the Emergency 2.7
Response Facility (ERF) and at the Secondary Emergency Response
Center approximately 10 miles away from BVPS-2 at South Heights, 2.8
Pennsylvania.

The existing VHF remote consoles are located at the communications 2.9
console 1 in the main control room, communications console 2 in the 2.10
Shift Supervisor's office, and at the BVPS-1 auxiliary shutdown 2.11
panel.

All of the above remote consoles are connected to two separate 2.12
control lines. One control line is connected to VHF high band radio 2.13
transmitter/receiver and is the primary radio station for BVPS-1 and 2.14
BVPS-2. The other control line, selectable by a switch, is connected 2.15
to a VHF low band radio transmitter receiver and is a secondary radio 2.16
system for BVPS-1 and BVPS-2. Both of these base radios are in the 2.17
radio building. Each remote console has two speakers so that 2.18
messages can be received from both the primary and secondary base 2.19
stations. The switch selection is identified by lights on the 2.20
console.

The primary radio station can communicate directly with the DLC 2.21
System Control Center, the Pennsylvania Emergency Management Agency, 2.22
the West Virginia Emergency Services Agency, and the Ohio Disaster 2.23
Service Agency, all of which are within the 10 mile radius of the 2.24
plant.

The consoles within BVPS-2 are powered from a 120 V ac essential bus 2.25
backed by the onsite, nonsafety-related diesel generator. 2.26

The radio control circuits at the plant and the radio building are 2.27
powered by a 48 V dc dedicated communication battery/charger system. 2.28
The batteries are sized to run the system 8 hours if the ac source is 2.29
lost.

There is a high band base radio transmitter/receiver in the main 2.30
control room. The antenna for this station is on the roof of the 2.31
plant. The radio is for emergency use in the event of losing both 2.32
radio transmitter/receiver stations. 2.33

The security radio has a main and a backup repeater station. The 2.36
power for each is an ac to dc converter with a battery backup. These 2.37
batteries are sized to run the system 8 hours if the ac source is
lost. Hand-held units key the repeaters, which retransmits all 2.38
messages to give better radio reception in the plant area. 2.39

<u>PAX Telephone System</u> 2.41

The PAX telephone system is described in Section 9.5.2.2.1.4. The 2.43
PAX system is a commercial-type telephone network consisting of an 2.45
onsite switchboard located in the communication area of BVPS-1 that
provides telephone service to BVPS-2 dial-type telephone handsets. 2.46

PAX telephones are located at the communication consoles in the main 2.47
control room, at the Shift Supervisor's office, and at the auxiliary 2.48
shutdown panel. PAX phones are also located at the BVPS-2 alternate 2.49
shutdown panel, the ESP, and the essential bus inverter and rectifier 2.50
area.

Telephones are located throughout BVPS-2 and associate buildings on 2.51
the site. The primary plant telephone system consists of 100 line, 2.52
rotary type telephone switchboard. This switchboard is powered from 2.54
a 48 V dc source.

The 48 V dc source is obtained from a 120 V ac to 48 V dc converter. 3.2
The converter supplies 48 V dc operating power to the switchboard and 3.3
current to keep 48 V battery bank fully charged. The battery bank 3.5
operates in parallel with the converter and maintains full power to
the switchboard for a minimum of 8 hours in the event of a converter 3.6
failure or a loss of ac power to the converter. The converter is 3.8
connected to the vital ac bus. The converter is sized to provide 3.9
full power to the switchboard and simultaneously recharge the battery 3.10
from fully discharged to fully charged within 24 hours. This power 3.11
system is shared with BVPS-1 telephone switchboard, which has an
indentical 100 line telephone switchboard. 3.12

The BVPS-1 and BVPS-2 switchboards are interconnected so that 3.13
incoming and outgoing calls can be completed even with a failure of 3.14
either switchboard. All of the common switchboard equipment for 3.15
BVPS-2, such as ringers, dial tone, etc, are provided with standby 3.16
units. The telephone lines from the BVPS-2 switchboard to various 3.17
parts of the plant are fed radially and are in separate conduits. 3.18

The loss of a cable within the plant would not affect more than six 3.19
telephones. Most of the telephone cables only serve two or three 3.20
telephones. The 20 trunk lines to the switchboard leaves the plant 3.21
in 2 separate cables in separate underground duct runs. These trunks 3.23
tie to a 1,000 line switch at the ERF. The loss of one cable would 3.24
only reduce the number of trunk lines to the plant. The trunk lines 3.25
tie to the DLC telephone system and to the local and long distance
Bell Telephone system network. 3.26

There is an independent telephone system between the BVPS-2 main 3.27
control room and the containment building. Telephones on this system 3.29
are located in the main control room, containment building, personnel 3.30
hatch, and emergency air lock. The system is powered from the 3.31
essential ac bus. If the telephone handset is lifted at any one of 3.32
the four locations, it automatically rings at the other two 3.33
locations.

Direct telephone lines from the ERF switchboard to key plant 3.34
personnel in the administration building have been established. This 3.36
is in addition to a 120 line solid-state telephone switchboard
dedicated to the administration building. This switchboard is 3.38
connected via trunk circuits to the ERF 1,000 line switchboard, which
in turn connects to all the DLC communication systems and the Bell 3.39
Telephone system network. The 1,000 line switchboard at the ERF has 3.41
redundant equipment. The ERF switchboard is connected to the DLC 3.42
network and the Bell system with a large number of trunks. 3.43

The administration building switchboard is powered by 48 V dc from an 3.44
ac to dc converter operating in parallel with a 48 V battery system. 3.45
The 48 V battery can operate the system for 8 hours in the event of 3.46
an ac power failure. 3.47

A direct telephone system is provided between the ERF and the main 3.48
control room. These lines are established for emergency use. 3.49
Personnel in the ERF can access one of six lines to the control room. 3.50
In the control room, two of these lines appear on the operator's 3.51
desk, two on the Shift Supervisor's desk, and two in the computer 3.52
room. Lifting the handset at either end will automatically ring the 3.53
respective line at the other end. This system is powered from the 3.55
essential bus at the ERF end and from the vital bus at the BVPS 3.56
end.

A direct telephone line is connected to the DLC system control center 3.57
from the BVPS-2 control room. This line is powered by dry cell 4.1
batteries and has a separate signaling system.

Plant-to-Offsite Communications Systems 4.3

Information regarding plant-to-offsite communications systems is 4.4
described in the Emergency Preparedness Plan and has been 4.5
successfully reviewed in accordance with SRP 13.3. SRP 9.5.2 4.7

indicates that the emergency preparedness licensing branch should
review plant-to-offsite communications as part of their 4.8
responsibility under SRP 13.3. No acceptance criteria or review 4.9
procedures applicable to plant-to-offsite communications systems are
provided in SRP 9.5.2 and conclusions presented in the "Evaluation 4.10
Findings" section of SRP 9.5.2 pertain only to the areas of review 4.11
already performed under SRP 13.3.

The plant-to-offsite communications consist of the following separate 4.12
and diverse systems: commercial telephone land-line system, plant- 4.15
to-offsite radio system, microwave system, system operator telephone 4.17
system, and PAX telephone system.

Commercial Telephone Land-Line System 4.19

Selected locations in the plant are provided with commercial 4.21
telephone company voice circuits and telephone handsets. Components 4.25
of this system are the handsets and their cabling system throughout
the plant. The main control room, Shift Supervisor's office, plant 4.26
offices, and security office are also served by the Bell Telephone 4.27
system. The Bell system cables are in separate manholes and are 4.28
independent of the DLC telephone system. The talk circuit and ringer 4.30
power for single lines is from the Bell system's central office. 4.31
Power for lights and ringer on key set telephones is from the BVPS-2 4.32
essential bus.

Plant-to-Offsite Radio System 4.34

The main components of the system are described in Section 4.35
9.5.2.2.2.2.

This radio system is powered from the 48 V dc dedicated communication 4.37
battery/charger system. 4.38

Microwave System 4.40

The microwave system is a shared facility with BVPS-1. It is 4.42
comprised of microwave radios (located at the switchyard relay house) 4.44
and their affiliated circuits.

The microwave radios are powered from a BVPS-1 48 V dc dedicated 4.45
switchyard battery/charger system. 4.46

System Operator Telephone System 4.48

The system operator telephone is located on the communication console 4.49
in the main control room. It is a direct link, via hardwire and 4.52
microwave radio, to the DLC dispatcher. It is separated from all 4.53
other telephone systems and powered by two dedicated No. 6 dry cells. 4.54

NRC Letter: September 19, 1983 1.10

Question 430.59 (SRP 9.5.2) 1.14

In Section 9.5.2.2.1.2 of the FSAR, you state that during emergency 1.15
or accident conditions the calibration jack "...system can be used as 1.16
an alternate means to relay messages between different areas of the
plant." Decribe how the relaying or messages using the calibration 1.17
jack system will be accomplished for those areas specified in Request 1.18
430.57 above. The description should include the maximum number of 1.19
plant personnel needed to relay the messages, the procedures, if any, 1.20
that will be used in setting-up and using the relay, and assurances
that adequate station personnel will be onsite in the event that the 1.21
relay system must be used (SRP 9.5.2, Part II).

Response: 1.22

The calibration jack system is an installed network of phone jacks 1.23
and cabling with power supplies provided across the voice circuits. 1.24
Two voice circuits are available at each jack station. 1.25
Headset/amplifier units can be connected to the network at any jack 1.26
location, enabling communications to take place between two or more 1.27
jack station locations.

In the event of an emergency, the jack system could be called upon as 1.28
an additional or alternate means of communicating between preselected 1.29
locations in the plant. For example, if a fire situation occurred in 1.30
a plant building, a convenient jack station at the fire brigade 1.31
staging area could be designated, and an individual dispatched to the
location to establish a direct communication link to the main control 1.32
room or emergency shutdown panel area. It is not envisioned that 1.34
this would be the primary means of communication, but could be used 1.35
in addition to or in place of page party, radio, or telephone.

Section 9.5.2.2.1.2, which states that during emergency or accident 1.36
conditions the calibration jack "...system can be used as an 1.37
alternate means to relay messages between different areas of the
plant," has been revised to, "...system can be used as an alternate 1.38
means of communications between two or more areas of the plant."
SRP 9.5.2 is devoted to the design of communications systems and 1.39
provides no criteria for such items as staffing.

NRC Letter: September 19, 1983 1.9

Question 430.60 (SRP 9.5.2) 1.13

In Section 9.5.2.4 of the FSAR you state that in-service inspection 1.14
tests, preventative maintenance, and operability checks are performed 1.15
periodically to prove the availability of the communication systems.
Provide the frequency for these tests (SRP 9.5.2, Parts II and III). 1.16

Response: 1.17

All communications systems are inspected and tested (and adjusted if 1.18
required) prior to completion of installation to ensure proper 1.19
coverage and audibility. The systems described above are of 1.20
conventional design and their performance has been proven successful
at other operating plants. 1.21

The BVPS Emergency Preparedness Plan (EPP) includes implementing 1.22
procedures which prescribe the required frequency for periodic 1.23
testing of communication systems at BVPS-2. Communication systems 1.24
are tested based on their frequency of use and importance to the site
responses outlined in the EPP. Since the intra-plant communication 1.26
systems (i.e., page party system, calibration jack system, radio
system, and private automatic exchange telephone-PAX system) are used 1.27
on a daily basis, periodic testing is not required. Damaged or 1.28
broken equipment is repaired by the appropriate maintenance
organization. To ensure maximum audibility, the page party system is 1.29
tested every 4 months. All plant to off-site communication systems 1.30
in use on a daily basis (i.e., commercial telephone land line system
and system operator telephone system) are not required to be 1.31
periodically tested. The DLC radio system is tested annually in 1.32
accordance with the provisions of the FCC license. The radio 1.33
communication links between the control room, the three risk
counties, and the Pennsylvania State Police are tested weekly. The 1.35
microwave system is monitored continuously at all terminals for alarm
conditions. Monthly checks are accomplished on microwave terminals 1.36
and all terminals are inspected on a 2-year schedule by DLC
substations and shops personnel. 1.37

The Emergency Communication System (i.e., States Hotline, Nuclear 1.38
Regulatory Commission ENS Hotline, Nuclear Regulatory Commission HPN 1.39
Hotline, and the Department of Environmental Resources/Bureau of
Radiation Protection Hotline) are tested on a monthly basis in 1.40
accordance with EPP Implementing Procedures.

NRC Letter: September 19, 1983 1.9

Question 430.61 (Section 9.5.3) 1.13

Identify the vital areas and hazardous areas where emergency lighting 1.14
is needed for safe shutdown of the reactor and the evacuation of 1.15
personnel in the event of an accident. Tabulate the lighting system 1.16
provided in your design to accommodate those areas so identified.
Include the degree of compliance to Standard Review Plan 9.5.1 1.17
regarding emergency lighting requirements in the event of a fire 1.18
(SRP 9.5.3, Parts I and II).

Response: 1.19

Normal ac lighting is used throughout the plant. Backup dc lighting 1.21
is used for illumination of all personnel exits. Backup dc lighting 1.22
is used in conjunction with backup ac lighting in areas from which
safe shutdown operations may be controlled. 1.23

These safe-shutdown areas are: 1.24

1. Main control room, 1.26

2. Emergency shutdown panel area, 1.27

3. Class 1E switchgear areas, 1.28

4. Essential bus inverter and rectifier area, and 1.29

5. Alternate shutdown panel area. 1.30

Additional backup lighting in the form of sealed beam lamps powered 1.32
by individual, 8-hour rated battery packs is provided in the 1.33
following areas:

1. Personnel exits throughout the plant, and 1.35

2. Safe shutdown control areas. 1.36

These individual sealed beam/battery pack units provide 8 hours of 1.38
acceptable illumination for personnel evacuation and firefighting 1.39
activities in the event that a fire has interrupted the circuit
integrity of the backup dc and backup ac lighting systems. 1.40

The lighting system is, therefore, summarized as follows: 1.41

	Normal AC	Backup DC	Individual Sealed Beam/Battery Pack Units	Backup AC
Safe shutdown control areas	X	X	X	X
Personnel exits throughout the plant	X X	X X	X X	
Balance of plant	X			

This design is in full compliance with Standard Review Plan 9.5.1.

The following table depicts the safe shutdown control (work) stations and the two types of emergency lighting that are available in these areas to provide for safe shutdown of the reactor and the evacuation of personnel in the event of an accident:

Area/Elevation/Fire Area	Backup AC with Onsite Nonsafety Diesel Generator	Individually Sealed Beam/8 hr Rated Battery Pack Units
Main Control Room 735-6 CB-3	X	X
Emergency Shutdown Panel Area 707-6 CB-1	X	X
Alternate Shutdown Panel Area 755-6 ASP	X	X

In addition to the two power sources indicated above, the backup ac has the ability to automatically transfer to the 2-hour rated backup dc station batteries, providing for a third emergency power source.

All access and egress paths to the safe shutdown control (work) stations have individually sealed beam/8-hr rated battery pack units, providing the necessary emergency illumination to/from these stations.

All remaining Category I (nuclear safety-related) task areas, and access and egress paths thereto, are serviced with portable lighting system(s) that consist of 8-hr rated battery pack units and are readily accessible to main control room personnel. Refer to the response provided for Question 430.65, Amendment 8 for illumination

levels provided and Table Q430.61-1, Amendment 8, for listing of task areas. 2.46

TABLE Q430.61-1

TASK AREAS REQUIRING EMERGENCY PORTABLE LIGHTING SYSTEMS

Nuclear Safety-Related Building/Area	Building/Area Elevation (ft-in)	Fire Area Identification
Control Bldg	707-6	CB-1
	725-6	CB-2
	735-6	CB-3
Auxiliary Bldg	710-6	PA-3
	735-6	PA-3
	755-6	PA-4
	773-6	PA-5
	755-6	PA-6
	755-6	PA-7
Service Bldg	730-6	SB-1
	730-6	SB-2
Diesel Generator Bldg	730-6	DG-1
	730-6	DG-2
Cable Vault and Rod Control Area	735-6	CV-1
	735-6	CV-2
	755-6	CV-3
	773-6	CV-4
	773-6	CV-5
Main Steam Valve Area	773-6	MS-1
Safeguards Area	718-6	SG-1N
	718-6	SG-1S
	741-0	SG-1N
	741-0	SG-1S
Fuel Bldg	752-5	FB-1
	766-4	FB-1
Reactor Bldg	692-11	RC-1
	718-6	RC-1
	738-10	RC-1
	767-10	RC-1

NRC Letter: September 19, 1983 1.9

Question 430.62 (Section 9.5.3) 1.13

Expand the lighting section of the FSAR to include a discussion of 1.14
how lighting will be provided for those areas listed in Questions 1.15
430.57 and 430.62 above and illuminated by the emergency DC lighting
system only, in the event of a loss of offsite ac power (in excess of 1.16
8 hours), or provide the rationale why lighting is not required in 1.17
these areas. Include in your discussion what, if any, other areas 1.18
would require lighting during an extended loss of ac power, and how 1.19
it would be provided (SRP 9.5.3, Parts I and II).

Response: 1.20

Since both the backup ac and backup dc lighting subsystems are 1.21
ultimately backed by the onsite nonsafety diesel generator, the areas 1.22
served by these subsystems will receive backup lighting of an
extended duration. The diesel generator has a minimum 7-day onsite 1.23
fuel oil storage capacity.

The areas served are: 1.24

1. Safe shutdown control areas; backup ac and backup dc, and 1.26

2. Personnel exits backup dc; no other areas of the plant 1.27
require backup lighting, regardless of duration.

A complete loss of ac power (offsite and onsite) is not postulated 1.29
for BVPS-2, and would not be in our design basis, for it encompasses 1.30
a "double failure" criterion precept.

However, as described in the responses provided for Questions 430.61 1.31
and 430.65, Amendment 8, the following dc-based lighting systems 1.32
would be available for this supposition:

1. DC lighting, powered by 8-hr rated battery pack units, for 1.34
safe shutdown control stations and access and egress paths 1.35
thereto.

2. DC lighting, powered by 2-hr rated station batteries, for 1.36
safe shutdown control stations.

3. Portable lighting units 1.37
for infrequent task areas and access and egress routes 1.38
thereto.

NRC Letter: September 19, 1983

Question 430.63 (Section 9.5.3)

Sections 8.3.1 and 9.5.3 of the FSAR do not indicate how during accident and transient conditions the backup ac lighting system is connected to its power source. Identify whether the connection is manual or automatic (SRP 9.5.3, Parts I and II).

Response:

The connection is automatic. The backup ac lighting subsystem is connected to a single non-Class 1E, 480V unit substation through a non-Class 1E, 480V MCC and 480-120/240V dry-type transformers. In the event of a loss of normal ac power, this 480V unit substation is automatically loaded onto the onsite, nonsafety diesel generator (Section 8.3.1.1.1).

Refer to the responses provided for Questions 430.66, 430.67, and 430.68, Amendment 8, for additional clarification on lighting system power sources.

NRC Letter: September 19, 1983 1.9

Question 430.64 (Section 9.5.3) 1.13

Provide a discussion on the protective measures taken to assure a 1.14
functionally operable lighting system, including considerations given 1.15
to component failures, loss of ac power, and the severing of lighting
cables as a result of an accident or fire (SRP 9.53, Parts I and II). 1.16

Response: 1.17

The lamp in sealed beam/battery pack units will not normally be 1.18
illuminated and will be activated by a loss of normal ac power. 1.19
These units will receive the necessary power to trickle charge the 1.20
battery packs and provide indication of available normal ac power 1.21
from local normal ac lighting circuits. A sealed beam/battery pack 1.22
unit will, therefore, be activated by the loss of normal ac lighting
power in the area serviced by the unit, whatever the origin of 1.23
failure (component failure, severing of cables, etc). Individual 1.24
power supplies assure that the failure of any one component will not
affect the balance of the units.

The latter system will not be lost as a result of an accident or fire 1.25
since the sealed beam units are self-contained and do not require 1.26
external cabling, with the exception of trickle charging.

NRC Letter: September 19, 1983

Question 430.65 (Section 9.5.3)

You state in Section 9.5.3.1 of the FSAR that the lighting systems provide adequate illumination in all access areas and in all areas required for control of safety-related equipment. This statement is too general. The staff has determined that a minimum of 10 foot-candles at the work station is required to adequately control, monitor, and/or maintain safety-related equipment during accident and transient conditions. For those safety-related areas listed in Requests 430.51 and 430.62, above, and illuminated by the ac and dc lighting systems only, verify that the minimum of 10 foot-candles at the work station is being met. Modify your design as necessary (SRP 9.5.3, Parts I and II).

Response:

All backup emergency lighting subsystems in those areas required for the control of safe shutdown operations has been designated to provide a minimum of 10 foot-candles at the safe shutdown work stations addressed. Calculations verifying this attribute have been performed and completed.

As identified in the response to Question 430.61, Amendment 8, all safe shutdown control stations shall have an illuminated level of 10 foot-candles average maintained within the task-seeing areas of these work stations, with power provided from both the onsite nonsafety-related diesel generator and local battery pack units.

In addition, as further identified in Question 430.61, all access and egress paths to safe shutdown control stations shall have an illumination of 1/2 foot-candle average maintained as these paths are determined to be minimum activity and low hazard environments in accordance with Illuminating Engineering Society (IES) guidelines. These paths will have their lighting powered from both the onsite, nonsafety-related diesel generator and local battery pack units.

Task areas in the plant (where activities for equipment maintenance or repair may be required) and access and egress paths thereto, may be illuminated by portable battery powered lighting, readily accessible to operations personnel. Portable lighting facilitates tasks for personnel by providing direct lighting at a proper and adjustable angle on the equipment, minimizing surface shadows which could hinder maintenance or repair.

NRC Letter: September 19, 1983 1.9

Question 430.66 (SRP 9.5.3) 1.13

Section 9.5.3.2 of the FSAR describes the emergency lighting system 1.14
which is composed of three subsystems. They are 125 V dc, 1.15
480-120/240 V ac, and either hour battery lighting systems. A number 1.16
of areas in the plant are served by one or more of these systems.
All these systems are classified non-Class 1E and receive power from 1.17
non-Class 1E sources, i.e., non-Class 1E station batteries for the dc 1.18
lighting and the non-Class 1E emergency diesel generator for the ac
lighting. Assuming a failure or nonavailability of any or all of 1.19
these systems following a seismic event, it is possible that portions 1.20
of the plant, particularly the control room, may be without
sufficient lighting or without lighting for an extended period of 1.21
time during this design basis event. This is unacceptable. It is 1.23
our position that adequate lighting be provided to all vital,
hazardous, and safety-related areas needed for the safe shutdown of 1.24
the reactor and the evacuation of personnel in the event of an
accident. Modify your design to provide this necessary lighting 1.25
(SRP 9.5.3, Parts I and II). 1.26

Response: 1.27

The BVPS-2 design provides four lighting subsystems for the safe 1.28
shutdown control areas. Three of the subsystems can be energized 1.29
from onsite backup power supplies: backup ac, backup dc, and sealed
beam/battery pack units. In addition, the backup ac and backup dc 1.31
subsystems are capable of an indefinite period of operation in the
event of loss of normal power. 1.33

The acceptance criteria of SRP 9.5.3 (Part II) states: 1.34

> "There are no general design criteria or regulatory guides that 1.36
> directly apply to the safety related performance requirements for 1.37
> the lighting system. The Power Systems Branch (PSB) will use the 1.38
> following criteria to access the systems design
> capability:...(2) The emergenecy lighting system(s) is acceptable 1.39
> if the integrated design of the system(s) will provide adequate
> emergency station lighting in all areas, from onsite power 1.40
> sources, required for firefighting, control and maintenance of
> safety related equipment, and access routes to and from these 1.41
> areas; ..."

The BVPS-2 design meets these criteria with one 8-hour duration 1.46
subsystem and two long-term duration subsystems. The coexistence of 1.47
these subsystems in the safe shutdown control areas provides a very
high degree of reliability.

The postulation of the unavailablity of non-Class 1E systems due to a 1.48
seismic event must include the conclusion that the operability of 1.49

plant lighting fixtures cannot be verified, regardless of power
supply. Lighting fixtures qualified for operation during and after a 1.50
seismic event are not available.

Because lighting systems cannot be considered Class 1E, an isolation 1.51
device would be required in a power circuit from a Class 1E bus. Any 1.53
non-Class 1E equipment on the load side of the isolation device
could, therefore, not be verified as operable during a seismic event 1.54
(i.e., distribution panels, wiring, conduit run through non-seismic
areas, etc.).

Additionally, since BVPS-2 has the option of supplying nonsafety- 1.55
related loads from a nonsafety-related diesel generator, it was 1.56
determined that the backup lighting subsystems should be supplied
from there. This design eliminates any unnecessary risk to the 1.57
Class 1E power systems which would be presented by connecting the
backup lighting system to a safety related bus. 1.58

Personnel evacuation routes are serviced by the 8-hour sealed 2.1
beam/battery pack units and the backup dc subsystem. The sealed 2.2
beam/battery pack units will provide lighting for firefighting and
evacuation in the event of damage to the backup dc lighting subsystem 2.3
(e.g., fire damage to supply cables). The backup dc subsystem will 2.5
provide long-term duration lighting in the event of a loss of normal
power for any reason.

The backup lighting system at BVPS-2 will provide acceptable and 2.6
reliable lighting to meet the illumination needs in safe shutdown 2.7
control areas and personnel evacuation routes and meets the
requirements given in SRP 9.5.3.

The BVPS-2 lighting system is designed to provide adequate and 2.8
reliable lighting at all plant locations needed to accomplish a safe 2.9
reactor shutdown, and to promote personnel safety and aid evacuation,
if required, for the unlikely failures cited in Question 430.66 such 2.10
as an accident, fire, or seismic event.

Specific system design attributes and goals (illumination sufficiency 2.11
and duration for all design basis events) at vital plant areas are 2.12
attained by a combination of diverse and highest grade, quality
lighting components and distribution systems, including: 2.13

1. Normal ac lighting, powered via unit station transformers, 2.15

2. Emergency ac lighting, powered from motor control centers 2.16
   backed by an onsite nonsafety-related diesel generator,

3. Dc lighting, powered by 8-hr battery packs, automatically 2.17
   energized upon loss of normal ac power, and

4. Backup dc lighting, powered by onsite station batteries. 2.18

These lighting systems in total, conform to the Illuminating Engineering Society (IES) recommendations for industrial facilities.

In particular, control room provisions are as follows:

Lighting Provision	Condition
• Normal ac lighting	All normal plant operations
• Dc station-backed and onsite nonsafety-related diesel-backed lighting	Loss of offsite power
• 8-hr battery packs, seismically supported, self-contained	Loss of all power, all design basis events

Since the dc lighting system is powered via self-contained battery packs, which are seismically supported in all Category I buildings and do not require external cabling with the exception of a trickle charge, there is no concern over the loss of lighting due to a fire or accidents involving cabling of the dc lighting system.

The dc lighting system is also discussed in Section 1.4 of the Fire Protection Evaluation Report (FPER). As discussed in the FPER, sealed beam, battery-powered portable hand lighting units are also provided for emergency use.

NRC Letter: September 19, 1983 1.9

Question 430.67 (SRP 9.5.3) 1.13

In Section 9.5.3.2.3 of the FSAR you state that the backup ac 1.14
lighting system is continuously energized and upon loss of offsite 1.16
power receives its power from the nonsafety-related diesel generator.
You also state in Section 9.5.3.5 that the system will be tested when 1.17
the onsite non-safety diesel generator is tested under load. 1.18
Describe the procedures of how the lighting system test will be 1.19
performed and the frequency of the test (SRP 9.5.3, Parts I and II). 1.20

Response: 1.21

The backup ac lighting subsystem receives power from the onsite 1.22
nonsafety-related diesel generator through a 4,160 V to 480 V to 1.24
120 V/240 V distribution system.

There are no transfer devices associated with the backup ac lighting. 1.25
Since this is the same lighting system used under normal conditions 1.26
(except for the power source), periodic testing is not necessary to 1.27
verify its operability.

Periodic testing of the nonsafety-related diesel generator will 1.28
ensure its operability and verify functional performance of the 1.29
diesel generator as well as supporting equipment. Testing will be 1.30
identified and performed in accordance with written test procedures
that specify the frequency of testing. In determining the frequency, 1.32
the following factors will be considered:

1. Testing frequency required for safety-related diesel generators (at least once per month), 1.34

2. Operating history of the diesel generator and success of previous tests, and 1.35

3. The importance of plant functions which are supported by the diesel generator. 1.36

NRC Letter: September 19, 1983 1.10

Question 430.74 (Sections 3.2, 9.5.4 through 9.5.8) 1.13

The FSAR text and Table 3.2-1 indicate that the components and piping 1.14
systems for the diesel generator auxiliaries (fuel oil system, 1.15
cooling water, lubrication, air starting, and intake and combustion
system) that are mounted on the auxiliary skids are designed seismic 1.16
Category I and are ASME Section III Class 3 quality to the extent 1.17
possible. The engine mounted components and piping and certain other 1.18
components listed in the various sections of 9.5 and Table 3.2-1 are 1.19
designed and manufactured to DEMA standards and/or manufacturer's 1.20
standards and are seismic Category I. This is not in accordance with 1.21
Regulatory Guide 1.26 which requires the entire diesel generator
auxiliary systems be designed to ASME Section III Class 3 or Quality 1.22
Group C. You also state that the figures in Section 9.5 show where 1.23
quality group classification changes are. The figures do not provide 1.24
this information. Provide the following: (a) the industry standards 1.25
that were used in the design, manufacture, and inspection of the
engine mounted piping and components, (b) show on the appropriate 1.26
P&ID's where the Quality Group Classification changes from Quality 1.27
Group C, and where the Seismic Category I portions of the system are
located. Sections 9.5.4 through 9.5.8 and Table 3.2-1 define certain 1.28
pumps, filters, strainers, valves, and subsystems in the diesel 1.29
generator auxiliary systems as Quality Group D or not applicable with 1.30
regard to Quality Group Classification. It is our position that all 1.31
components and piping in the diesel generator auxiliary systems be
designed to Seismic Category I ASME Section III Class 3 requirements. 1.32
Comply with this position or justify noncompliance (SRP 9.5.4 through 1.33
9.5.8, Part III).

Response: 1.34

Regulatory Guide 1.26 does not cover the diesel generator or its 1.35
auxiliary systems except for the "cooling water ... systems ... that 1.36
are designed for functioning of ... diesels ..." (paragraph C.2.b). 1.37
Refer to revised Regulatory Guide 1.26, Table 1.8-1, Amendment 8, 1.38
which addresses the use of non-ASME III components in the diesel 1.40
generator cooling water system.

Regulatory Guide 1.26 also states (in Section B): 1.41

> "Other systems not covered by this guide such as ... diesel 1.43
> engine and its generators and auxiliary support systems ... 1.44
> should be designed, fabricated, erected, and tested to quality 1.45
> standards commensurate with the safety function to be performed.
> Evaluation to establish the quality group classification of these 1.46
> other systems should include consideration of the guidance 1.47
> provided in regulatory positions C.1 and C.2 of this guide." 1.48

BVPS-2 has followed this guidance. The diesel generators and those portions of diesel auxiliary systems which have a safety function have been designed, fabricated, erected, and tested under the vendor's Quality Assurance Program, which meets the requirements of 10 CFR 50 Appendix B. As stated in the FSAR, these components are classified Safety Class 3 and, to the extent possible, are built to the rules of ASME III, Class 3. Certain components, considered by the vendor to be part of the engine (as distinguished from auxiliary support systems) were built to the manufacturer's standards. Refer to revised Table 3.2-1, Amendment 8, which identifies Safety Class 3 equipment that was not built to ASME III rules. Refer to revised Figures 9.5-7 through 9.5-12, Amendment 8, which identify ASME and non-ASME piping. The non-ASME Safety Class 3 components are high quality, proven by experience, and were fully controlled by the vendor's QA program. Similar equipment has been accepted by the NRC for other nuclear power plant applications.

In addition, in Regulatory Guide 1.26 the phrase "standards commensurate with the safety function to be performed," acknowledges that not all components associated with the diesel need to be classified as safety-related. Nonsafety-related components have been identified in Sections 9.5.4 through 9.5.8. Figure 9.5-11 has been revised, adding a note that all components shown are Safety Class 3. Figures 9.5-7 through 9.5-10 and Figure 9.5-12 show the boundaries between Safety Class 3 and nonsafety-related portions of the systems. Safety-related equipment is designated on the figures by the use of an asterisk as the first character of the equipment number (e.g., the starting air tanks have the equipment numbers *TK21A&B and *TK22A&B). All piping connected to Safety Class 3 equipment is classified as Safety Class 3 except where the figures show a boundary.

TABLE 1.8-1 (Cont)

organic and inorganic species if 2-inch charcoal bed depth is 1.14
provided; 99 percent if 4 or more inches of charcoal bed depth is 1.15
provided) since these represent more realistic values. 1.16

<u>RG No. 1.26, Rev. 3</u> 1.20
FSAR Reference Section 3.2.2 1.22

<u>QUALITY GROUP CLASSIFICATIONS AND STANDARDS FOR WATER-, STEAM-, AND</u> 1.24
<u>RADIOACTIVE-WASTE-CONTAINING COMPONENTS OF NUCLEAR POWER PLANTS</u> 1.25
<u>(FEBRUARY 1976)</u>

Quality group classifications and standards for water-, steam-, and 1.27
radioactive-waste-containing components of Beaver Valley Power 1.28
Station - Unit 2 meet the intent of Regulatory Guide 1.26 with the 1.29
following alternatives:

1. The safety class terminology of ANSI N18.2 and 1.32
ANSI 18.2a-1975 is used instead of the quality group
terminology. Thus, the terms Safety Class 1, Safety 1.33
Class 2, Safety Class 3, and Non-nuclear Safety (NNS) Class 1.34
are used instead of Quality Groups A, B, C, and D,
respectively, and are consistent with present nuclear 1.35
industry practice.

2. Paragraph NB-7153 of the ASME Section III Code requires that 1.36
there be no valves between a code safety valve and its 1.37
relief point unless special interlocks prevent shutoff
without other protection capacity. Therefore, as an 1.38
alternative to Paragraphs C.1.e and C.2.c, a single safety
valve designed, manufactured, and tested in accordance with 1.39
ASME III Division 1 is considered acceptable as the boundary
between the reactor coolant pressure boundary and a lower 1.40
safety class or NNS class line.

3. Portions of the emergency diesel generator cooling water 1.41
system, considered by the vendor to be parts of the engine 1.42
(as distinguished from auxiliary support systems), were
built to the manufacturer's standards rather than ASME III. 1.43
These are identified in Table 3.2-1 and Section 9.5.5. The 1.45
components used are of high quality, proven by experience,
and were designed, fabricated, erected, and tested under the 1.46
vendor's Quality Assurance Program which meets the require- 1.47
ments of 10 CFR 50, Appendix B. Similar equipment has been 1.49
accepted by the NRC for other nuclear power plant
applications. 1.50

TABLE 1.8-1 (Cont)

RG No. 1.27, Rev. 2 1.54
FSAR Reference Sections 2.4.11.6, 9.2.5 1.56

ULTIMATE HEAT SINK FOR NUCLEAR POWER PLANTS (JANUARY 1976) 1.58

The ultimate heat sink for Beaver Valley Power Station - Unit 2 2.1
follows the guidance of this regulatory guide.

RG No. 1.28, Rev. 2 2.5
FSAR Reference Sections 17.1.2, 17.2 2.7

QUALITY ASSURANCE PROGRAM REQUIREMENTS (DESIGN AND CONSTRUCTION) 2.8
(FEBRUARY 1979)

This regulatory guide does not apply to the Beaver Valley Power 2.10
Station - Unit 2 (BVPS-2) Quality Assurance Program since it is 2.12
applicable to construction permit applicants docketed after October 2.13
1979. BVPS-2, docketed October 20, 1972, meets the requirements of 2.14
Appendix B to 10 CFR 50 with the BVPS-2 Design and Construction 2.15
Quality Assurance Program submitted and approved through Appendix A 2.16
of the BVPS-2 PSAR. Regulatory Guide 1.28 does not apply to the 2.17
BVPS-2 Quality Assurance Program for plant operations since it is
applicable only to the plant design and construction phase. 2.18

RG No. 1.29, Rev. 3 2.22
FSAR Reference Section 3.2.1 2.24

SEISMIC DESIGN CLASSIFICATION (SEPTEMBER 1978) 2.25

The seismic design classification of structures, systems, and 2.27
components at Beaver Valley Power Station Unit 2 follows the guidance 2.29
of Regulatory Guide 1.29 with the following clarifications: 2.30

Each component which is required to mitigate the consequences of 2.36
an accident, as defined in ANSI N18.2, shall be classified 2.37
Seismic Category I. In addition, all components classified as 2.38
Safety Class 1, 2, or 3 shall be designated Seismic Category I. 2.39
Seismic Category I components, structures, and systems shall be 2.40
designed to remain functional in the event of the safe shutdown 2.41
earthquake (SSE). All Seismic Category I components are designed 2.42
and constructed to Quality Assurance (QA) Category I 2.43
requirements.

Portions of structures, systems, or components whose continued 2.44
function after an SSE are not required, but whose failure could 2.45
reduce the functioning of other safety-related structures, 2.46
systems, or components shall be designated Seismic Category II.
These structures, systems, or components shall either be 2.47
seismically designed, located to preclude interactions, further 2.48

TABLE 1.8-1 (Cont)

restrained, structurally upgraded, or proven incapable of affecting safety.

Seismic Category I design requirements shall extend to the first 2.49
seismic restraint beyond the seismic boundary and shall include 2.50
the interface portion of the boundary itself (that is, for piping 2.51
systems, the isolation valve at a boundary between Seismic
Category I and nonseismic portions shall be designated Seismic 2.52
Category I. The piping up to and including the first seismic 2.54
restraint beyond the valve shall be designed to Seismic 2.55

TABLE 3.2-1 (Cont)

Item/Mark No.[16]	Location[1]	Safety Class	Code or Standard	Missile Protection[2]	Flood Protection[3,4]	Remarks
Instrumentation and controls required to perform a safety function	MV, SB, SA, Y, CB, CS	NA[17]	[9]	PS	PAG, PBG	
Service Water System (Section 9.21)						
Service water system piping and valves:						
Between and including containment isolation valves	CS, CV	2	ASME III	PS	PBG	
Outside containment	IS, SA, FB, DG, AB, CB, Y, CS, and CV	3	ASME III	PS	PAG, PBG	
Inside containment	CS	3	ASME III	PS	PAG, PBG	
Service water pump and motor/ 2SWS*P21A,B,C	IS	3	ASME III Class 1E [15]	PS	PBG	
Service water pump seal water strainer/STRM 47 and 48	IS	3	ASME III Class 1E	PS	PBG	
Instrumentation and controls required to perform a safety function	CS, CV, IS, SB, FB, DG, AB, CB	NA[17]	[9]	PS	PAG, PBG	
Emergency Diesel Generator Supporting Systems (Section 9.5)						
Air starting system						
Tanks/ 2EGA*TK21A,B 2EGA*TK22A,B Shutdown air tank	DG	3	ASME III	PS	PAG	
Piping and valves from compressor discharge check valve up to and including the air start solenoid valves, and up to the air start valves	DG	3	ASME III	PS	PAG	

TABLE 3.2-1 (Cont)

Item/Mark No.[1,8]	Location[1]	Safety Class	Code or Standard	Missile Protection[2]	Flood Protection[3,4]	Remarks
Air start valves, air start distributors, and piping and valves downstream of air start valves, air start solenoid valves and shutdown solenoid valve	DG	3	Mfr's Std	PS	PAG	

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2.25

TABLE 3.2-1 (Cont)

Item/Mark No.⁽¹⁾	Location⁽²⁾	Safety Class	Code or Standard	Missile Protection⁽³⁾	Flood Protection⁽³,⁴⁾	Remarks
Air Intake and Exhaust System						
Air intake and exhaust piping outboard of turbo charger	DG	3	ASME III	PS	PAG	
Air intake filter/ 2EDG*FLTA1B 2EDG*FLTA1A	DG	3	Mfr's std	PS	PAG	
Air intake silencer/ 2EDG*SIL2A and B 2EDG*SIL1A and B	DG	3	Mfr's std	PS	PAG	
Turbo charger and engine-mounted air intake and exhaust piping	DG	3	Mfr's std	PS	PAG	
Exhaust silencer/ 2EDG*SIL3A and 3B	DG	3	Mfr's std	PS	PAG	
Cooling Water System						
Jacket water expansion tank 2EGS*TK-1A&B intercooler water heat exchanger 2EGS*E21A&B, jacket water heat exchanger 2EGS*E22A&B, jacket water keep-warm heater 2EGS*E23A&B, jacket water keep-warm pump 2EGS*P23A&B	DG	3	ASME III	PS	PAG	
Engine-driven jacket water pump 2EGS*P22A&B, engine-driven inter-cooler water pump 2EGS*P21A&B	DG	3	Mfr's std	PS	PAG	
Cooling water piping and valves from jacket water expansion tank to diesel generator	DG	3	ASME III	PS	PAG	

TABLE 3.2-1 (Cont)

Item/Mark No.[1][4]	Location[1]	Safety Class	Code or Standard	Missile Protection[7]	Flood Protection[3],[4]	Remarks
Engine-mounted cooling water piping and valves	DG	3	ASME III/ Mfr's std	PS	PAG	
Lubrication System						
Lube oil heat exchanger 2EGO*E21A&B, strainers 2EGO*STR22A&B	DG	3	ASME III	PS	PAG	
Engine driven lube oil pump 2EGO*P21A&B, strainers 2EGO*STR1A&B, keep warm and prelube pump 2EGO*P24A&B	DG	3	Mfr's std	PS	PAG	
Keep warm heater 2EGO*E24A&B, strainers 2EGO*STR23A&B, filters 2EGO*FLT21A&B	DG	3	ASME III	PS	PAG	
Rocker arm lubrication system	DG	3	Mfr's std	PS	PAG	
Fuel Oil Supply System						
Fuel oil piping of diesel generator from oil storage tank to diesel	DG	3	ASME III	PS	PBG, PAG	
Diesel fuel oil storage tanks/2EGF*TK21A and B	DG	3	ASME III	PS	PBG	
Diesel fuel transfer pumps with motor/ 2EGF*P21A,B,C,and D	DG	3	ASME III Class 1E	PS	PBG, PAG	
Strainers 2EGF*STR39, 40, 41, & 42	DG	3	ASME III	PS	PAG	
Diesel fuel oil day tanks/ 2EGF*TK22A and B	DG	3	ASME III	PS	PAG	
Motor driven fuel oil pump 2EGF*P22A&B	DG	3	ASME III	PS	PAG	
Engine driven fuel oil pump 2EGF*P23A&B	DG	3	Mfr's std	PS	PAG	

TABLE 3.2-1 (Cont)

Item/Mark No.[1,8]	Location[1]	Safety Class	Code or Standard	Missile Protection[2]	Flood Protection[3,4]	Remarks	
Fuel oil filters, accumulator tank, engine mounted piping and valves	DG	3	Mfr's std	PS	PAG		4.35 4.36 4.37 4.38
Instrumentation and controls for fuel oil, lube oil, air, and cooling water supply systems required to perform a safety function	DG, CB	NA[17]	[9]	PS	PBG, PAG		4.42 4.43 4.44 4.45 4.46

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p. 10b of 24

BVPS-2 FSAR

TABLE 3.2-1 (Cont)

Item/Mark No.[15]	Location[1]	Safety Class	Code or Standard	Missile Protection[2]	Flood Protection[3,4]	Remarks
Primary Plant Component Cooling Water System (Section 9.2.2)						
Piping and Valves:						
Inside containment	CS	3	ASME III Class 1E	PS	PAG, PBG	
Outside containment	AB,FB,CV	3	ASME III Class 1E	PS	PAG, PBG	
Between and including containment isolation valves	CV, CS	2	ASME III Class 1E[5]	PS	PBG	
Primary component cooling water surge tanks/ 2CCP*TK21A and B	AB	3	ASME III	PS	PAG	
Primary component cooling water pumps with motors/ 2CCP*P21A,B,C, and D	AB	3	ASME III Class 1E	PS	PAG	
Primary component cooling water heat exchangers	AB	3	ASME III	PS	PBG	
Instrumentation and controls required to perform a safety function	CS,AB,CB,FB	NA[17]	[9]	PS	PAG, PBG	
Boron Recovery System (Section 9.3.4)						
Degasifier steam heater/ 2BRS*E21A and B	AB	3	ASME III	NR[18]	PBG	
Degasifier recovery exchanger/ 2BRS*24A ,B 1 and 2	AB	3	ASME III	NR[18]	PAG	
Piping and isolation valves to maintain QA Category I pressure boundary.	AB	3	ASME III Class 1E	NR[18]	PAG, PBG	

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NRC Lett·: September 19, 1983 1.9

Question 430.75 (Section 9.5.4) 1.13

In Section 9.5.4.3 you state that diesel fuel oil is available from 1.14
local distribution sources. In Table 9.5-2 you identify the sources 1.15
where diesel quality fuel oil will be available and the distances
required to be travelled from the source to the plant. Discuss how 1.18
fuel oil will be delivered onsite under extremely unfavorable
environmental conditions.

Response: 1.20

Fuel oil can be delivered onsite by truck under unfavorable 1.21
environmental conditions. The five major oil distributors, all 1.22
within 40 miles of the site, provide a number of alternative
distribution routes. Under extremely unfavorable environmental 1.23
conditions, delivery of fuel oil by truck can be accomplished in less
than 1 day. Environmental conditions considered are those having 1.25
potential for affecting a large area for a prolonged period of time, 1.26
such as floods or snowstorms. Flooding is not a concern because 1.27
water levels high enough to cover all roads into the plant
are not
Road maintenance in the affected 1.30
area is sufficient to ensure that any snow accumulation which could
prevent fuel oil delivery is removed from major roads within a day. 1.31

probable maximum flood

NRC Letter: September 19, 1983 1.9

Question 430.77 (Sections 9.5.4, 9.5.5, 9.5.6, 9.5.7, and 9.5.8) 1.13

You state in the FSAR that protection from high and moderate energy 1.14
pipe breaks is provided for the emergency diesel generators. 1.15
Section 3.6, Table 3.6B-1, identifies the emergency diesel generator 1.16
air start and combustion air and exhaust systems as high energy 1.17
systems, but does not provide any analysis for these systems. In 1.18
addition, Table 3.6B-2 only identifies portions of the emergency
diesel engine fuel oil and air start systems as essential systems 1.19
needed for shutdown; all emergency diesel engine systems are
necessary for shutdown. This is unacceptable. Identify all high and 1.21
moderate energy lines and systems that will be installed in the
diesel generator room. Discuss the measures that will be taken in 1.22
the design of the diesel generator facility to protect the safety
related systems, piping, and components from the effects of high and 1.23
moderate energy line failure to assure availability of the diesel 1.24
generators when needed. Update Table 3.6B-2 as necessary. Refer to 1.26
Question 430.106 for additional concerns on high energy line breaks
with regard to the air start system (SRPs 9.5.4 - 9.5.8, Parts II and 1.28
III).

Response: 1.29

a. Refer to revised Table 3.6B-2, Amendment 3, which identifies all 1.31
diesel engine systems.

b.1 Refer to revised Sections 3.6B.1.3 and 3.1.1.3, Amendment 4, for 1.32
criteria used in evaluating high and moderate energy piping 1.34
failures, that is, application of single failure, application of
loss of offsite power, etc. 1.35

Under the criteria contained in the revised sections, since an 1.37
immediate plant shutdown is not required as a result of any 1.38
postulated piping failures in diesel generator systems, the
damage due to any postulated piping failure must be limited to 1.39
prevent a total loss of safe shutdown function without
postulation of concurrent LOOP or single active failure. 1.40
Protection from pipe break propagation in emergency diesel 1.41
generator support systems is provided by locating the redundant 1.42
diesel and associated support systems in separate cubicles/rooms
(see Sections 3.6B.1.2.1.1 and 3.6B.1.2.1.2). A break in any of 1.44
the high or moderate energy diesel systems installed in one of
the diesel generator rooms will not affect the redundant diesel 1.45
and associated systems located in the other diesel generator
room.

b.2 Refer to revised Table 3.6B-1, Amendment 8, which deleted the 1.47
combustion air and exhaust systems since these systems are not 1.48

normally pressurized nor normally operating during normal plant conditions (see BTP ASB 3-1, Appendix A).

At a meeting on March 6, 1984, the NRC requested additional information on the ability of the emergency diesel generator systems to remain operable considering simultaneous occurrence of a high energy piping failure, loss of offsite power, and a single failure. BVPS-2 has been designed and evaluated according to the direction provided in SRP 3.6.1 and 3.6.2, as supplemented by BTPs ASB 3-1 and MEB 3-1. These SRPs and supplemental BTPs specifically define the criteria, coincident assumptions, and postulated failures to be used in high energy pipe failure evaluations. Based on these regulatory documents, simultaneous occurrence of a piping failure, a loss of offsite power, and a single failure of the redundant diesel generator need not be considered in the evaluation of piping failures in the diesel generator cubicles. The specific evaluation is described as follows:

1. A high energy pipe failure in the diesel generator piping must be postulated to occur during normal plant conditions, in accordance with BTP ASB 3-1, item B.3.a. Normal plant conditions are defined as conditions during reactor startup, operation at power, hot standby, or reactor cooldown to cold shutdown, in accordance with Appendix A of BTP ASB 3-1. Section 15.0.1.1 classifies these events as Condition I Normal Operation and Operational Transients. A loss of offsite power, requiring diesel generator operation, is not classified as a normal plant event. Rather, it is considered in Section 15.0.1.2 as a Condition II event, Faults of Moderate Frequency (see SRP 15.2.6, Loss of Nonemergency AC Power to the Station Auxiliaries). Therefore, if the plant is already in a loss of offsite power condition and requiring diesel generator operation, a coincident high energy pipe failure need not be postulated.

2. When piping failures are postulated during normal plant operation, BTP ASB 3-1 item B.3.b requires that an evaluation be made to determine whether the direct effects of the pipe failure is a trip of the turbine generator or reactor protection system. If either of these occur, a loss of offsite power must then be assumed coincident with the pipe failure, in accordance with item B.3.b(1) of the same regulatory document. BVPS-2 has performed this evaluation process for the specific pipe failures affecting the diesel generators. None of these failures will result in direct consequences causing a turbine generator trip or reactor protection system actuation. Therefore, if a piping failure occurs, a coincident loss of offsite power need not be assumed and operation of the diesel generators is not necessary for this event.

3. Protection has been provided in the BVPS-2 design such that 2.25
a piping failure can only affect one of the two redundant 2.26
diesel generators regardless of which condition the plant
is in.

TABLE 3.6B-1

HIGH-ENERGY PIPING SYSTEMS

System	FSAR Section	Location: Inside Containment	Location: Outside Containment
Auxiliary steam	10.4.10		X
Blowdown - steam generator	10.4.8	X	X
Boron recovery	9.3.4.6		X
Charging and volume control	9.3.4	X	X
Condensate - aux condensate	10.4.10		X
Condensate - chemical treatment	10.3.5		X
Condensate - demineralizer	10.4.6		X
Condensate - main condensate	10.4.7		X
Condensate - makeup, drawoff, transfer, storage	10.4.7		X
Electrohydraulic control system - turbine generator	10.2		X
Extraction steam	10.3		X
Feedwater - chemical treatment	10.3.5		X
Feedwater - auxiliary feedwater	10.4.9	X	
Feedwater - main	10.4.7	X	X
Primary plant gas supply	9.5.9	X	X
Gland steam	10.4.3		X
Hydrogen control (post-DBA)	6.2.5		X
Heater drains - high-pressure	10.4.7		X
Heater drains - low-pressure	10.4.7		X
Main steam	10.3	X	X
Reactor coolant	5.2	X	

TABLE 3.6B-1 (Cont)

		Location		
System	FSAR Section	Inside Containment	Outside Containment	
Residual heat removal	5.4.7	X		2.21
Steam drains	10.3		X	2.23
Steam generator water cleanup	10.4.8		X	2.25
Safety injection	6.3	X	X	2.27
Steam vents	10.3		X	2.29
Drains (aerated & hydrogenated)	9.3.3	X	X	2.31
Sampling system (radioactive)	9.3.2	X	X	2.33
Hot water heating	10.4.10			2.35
Emergency diesel - air start	9.5.6		X	2.37
Turbine plant sampling	9.3.2		X	2.39

NRC Letter: September 19, 1983

Question 430.78 (Section 9.5.4)

Discuss the precautionary measures that will be taken to assure the quality and reliability of the fuel oil supply for emergency diesel generator operation. Include the type of fuel oil, impurity and quality limitations as well as diesel index number or its equivalent, cloud point, entrained moisture, sulfur, particulates, and other deleterious insoluble substances, procedure for testing newly delivered fuel, periodic sampling and testing of onsite fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks, and periodic system inspection. In your discussion include reference to industry (or other) standards which will be followed to assure a reliable fuel oil supply to the emergency generators (SRP 9.5.4, Parts II and III).

Response:

Precautionary measures taken to assure the quality and reliability of the fuel oil supply include periodic sampling and analyses of the fuel oil and the removal of accumulated water from storage tanks if necessary.

The following is a description of some of the fuel oil characteristics and their limiting values:

1. Type of fuel oil - No. 2 Fuel Oil,

2. Impurity level - less than 2 mg of insolubles per 100 ml,

3. Diesel index number - Cetane number greater than 40,

4. Cloud point - specified at 40°F,

5. Water and sediment - less than .05% by volume,

6. Sulfur content - less than 0.5% by weight,

7. Carbon residue on 10% bottoms - 0.35% by weight maximum,

8. Ash - less than 0.01% by weight, and

9. The fuel oil meets the requirements of ASTM D975-77.

Testing of newly-delivered fuel oil includes taking a sample with a bacon bomb near the bottom of the supply truck and performing analyses for kinematic viscosity, cloud point, water and sediment, and 90 percent distillation temperature. This is performed within 2 hours and completed before the fuel oil supply truck is unloaded. Shortly after unloading, and within 2 weeks, the samples will be

analyzed for flash point, carbon residue on 10 percent distillation 1.45
residue, percent ash, viscosity, percent sulfur, copper strip
corrosion, and cetane number.

Periodic sampling of the fuel oil day tank is performed at least 1.46
quarterly. Sampling is done in accordance with ASTM D270-1975 and to 1.47
determine viscosity, percent water, and sediment.

Condensate is removed from the day tanks every 31 days following each 1.48
operation of the diesel where the period of operation is longer than 1.49
1 hour.

NRC Letter: September 19, 1983

Question 430.79 (Section 9.5.4)

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision will be made in the design of the fuel oil storage fill systems to minimize the creation of turbulence of the sediment in the bottom of the storage tank? Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator (SRP 9.5.4, Parts I, II, and III).

Response:

Revised Section 9.5.4, Amendment 4, discusses design features which minimize stirring of sediment. Additionally, should stirred sediment be a problem, it would not affect diesel operation. As shown on Figure 9.5-7, strainers will prevent significant amounts of sediment from being transferred to the day tank while a duplex filter protects the engine from particles transferred from the day tank.

Alarms are provided for high differential pressure on the strainers. In the event a strainer is seriously restricting flow, a low level in the day tank will cause the backup transfer pump (with its own strainer) to start. Restriction of the duplex filter will result in an alarm, which would allow the valving in of the clean filter element, to replace the clogged one while the engine continues running.

NRC Letter: September 19, 1983 1.9

Question 430.82 (Section 9.5.4) 1.12

Figure 9.5-7 of the FSAR shows a fuel oil accumulator tank on the 1.13
diesel engine fuel oil system. The accumulator tank is located on 1.14
the engine skid and is connected in parallel with the fuel oil
headers. Provide a description of the tank and its purpose 1.15
(SRP 9.5.4, Part III).

Response: 1.16

Refer to revised Section 9.5.4, Amendment 4, for the description of 1.17
the fuel oil accumulator tank. 1.18

Also refer to revised Figure 9.5-7, Amendment 8. The line leading 1.20
from the accumulator tank to the pressurized return header is a 1/4
inch line, which is connected to the top of the accumulator tank. 1.21
The purpose of this line is to purge air from the accumulator. The 1.23
fuel flow through the line is a small fraction of the fuel flow to
the diesel engine and will have an insignificant effect on the 1.24
operation of the system.

Fuel is supplied to the injection pumps, via the fuel inlet header, 1.25
from the engine-driven fuel oil pump. The injection pumps are cam- 1.26
driven reciprocating pumps, which deliver the required amount of fuel
(controlled by the governor) to the injection nozzles. Priming of 1.28
the injection pumps is accomplished by pressurized fuel flowing from
the inlet header and filling the injection pump's cylinder, with 1.29
excess fuel flowing to the pressurized return header. This return 1.30
header is pressurized to assure that the injection pump is fully
primed. A spring-loaded check valve is used in the discharge of this 1.31
return header to maintain pressure during operation, and to prevent 1.32
the header and injection pump from emptying when the engine is
stopped.

NRC Letter: September 19, 1983

Question 430.83 (Section 9.5.4)

Section 9.5.4.3 states that the day tank is within a sump of sufficient capacity to hold the entire contents of the day tank. Figure 9.5-7 of the FSAR shows a platform underneath the day tanks; it is assumed that this is the sump. No description is provided for the day tank sump drainage system. Describe the operation of the day tank drainage system and the procedures that will be used when in operation to prevent an oil spill and resulting fire hazard in the diesel generator area (SRP 9.5.4, Part III).

Response:

Refer to revised Section 9.5.4, Amendment 4.

The fuel oil day tank is located within a diked area. Within this diked area is a sump, which gravity-drains to a waste oil separator located east of the diesel generator building (Figure 9.3-20). The drain piping is extra heavy cast iron (ASTM A74) soil pipe with hub and spigot caulked joints, and is encased in concrete within the diesel generator building. The sump within the diked area has a level switch with a set-point that would alert the operator when there is an abnormal condition. In addition, fuel oil leakage will be visually evident during testing that is performed monthly. Immediate action will be taken to determine the root cause of any leakage and appropriate corrective action will be taken.

The waste oil separator is located and designed such that no backflow could occur between the separator and the building sumps. High level in the separator is alarmed, requiring the operator to manually activate the waste oil separator transfer pump. The transfer pump transfers wastes to a truck for proper disposal. Should the level increase substantially prior to transfer to the truck, an overflow connection on the separator would transfer the excess waste oil to manhole number 14 and then to the sewage treatment facility.

The design of the diesel generator fule oil transfer and drainage systems meets the guidance of BTP CMEB 9.5-1, "Guideline for Fire Protection for Nuclear Power Plants."

NRC Letter: September 19, 1983 1.9

Question 430.90 (Section 9.5.5) 1.12

You state in Section 9.5.5.2 that the diesel engine cooling water is 1.13
treated as appropriate to minimize corrosion. Provide additional 1.14
details of your proposed diesel engine cooling water system chemical
treatment with regard to precluding organic fouling and discuss how 1.16
your proposed treatment complies with the engine manufacturer's
recommendations (SRP 9.5.5, Parts I and III). 1.17

Response: 1.18

Makeup for the diesel engine cooling water system is provided from 1.19
the demineralized water system which will minimize organic fouling. 1.20

Water purity and chemistry will be maintained in compliance with the 1.21
manufacturer's recommendations.

The diesel engine cooling water system is a closed loop water system 1.22
with both its initial and makeup water supplied from the 1.23
demineralized water system. Provisions for chemical treatment of the 1.24
closed loop are provided to prevent against organic fouling. This 1.25
treatment consists of the addition of an inhibitor chemical (a
mixture of Nitrite and boron) which is maintained in the water by the 1.26
BVPS chemistry department. The BVPS chemistry manual specifies that 1.27
the emergency diesel generator coolant water is sampled quarterly for
pH, conductivity, Nitrite, and boron. This inspection monitors for 1.29
the correct inhibitor concentration and verifies that the pH is
maintained within the 8.5 to 9.5 range specified by the manufacturer. 1.30

The service water side of the jacket coolant water heat exchanger 1.31
also has the capability for chemical treatment to prevent fouling and 1.32
corrosion. However, use of this treatment system will probably not 1.33
be necessary unless the diesel generator is laid up for an extended 1.34
period of time, since the system will normally be flushed out once a
month during the diesel generator operational test. Need for such a 1.36
chemical treatment would be determined by a rise in jacket coolant
water temperatures, which are monitored and logged in the monthly 1.37
diesel generator test.

NRC Letter: September 19, 1983 1.9

Question 430.92 (Section 9.5.5) 1.13

The diesel generators are required to start automatically on loss of 1.14
all offsite power and in the event of a LOCA. The diesel generator 1.15
sets should be capable of operation at less than full load for
extended periods without degradation of performance or reliability. 1.16
Should a LOCA occur with availability of offsite power, discuss the 1.17
design provisions and other parameters that have been considered in 1.18
the selection of the diesel generators to enable them to run unloaded
(on standby) for extended periods without degradation of engine 1.19
performance or reliability. Expand your FSAR to include and 1.20
explicitly define the capability of your design with regard to this
requirement (SRP 8.3.1, Parts II and III; SRP 9.5.5, Part III). 1.21

Response: 1.22

During a LOCA, the diesel generators would normally not run unloaded for 1.23
extended periods of time. The diesel generators would start 1.24
automatically and would be shut down by the operator once the
availability of offsite power is verified. The diesel generators 1.26
would then be available to start automatically should offsite power
be lost.

Manufacturer's recommendations that are to be followed for no load or 1.27
light load running conditions are discussed in the response provided 1.28
for Question 430.25, Amendment 4.

NRC Letter: September 19, 1983

Question 430.103 (Section 9.5.6.2)

You state in Section 9.5.6.2 that the diesel generator air start systems for both safety-related emergency diesel generators are connected by a nonsafety-related cross-connect with proper isolation valves provided. It is further stated that cross-connect will be used to start the failed diesel using the other diesel's starting air receivers. Inadequate information is provided to evaluate this aspect of the system design. Provide the following for the safety-related diesels only:

1. State the conditions under which this portion of the air start system will be used.

2. Describe the procedures, administrative controls, and limiting conditions of operation that will govern the use of this cross-connect during the above stated conditions.

3. In light of Question 430.102, show that the requirements of 430.102(b) are met for this operating condition assuming that the failed engine controls that will be used to preclude the depletion of the control air below the minimum required for 7 day operation (SRP 9.5.6, Part III).

Response:

The air start system becomes safety-related at the inlet check valves to the safety-related starting air receivers. The cross-connect occurs on the nonsafety-related side of the class break and cannot utilize stored air from any start system. Since the air compressor motors are power by their associated diesel generator, (with loss of offsite ac power) the compressors associated with an operating diesel generator can be used to charge the air receivers of the other diesel generator through the air system cross-connect. In no way can use of the cross-connect allow any of the two diesel generator systems' air receivers to be depleted through the cross-connect.

The isolation valves called out in the diesel generator cross-connect system will be administratively controlled under the BVPS operating manual procedure governing lockout. This procedure controls the use of padlocks or locking devices on operating equipment. A log of padlocked equipment is maintained by the shift supervisor. Keys for such equipment are only issued through the concurrence of the Nuclear Shift Operating Foreman or Nuclear Shift Supervisor.

NRC Letter: September 19, 1983

Question 430.105 (Section 9.5.6)

Section 3.6 of the FSAR defines the air starting system of your plant as a high energy system. A high energy line pipe break in the air starting system of one diesel generator, plus any single active failure in any auxiliary system of the other diesel generator will result in loss of all onsite ac power. This is unacceptable. Provide the following information:

1. Assuming a pipe break at any location in the high energy portion of the air start system, demonstrate that no damage from the resulting pipe whip, jet impingement, or missiles (air receivers, or engine mounted air tanks) will occur on either of the two diesel generators or their auxiliary systems.

2. Section 9.5.6.2 states that the air receivers, valves, and piping to the engine are designed in accordance with ASME Section III Class 3 (Quality Group C) requirements. This is partially acceptable. We require the entire air starting system from the compressor discharge up to and including all engine mounted air start piping, valves and components be designed to Seismic Category I, ASME Section III Class 3 (Quality Group C) requirements. Show that you comply with this position (SRP 9.5.6, Parts II and III).

Response:

1. Refer to the response provided for Question 430.77, Amendment 8, and revised Section 9.5.6, Amendment 4, for discussion of the effect of loss of air pressure on an operating diesel generator.

2. Refer to revised Section 9.5.6, Amendment 4, and the response to Question 430.74, Amendment 8.

NRC Letter: September 19, 1983 1.9

Question 430.108 (Section 9.5.7) 1.13

For the diesel engine lubrication system in Section 9.5.7 provide the 1.14
following information: (1) define the temperature differentials, flow 1.16
rate, and heat removal rate of the interface cooling system external
to the engine and verify that these are in accordance with 1.17
recommendations of the engine manufacturer; (2) discuss the measures
that will be taken to maintain the required quality of the oil, 1.18
including the inspection, frequency of inspection, and replacement
when oil quality is degraded; and (3) describe the capability for 1.19
detection and control of system leakage and the frequency it will be 1.21
checked (SRP 9.5.7, Parts II and III).

Response: 1.22

1. Refer to revised Section 9.5.7 and Table 9.5-3, Amendment 4, and 1.24
the response provided for Question 430.95, Amendment 7. 1.25

2. Through the Preventive Maintenance Program, emergency diesel 1.26
generator lube oil will be sampled and tested annually. Samples 1.28
will be sent for a complete spectrographic analysis, and results
of this analysis will be evaluated to determine if the oil change 1.30
frequency recommended by the emergency diesel generator vendor
should be modified.

3. Possible leakage of lube oil into the diesel generator cooling 1.31
water can be detected by any of the following checks. During a 1.33
monthly operations surveillance test (OST), the cooling water
sight glass level and the lube oil level are checked both before 1.34
and during operation. Through this check, oil leakage can be 1.35
detected in the cooling water or suspected by a decrease in lube
oil level with a corresponding increase in cooling water level. 1.36
Also, unusually high cooling water temperatures noted during the 1.37
OST would indicate possible cooling water contamination. The 1.39
lube oil level dipstick is checked and logged every shift. A 1.40
decrease noted in this reading will indicate lube oil leakage,
which could be into the cooling water. In addition to the 1.41
previous methods, the BVPS chemistry manual specifies that the
emergency diesel generator coolant water should be sampled once 1.42
per month. If lube oil leakage is discovered in the cooling 1.43
water, or suspected of existing, immediate action will be taken
to locate the root cause of the leakage in accordance with the 1.44
appropriate station procedures.

NRC Letter: September 19, 1983 1.9

Question 430.109 (Section 9.5.7) 1.13

What measures have been taken to prevent entry of deleterious 1.14
materials into the engine lubrication oil system due to operator 1.15
error during recharging of lubricating oil or normal operation (SRP
9.5.7, Parts II and III).

Response: 1.16

Prior to use, all lube oil for the emergency diesel generators is 1.17
sampled by the Station Chemistry Department in accordance with 1.18
existing procedures and tests. The addition of lubricant into the 1.19
emergency diesel generator lube oil system is performed in accordance
with a site approved procedure. This procedure addresses two 1.21
alternate methods of adding lubricant to the system. Method Number 1 1.22
(less preferred) utilizes a 4-inch gravity fill connection which is
marked "Lube Oil Fill Connection." Unless oil is being added, this 1.24
connection remains capped, thus preventing the entry of deleterious
materials. Method Number 2 (more preferred) utilizes the discharge 1.25
side of the prelube/filter circulating pump. This pump discharges to 1.26
the lube oil filters and strainers, thus preventing the entry of
deleterious materials into the lube oil system. Oil is stored in 1.28
closed, sealed drums until used.

NRC Letter: September 19, 1983 1.9

Question 430.113 (Section 9.5.7) 1.13

An emergency diesel generator unit in a nuclear power plant is 1.14
normally in the ready standby mode unless there is a loss of offsite 1.15
power, an accident, or the diesel generator is under test. Long 1.16
periods on standby have a tendency to drain or nearly empty the
engine lube oil piping system. On an emergency start of the engine 1.17
as much as 5 to 14 or more seconds may elapse from the start of
cranking until full lube oil pressure is attained even though full 1.18
engine speed is generally reached in about five seconds. With an 1.19
essentially dry engine, the momentary lack of lubrication at the
various moving parts may damage bearing surfaces producing incipient 1.20
or actual component failure with resultant equipment unavailability.

The emergency condition of readiness requires this equipment to 1.21
attain full rated speed and enable automatic sequencing of electric 1.22
load within ten seconds. For this reason, and to improve upon the 1.23
availability of this equipment on demand, it is necessary to
establish as quickly as possible an oil film in the wearing parts of 1.24
the diesel engine. Lubricating oil is normally delivered to the 1.25
engine wearing parts by one or more engine driven pump(s). During 1.26
the starting cycle the pump(s) accelerates slowly with the engine and
may not supply the required quantity of lubricating oil where needed 1.27
fast enough. To remedy this condition for the rocker arm assembly 1.28
lubrication system, as a minimum, an electrically driven lubricating 1.29
oil pump, powered from a reliable dc power supply, should be
installed in the rocker arm lube oil system to operate in parallel 1.30
with the engine driven rocker arm lube pump. The electric driven 1.31
prelube pump should operate only during the engine cranking cycle or
until satisfactory lube oil pressure is established in the engine 1.32
rocker arm lube distribution header. The installation of this 1.33
prelube pump should be coordinated with the respective engine
manufacturer.

Confirm your compliance with the above requirement or provide your 1.34
justification for not installing an electric prelube oil pump (SRP 1.35
9.5.7, Parts II and III).

Response: 1.36

The BVPS-2 emergency diesel generator units are specifically designed 1.37
with nuclear standby service in mind. The units have a 1.38
Keep-warm and prelube pump that operates
continuously, maintaining the engine in a prelubricated condition for 1.39
emergency starts with the exception of the rocker arms. The rocker 1.40
arm has its own lube oil system consisting of an engine-driven pump
and an electric rocker arm prelube pump. With regard to dry 1.41
emergency starts, the vendor technical manual states that the system
is properly lubricated and ready for emergency starts if, (A) the 1.42

engine has been operated in the past week, or (B) the rocker arm
prelube oil pump has been run for at least 5 minutes but no more than 1.43
30 minutes in the past week.

The operating manual will require the electric rocker arm prelube 1.44
pump to be operated for at least 5 minutes (but no more than 30 1.46
minutes) once a week unless the engine has been operated within the
previous week. This will ensure that the system is properly 1.47
lubricated and ready for emergency starts.

Daily operation of the electric rocker arm prelube pump, as discussed 1.48
in SRP 9.5.7, would be excessive lubrication for the BVPS-2 diesel 1.49
generators when compared to the manufacturer's recommendations.

NRC Letter: September 19, 1983 1.9

Question 430.115 (Section 9.5.7) 1.13

In Section 9.5.4 you state that diesel fuel oil is available from 1.14
local distribution sources, but you have not discussed the 1.15
availability of lube oil. Identify the sources where diesel quality 1.16
lube oil will be available and the distances required to be travelled
from the source(s) to the plant. Also discuss how the lube oil will 1.18
be delivered onsite under extremely unfavorable environmental
conditions (SRP 9.5.7, Parts II and III). 1.19

Response: 1.20

Diesel lube oil will be stored at the site in quantities for one 1.21
complete change of one diesel engine. In addition, lube oil can be 1.22
obtained from Cleveland, Ohio (a 2-hour drive) which has a minimum of
5,000 gallons of Mobilguard 312 on hand at all times. The total 1.24
capacity of the sump is 1,400 gallons. The normal time involved in 1.25
obtaining this oil is 5 days, and the lube oil can be expedited in an
emergency. There is sufficient onsite storage which precludes the 1.26
need to consider unfavorable environmental conditions. As stated in 1.27
the response provided for Question 430.114, the 1,400 gallons stored
onsite are adequate to supply both diesel engines, assuming excessive 1.28
consumption rates, for greater than 7 days starting with sump level
at the low alarm point. 1.29

NRC Letter: September 19, 1983 1.10

Question 430.120 (SRP 9.5.7) 1.13

Section 9.5.7 and Figure 9.5-11 do not give an adequate 1.14
representation of the lube oil system. Very few valves and pipe 1.16
sizes are shown. For example, a number of lines from the lube oil 1.17
heat exchanger, oil filter, and oil strainers lead directly back to
the lube oil sump, leading to the conclusion that the engine may not 1.19
be adequately lubricated due to the oil being diverted to the sump. 1.21
Provide a detailed description (including instrumentation) of the 1.22
lube oil flow paths, as well as a more detailed P&ID of the lube oil 1.24
system showing pipe sizes, valves, and instrument locations (SRP
9.5.7, Part III).

Response: 1.25

Refer to revised Figure 9.5-11, Amendment 8. The lines leading 1.27
directly back to the sump are 3/8 inch vent lines. The flow through 1.28
these lines will have an insignificant effect on the operation of the
system. 1.29

NRC Letter: September 19, 1983 1.9

Question 430.123 (Section 9.5.8) 1.13

Discuss the provisions made in your design of the diesel engine 1.14
combustion air intake and exhaust system to prevent possible 1.15
clogging, during standby and in operation, from abnormal climatic
conditions (heavy rain, freezing rain, dust storms, ice and snow 1.16
drifts, and snow) that could prevent operation of the diesel
generator on demand (SRP 9.5.8, Parts II and III). 1.17

Response: 1.18

Abnormal climatic conditions to be considered at BVPS-2 would include 1.19
heavy rain, freezing rain, ice and snow drifts, and snow. Heavy 1.21
rain, freezing rain, and snow cannot impair the functioning of diesel
intakes and exhausts because of the downward facing openings of the 1.22
labyrinths which are designed to protect the exhausts and intakes
from tornado missiles. Drifting snow cannot restrict intakes due to 1.24
their elevation, which is greater than 25 ft. above the ground (refer
to Figure 3.8-43). Blockage of diesel exhausts by drifting snow is 1.26
prevented by the location and configuration of the concrete hoods
(refer to Figure 3.8-43). Since each hood has two downward facing 1.28
openings, one on the north side of the center supporting pedestal and
one on the south side of the pedestal, blowing snow from the north or 1.29
south will not significantly drift at least one opening on each 1.30
diesel exhaust because of shielding by the pedestals and/or the
adjacent diesel exhaust hood. Snow blown from the east or west will 1.31
not drift significantly because the north opening of the "B" diesel
exhaust and the south opening of the "A" diesel exhaust permit 1.32
blowing snow to freely pass under the overhanging openings. In 1.33
addition, the area of the openings (over 50 ft^2) far exceeds the area
of the exhaust pipe (less than 8 ft^2) and would permit significant 1.34
screen blockage before diesel performance would be impacted. Snow 1.35
depth can reach 51 inches average at the diesel exhausts and still
maintain the 8 ft^2 total opening area, assuming the exhaust flow does 1.36
not blow or melt nearby snow (which it certainly would).

NRC Letter: September 19, 1983

Question 430.127 (Sections 8.3, 9.5.6, 9.5.7, and 9.5.8)

Diesel generators for nuclear power plants should be capable of operating at maximum rated output under various service conditions. For no load and light load operations, the diesel generator may not be capable of operating for extended periods of time under extreme service conditions or weather disturbances without serious degradation of the engine performance. This would result in the inability of the diesel engine to accept full load or fail to perform on demand. Provide the following:

1. The environmental service conditions for which your diesel generator is designed to deliver rated load including the following:

   Service Conditions

   a. Ambient air intake temperature range - °F, and

   b. Humidity, max - percent.

2. Assurance that the diesel generator can provide full rated load under the following weather disturbances:

   a. A tornado pressure transient causing an atmospheric pressure reduction of 3 psi in 1.5 seconds followed by a rise to normal pressure in 1.5 seconds.

   b. A low pressure storm such as a hurricane resulting in ambient pressure of not less than 26 inches Hg for a minimum duration of two (2) hours followed by a pressure of no less than 26 to 27 inches Hg for an extended period of time (approximately 12 hours).

3. In light of recent weather conditions (subzero temperatures), discuss the effects low ambient temperature will have on engine standby and operation and effect on its output particularly at no load and light load operation. Will air preheating be required to maintain engine performance? Provide curve or table that shows performance versus ambient temperature for your diesel generator at normal rated load, light load, and no load conditions. Also provide assurance that the engine jacket water and lube oil preheat systems have the capacity to maintain the diesel engine at manufacturer's recommended standby temperatures with minimum expected ambient conditions. If the engine jacket water and lube oil preheat systems capacity is not sufficient to do the above, discuss how this equipment will

be maintained at ready standby status with minimum ambient temperature.

4. Provide the manufacturer's design data for ambient pressure vs engine derating.

5. Discuss the effects that any other service and weather conditions will have on engine operation and output, i.e., dust storm, air restriction, etc. (SRP 8.3.1, Parts II and III, SRP 9.55, Part III; SRP 9.5.7, Parts II and III; SRP 9.5.8, Parts II and III).

Response:

The emergency diesel generator engines are designed to operate with an ambient building temperature of +10°F to +122°F and a combustion air intake tempature of -20°F to +104°F. The engine is also unaffected by humidity and can operate from 0 to 100 percent humidity.

The diesel engine manufacturer has reviewed the engine design relative to a tornado pressure reduction of 3 psi and the hurricane pressures. The diesel engine manufacturer has indicated that no deleterious effect will take place for these events due to their short event durations.

The diesel engine manufacturer indicated that regardless of temperature, safe and reliable performance of the engine is assured when operation of the engine is in accordance with the operation and maintenance instructions described in the response to Question 430.25 Amendment 3. The manufacturer has stated that the probability that extreme cold air temperatures could affect the ability of the diesel engine to start was considered in the responses to NRC questions relating to another nuclear plant. The effects of air temperature in combination with other engine parameters were considered in the manufacturer's analysis in response to those NRC questions. The manufacturer's conclusion was that no air preheating is required when combustion air temperatures are above -20°F.

The jacket water and lube oil preheat systems have been designed by the diesel engine manufacturer to maintain the engine at temperatures required by the diesel engine manufacturer to enhance first-start capability. The jacket water and oil preheat systems have been designed predicated on a room temperature of +10°F.

The diesel generators and associated auxiliary systems are located in heated cubicles. As described in Section 9.4.6 and Table 9.4-9, heating is provided by multiple electric unit heaters. The size and number of unit heaters required was determined without taking credit for the diesel's jacket water heater and lube oil preheater. Therefore, adequate building temperatures could be maintained with one unit heater out of service when the heat released by the diesel

in the standby mode is available. The only credible event which 2.30
would cause loss of all the heaters is a loss of the power supply.
In that event the diesel would start and the heaters would not be 2.31
required because of the heat released from the diesels under load. 2.32

The engine manufacturer's criteria do not require derating for any 2.33
ambient pressure expected at the site.

Refer to Figure 430.127-1, based on vendor-supplied drawing. Also 2.35
refer to the response provided for Question 430.123, Amendment 4.

NRC Letter: September 19, 1983 1.10

Question 430.128 (Section 8.3, SRPs 9.4.5 and 9.5.8) 1.14

In Section 8.3 of the FSAR you state that in the event of a loss of 1.15
offsite power (LOOP), the diesel generator room ventilation system 1.16
must be manually reconnected to the bus. The diesel generator room 1.18
ventilation system provides cooling to the diesel generator and its 1.19
auxiliary equipment during diesel generator operation. Failure to 1.20
restore the ventilation system to operating condition within a
reasonable amount of time will result in diesel generator room 1.21
temperatures exceeding the 120°F design ambient temperature specified 1.22
in Section 9.5.4 of the FSAR. Provide the following: 1.23

1. The means that are provided to the control room operator 1.30
   that tell him the ventilation system needs to be manually 1.31
   connected to the bus in the event of LOOP.

2. How and from where will manual reconnection be performed? 1.32

3. The time period that will be required to manually reconnect 1.33
   the ventilation system to the bus. This should include all 1.35
   travel time. The time interval between diesel generator 1.36
   start-up and operator recognition that the diesel room 1.38
   ventilation system has to be turned-on as a result of the
   room temperature alarm, procedures, or other indication, and 1.39
   other contingencies or actions that the operator must take 1.41
   as a result of the accident.

4. A room temperature versus time profile for the worst case 1.42
   outside ambient air temperature conditions for the following 1.43
   events:

   a. Diesel generator started, ventilation system 1.45
      automatically reenergized.

   b. Diesel generator started, ventilation system manually 1.46
      reenergized in the time specified in item 3 above. 1.47

   c. Diesel generator started, ventilation system not 1.48
      energized.

5. Assuming that the diesel room ventilation system is not 1.50
   reenergized for whatever reason, verify that the diesel 1.51
   generator and its associated equipment (electrical and
   mechanical) is qualified to operate in the maximum room 1.52
   temperature environment specified in 4(c) above and will be 1.53
   able to operate in this environment for a minimum of seven
   days of diesel generator operation. 1.54

6. If the diesel generator and its associated equipment 1.55
(electrical and mechanical) cannot operate in the maximum 1.56
room temperature environment of 4(c) above, state the
maximum allowable room temperature in which the diesel 1.57
generator and its associated equipment can operate, and 1.58
provide a list of diesel generator components whose
environmental operating temperatures are less than the 2.1
maximum room temperature specified in 4(c) above and their 2.2
operating temperatures. Discuss how the listed diesel 2.3
generator components will be upgraded to qualify and operate 2.4
in the maximum environmental room temperature or will be
protected during these conditions, so that the diesel 2.5
generator can perform its design safety function, or provide 2.6
assurance to the staff that the ventilation system will be
reenergized prior to reaching the maximum environmental room 2.7
temperature so that the diesel generator and the above 2.8
listed equipment can perform its design safety function,
(SRP 8.3.1, Parts II and III; SRP 9.4.5, Part III, and SRP 2.9
9.5.8, Parts II and III)

Response: 2.11

Refer to Section 9.4.6.3, which states that "Operation of the primary 2.12
and secondary supply fans, normal exhaust fans, and associated 2.13
motorized dampers is maintained during loss of normal station power 2.14
by automatic connection to the emergency buses."

In addition, the diesel generator secondary supply fan (2HVD*271A) 2.15
will be added to Table 8.3-3 in a future amendment.

NRC Letter: September 19, 1983

Question 430.129 (Section 9.5.8)

In the FSAR you state the primary fire protection system for the diesel generator building is a CO_2 system. The CO_2 is a nonsafety related system and is not qualified for seismic events. The system is seismically supported. Show that spurious actuation of the CO_2 fire protection system will not affect diesel generator availability and operability (SRP 9.5.8, Parts II and III).

Response:

As stated in the response to Question 280.3, Amendment 3, a review of spurious actuation of CO_2 systems has been completed. That response described changes required to the ventilation system identified in the review. No other unacceptable effects were identified in the review.

Postulated effects of spurious actuation of the CO_2 systems include dilution of the diesel combustion air and thermal transients in the diesel generator cubicles. The effects of dilution of combustion air resulting from spurious actuation of the CO_2 systems are less severe than the effect of a fire in one diesel generator cubicle which were addressed in the response to Question 430.124, Amendment 7. The effects of thermal transients are addressed as follows:

Discharge of the CO_2 systems is postulated to be a single shot resulting from a spurious actuation signal. The CO_2 nozzle discharge is directed away from essential equipment. This discharge will cause a rapid drop in air temperature. Due to the heat capacity of the building structure and equipment in the building, as well as heat sources in the building, the air temperature will return to near normal in minutes (refer to typical test data, Chemetron 1975).

The cooling of the air in the building is caused by the air mixing with the CO_2 discharge, which causes thermal equilibrium to be reached almost immediately. Cooling of equipment will then occur as thermal equilibrium between the equipment and the air/CO_2 mixture is approached through natural convection heat transfer. Because the mass of the air/CO_2 mixture is only a small fraction of the mass of the equipment and structures in the diesel generator building, the change in temperature for the equipment and structures will only be a fraction of the temperature change in the air. Electrical equipment enclosed in cabinets will be partially insulated by those enclosures and will therefore experience less temperature change.

Due to the low probability of spurious CO_2 discharge and the short duration of the event should it occur, no significant effects are expected.

Reference for Q430.129:

Chemetron 1975. Letter to R. E. Heilman, Stone & Webster Engineering Corporation, from H. V. Williamson, Chemetron Gases Group Research Center, February 6, 1975.

NRC Letter: September 19, 1983 1.9

Question 430.134 (Section 10.2) 1.13

In Sections 10.2.2.3 and 10.2.3.5 you discuss inservice inspection 1.14
and exercising of the main steam turbine stop and control and 1.15
reheater stop and intercept valves. You do not discuss the inservice 1.17
inspection, testing and exercising of the extraction steam valves.
Provide a detail description of: 1) the extraction steam valves, and 1.18
2) your inservice inspection and testing program for these valves. 1.19
Also provide the time interval between periodic valve exercising to 1.20
assure the extraction steam valves will close on turbine trip 1.21
(SRP 10.2, Part III).

Response: 1.22

Refer to Section 10.4.11 and revised Section 10.2.2.1, Amendment 4, 1.23
for the description of the extraction line nonreturn valves. 1.24

The extraction steam valves are not safety-related and are not an 1.25
ASME Section XI examination requirement. As such, they are not 1.26
inspected or tested within the plant's in-service inspection program
(ASME Section XI). However, these valves will be operationally 1.27
tested prior to any startup. The BVPS operating manual chapter on 1.28
the extraction steam system start-up requires all extraction steam
nonreturn valves to have been tested during start-up within 1 week. 1.29
This requirement is met in the start-up procedure by visually noting 1.30
the stroking of the valves in a test latch-unlatch sequence during 1.31
the turbine start-up.

NRC Letter: September 19, 1983

Question 430.136 (Sections 10.2.2.3 and 10.2.3.5)

In Sections 10.2.2.3 and 10.2.3.5 of the FSAR, you discuss the in-service inspection (ISI) program for the main turbine stop, control and combined intercept and intermediate stop valves, and the turbine overspeed protection system.

1. In the description of the ISI for the valves, you state the following: "The valves are partially closed and then reopened during this procedure [weekly valve exercising]" and "after this initial inspection program [valve dismantlement and visual inspection] is completed, inspection of all valves at least once every 36 to 39 months is suggested." This is not in accordance with the ISI criteria in Section II of SRP 10.2 and the Westinghouse Test Instructions (I.L. 1250-4093 B) which require complete closure of the valves and visual inspection every 36 to 39 months. Comply with this position.

2. In the description of the ISI for the turbine overspeed protection system, you state "... overspeed trip tests are performed periodically...." Define periodically (SRP 10.2, Parts II and III).

Response:

Refer to revised Sections 10.2.2.3, Amendment 4, and 10.2.3.5, Amendment 2 and the response to Question 251.2, Amendment 3.

DLC is not currently following the Westinghouse Test Instructions (I.L. 1250-4093 B) which were referenced in the question. The applicable information for BVPS-2 is contained in Westinghouse Instruction Manual 1250-C874, Volume 1. Thus, in accordance with this manual, DLC is following the recommendations of I.L. 1250-4700.06 rather than I.L. 1250-4093 B. DLC will conform to SRP Section 10.2 concerning valve maintenance and overspeed protection.

A complete turbine overspeed trip test (actual turbine trip) will be conducted during refueling outages unless previously conducted as a post-maintenance test of the turbine. The special test provision discussed in Section 10.2.2.3 will be used on a monthly basis to check the mechanical and backup electrical overspeed trips.

NRC Letter: September 19, 1983

Question 430.138 (Section 10.3.1)

You state in Section 10.3.1 of the FSAR that the main steam system is designed in accordance with Issue No. 1 of NUREG-0138, and that credit is being taken for all valves downstream of the main steam isolation valve (MSIV) to limit blowdown of a second steam generator in the event of a steam line break upstream of the MSIV. In order to confirm satisfactory performance following such a steam line break, you provided a tabulation (Table 10.3-1) in the FSAR of all flow paths that branch off the main steam lines between the MSIVs and the turbine stop valves. For each flow path originating at the main steam lines, the following information was provided:

a) System identification,

b) Maximum steam flow in pounds per hour,

c) Type of shut-off valve(s),

d) Size of valve(s),

e) Quality of the valve(s),

f) Design code of the valve(s),

g) Closure time of the valve(s), and

h) Actuation mechanism of the valve(s) (such as, solenoid-operated, motor-operated, and air-operated diaphram valves).

Sufficient descriptive information was not provided in the FSAR to confirm satisfactory performance following such a steam line break. Provide the following:

a) In the event of the postulated accident, termination of steam flow from all systems identified in Table 10.3-1, except those that can be used for mitigation of the accident, is required to bring the reactor to a safe cold shutdown. For these systems describe what design features have been incorporated to assure closure of the steam shut-off valve(s). Describe what operator actions (if any) are required.

b) If the systems that can be used for mitigation of the accident are not available or a decision is made to use other means to shut down the reactor, describe how these systems are secured to assure positive steam shut-off. Describe what operator actions (if any) are required.

c) Show that failure to isolate or secure these systems will not result in a blowdown of more than one steam generator.

If any of the requested information is presently included in the FSAR text, provide only the references where the information may be found (SRP 10.3, Parts II and III).

Response:

Closure of steam shutoff valves is not required for any of the branch lines off the main steam lines.

Reheat steam flow to the tube side of the reheater will cease when flow from the high pressure turbine exhaust to the shell side of the reheater is terminated by a turbine trip.

Turbine bypass steam flow to the main condenser is automatically controlled. Following a loss of offsite power (LOOP), the control valves will close. If offsite power remains available, the valves will modulate to control the cooldown of the reactor (Section 7.7).

The flow from all the remaining branch lines in combination is so small that it will have an insignificant effect compared to the effect of the postulated double-ended rupture of main steam line.

This flow is less than the flow which would pass through a main steam safety valve or power-operated relief valve. Therefore, postulation of failure of a safety or relief valve as the single failure is more restrictive than postulation of an MSIV failure.

As stated in Section 15.1.5.2, the most restrictive single failure is assumed to occur in the safety injection system for the analysis of a main steam line break.

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Question 430.141 (Section 10.4.1) 1.13

In Section 10.4.1.4 you have discussed tests, initial field 1.14
inspection, and inservice inspection but not the frequency of 1.15
inservice inspection of the main condenser. Provide this information 1.16
in the FSAR (SRP 10.4.1, Part III).

Response: 1.17

The main condenser is not included in the ASME Section XI Inservice 1.18
Inspection Program. The condenser is scheduled for inspection based 1.19
on plant chemistry conditions, results of fouling analysis, and
trends in operating parameters. These inspections are normally 1.21
scheduled during refueling outages but may occur more frequently
based on changes in the operating conditions mentioned above. The 1.23
condenser is inspected as outlined in Section 10.4.1.4.
Additionally, differential pressure and other plant parameters which 1.24
monitor condenser operation are monitored daily during plant 1.25
operation.

NRC Letter: September 19, 1983 1.9

Question 430.144 (Section 10.4.4.4) 1.13

In Section 10.4.4.4 you have discussed tests and initial field 1.14
inspection, inspections at refueling, and in-service inspection but 1.15
not the frequency of in-service testing and inspection of the turbine
bypass system. Provide this information in the FSAR (SRP 10.4.4, 1.16
Part I).

Response: 1.17

The turbine bypass system (TBS) is not included in the ASME 1.18
Section XI In-service Inspection Program. During preoperational 1.19
testing to Regulatory Guide 1.68, the TBS control valves and controls
will be inspected and tested as described in Section 14.2.12. The 1.21
TBS piping is inspected and tested in accordance with Paragraphs 136
and 137 of ANSI B31.1.

NRC Letter: September 19, 1983

Question 430.146 (Sections 10.3.2 and 10.4.4.3)

In Sections 10.3.2 and 10.4.4.3 of the FSAR you state that turbine bypass system interlocks are provided to prevent spurious opening of the turbine bypass valves. In Section 10.4.4.5 you state that interlock selector switches are provided in the main control room, but no description is provided. Provide a detailed description of the turbine bypass system interlocks, including interlock selector switches and their purpose (SRP 10.4.4, Part III).

Response:

Steam dump system interlocks are provided to prevent spurious opening of the steam dump valves. These interlocks are as follows:

1. High condenser pressure or insufficient condenser circulating water flow (C-9) blocks the signals which supply air to the individual dump valves.

2. Low-low reactor coolant system average temperature (P-12) blocks the signals which supply air to the individual dump valves. Redundant interlock selector switches for manual bypass of this interlock are provided to allow a planned, controlled plant cooldown but apply only to the cooldown condenser dump valves. A low-low reactor coolant system temperature signal always blocks the signals which supply air to those condenser dump valves that are not cooldown dump valves (this function of the low-low T_{avg} interlock cannot be bypassed).

3. On a reactor trip, upon actuation of load-loss permissive C-7A or upon selection of steam header pressure control, air can be supplied to half of the condenser dump valves (the half containing the cooldown condenser dump valves), and air to the remaining half remains blocked; upon actuation of load-loss permissive C-7B while the steam dump control mode is in the T_{avg} mode, air can be supplied to the remaining half.

4. Reactor trip (P-4) blocks the signals which allow air to be supplied to half of the condenser dump valves (the half that does not contain the cooldown dump valves).

5. Each of the four banks of condenser dump valves is tripped open by a temperature error signal from comparison of the auctioneered T_{avg} with T_{avg} (load rejection) or of the auctioneered T_{avg} with T_{avg} (reactor trip). The valves are tripped open one bank at a time. For a load rejection, either 0, 1, 2, 3 or 4 banks can be tripped open, depending on the temperature error signal generated by the load rejection. For a reactor trip, either 0,

1, or 2 banks can be tripped open, depending on the temperature error signal generated.

6. The condenser dump valves are modulated sequentially, one bank at a time. The second bank does not begin to modulate open until the first bank has received a signal to modulate fully open, the third bank does not begin to modulate open until the first and second banks have received signals to modulate fully open, etc. The sequence for modulating the valves closed is the reverse of the opening sequence (i.e., the last bank to open is the first bank to close, etc). The first bank to modulate open is also the bank that is tripped open first.

The interlocks are also presented in the Functional Logic Diagrams for BVPS-2 (Westinghouse drawing #108D993) on Sheet 10.

Also refer to revised Section 10.4.4.5, Amendment 8, for descriptions of the turbine bypass interlocks and interlock selector switches and their purposes.

pressure is relieved to the atmosphere through the atmospheric dump 1.10
valves and through the main steam safety valves (Section 10.3). 1.11

10.4.4.4 Inspection and Testing Requirements 1.14

During the Initial Startup Test Program, the turbine bypass control 1.15
valves and TBS controls are inspected and tested in accordance with 1.18
Section 14.2.12.

The TBS piping is inspected and tested in accordance with 1.21
Paragraphs 136 and 137 of ANSI B31.1.

10.4.4.5 Instrumentation Requirements 1.24

A steam dump control mode selector switch and redundant interlock 1.25
selector switches are provided in the main control room. Loss of 1.28
condenser vacuum and circulating water pump interlocks are provided
for the turbine bypass control valves.

The following control switches are provided in the main control room 1.29
for operation of the TBS: steam bypass control mode selector switch 1.30
(reset-T_{avg}-steam pressure), steam bypass interlock selector switches 1.31
(off/reset-on-defeat T_{avg}), and selector switches (loop 21 T_{avg} 1.33
defeated, loop 22 T_{avg} defeated, loop 23 T_{avg} defeated). 1.34

Manual/Auto stations for the atmospheric steam dump valves are 1.35
provided in the main control room and at the emergency shutdown panel 1.36
(ESP). A pushbutton at the ESP will transfer control from the main 1.37
control room to the ESP. A manual reset at the relay will transfer 1.38
control from the ESP back to the main control room. If their 1.39
respective steam line pressures are not high, the atmospheric steam
dump valves can be modulated automatically or manually from either 1.40
the main control room or from the ESP.

Manual stations for two of the atmospheric steam dump valves are 1.41
provided at the alternate shutdown panel (ASP). A pushbutton on the 1.42
ASP will transfer control from the main control room or the ESP to
the ASP. A manual reset at the relay on the ASP will transfer 1.43
control back to either the main control room or to the ESP. The 1.44
atmospheric steam dump valves can be modulated manually from the ASP
provided the transfer pushbutton on the ASP has been depressed. 1.45

Annunciation is provided in the main control room when control is at 1.46
the ESP or at the ASP. These conditions are also monitored by the 1.47
BVPS-2 computer. Red (open) and green (closed) indicating lights are 1.48
provided at the main control board, at the ESP, and at the ASP to
indicate where the control is at. 1.49

A manual loading station for the atmospheric residual heat release 1.50
valve is provided in the main control room and at the ESP. A 1.52
pushbutton at the ESP will transfer control from the main control
room to the ESP, and a manual reset at the relay on the ESP will 1.53