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February 21, 1989

W3P89-0028
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QA

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Generic Letter 88-14

Gentlemen:

The NRC issued Generic Letter 88-14, Instrument Air Supply System Problems Affecting Safety-Related Equipment, on August 8, 1988. The purpose of this generic letter was to request that licensees review NUREG-1275, Volume 2, and perform a design and operations verification of their instrument air system. This verification was to include:

1. Verification by test that actual instrument air quality is consistent with the manufacturer's recommendations for individual components served.

2. Verification that maintenance practices, emergency procedures, and training are adequate to ensure that safety-related equipment will function as intended on loss of instrument air.

3. Verification that the design of the entire instrument air system including air or other pneumatic accumulators is in accordance with its intended function, including verification by test that air-operated safety-related components will perform as expected in accordance with all design-basis events, including a loss of the normal instrument air system. This design verification should include an analysis of current air operated component failure positions to verify that they are correct for assuring required safety functions.

To perform the above, a multi-discipline task force was formed to review, evaluate and respond to the generic letter. This task force consisted of representatives from Operations, Plant Engineering, Maintenance, Nuclear Operations Support and Assessment (NOSA), Nuclear Operations Engineering and Construction (NOE&C) and Licensing.

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The attached response has been divided into three (3) sections corresponding respectively to the above. A description of the instrument air system has been included as a preface to the response.

Should you require additional information, please feel free to contact me or L.W. Laughlin, Site Licensing Support Supervisor, at (504) 464-3499.

This response is submitted as required under affidavit under provisions of Section 182a of the Atomic Energy Act of 1954, as amended.

Very truly yours,

R.F. Burski
Manager
Nuclear Safety & Regulatory Affairs

RFB:DMU:ssf

Attachment

cc: R.D. Martin, NRC Region IV
J.A. Calvo, NRC-NRR
D.L. Wigginton, NRC-NRR
NRC Resident Inspectors Office
E.L. Blake
W.M. Stevenson

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of	)	
	)	
Louisiana Power & Light Company	)	Docket No. 50-382
Waterford 3 Steam Electric Station	)	

AFFIDAVIT

R. F. Burski, being duly sworn, hereby deposes and says that he is Nuclear Safety and Regulatory Affairs Manager of Louisiana Power & Light Company; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached response to NRC Generic Letter 88-14; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

R.F. Burski
Nuclear Safety & Regulatory Affairs-
Manager

STATE OF LOUISIANA)
)ss
PARISH OF ORLEANS)

Subscribed and sworn to before me, a Notary Public in and for the Parish and State above named this 21st day of February, 1989.

Notary Public

My Commission expires [illegible].

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WATERFORD 3

RESPONSE TO GENERIC LETTER 88-14

W3P89-0028

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SYSTEM DESCRIPTION

The instrument air system at Waterford 3 is designed to provide a reliable supply of clean, dry, oil-free air for pneumatic instruments and controls and pneumatically operated valves during normal plant operation. The instrument air system serves no safety function. Air operated valves that are required for safe shutdown and accident mitigation are provided with safety related accumulators.

The instrument air system consists of:

1. two horizontal, oil-free, single stage, rotary air compressors

2. two air dryer assemblies with pre- and after- filters

3. one vertical air receiver

Each instrument air compressor package consists of an inlet filter, compressor, moisture separator, heat exchanger and discharge filter. Air from these packages is discharged into the instrument air receiver by a common header. The air then passes through the air filter/dryer assemblies.

During normal operations, pressure in the air receiver is maintained between 112-120 psig. Should pressure in the receiver fall below 105 psig, the second instrument air compressor starts automatically. If pressure

drops below 100 psig, a cross connect valve between the instrument and station air systems opens allowing station air to help maintain instrume air system pressure. The service air is introduced upstream of the instrument air receiver and the air filter/dryer assemblies.

Please note that at Waterford 3, the station and instrument air compress are identical units. The only difference in systems is that the station air system does not have air filter/dryer assemblies..

The instrument air filter/dryer assemblies are provided with an automatic bypass which opens when dryer outlet pressure falls below 95 psig. A strainer is installed in the filter/dryer bypass line to coarse filter th air.

Annunciation is provided in the control room for the following conditions:

1. Instrument Air Receiver Pressure Hi/Lo
2. Instrument Air Compressor A(B) Trip/Trouble
3. Instrument Air Compressor A(B) Separator Level Hi/Lo
4. Instrument Air Dryer A(B) Trouble
5. Instrument Air Dryer Bypassed
6. Instrument Air Pressure Backup Valve Open
7. Instrument Air Compressor A(B) Locked Out
8. Valve Operator N_2 Backup Actuated/Trouble

Even though they are not safety-related, the instrument air compressors supplied power from safety buses. If a loss of offsite power occurs, th instrument air compressors trip. They can be manually reconnected to th emergency diesel generators at the control room's discretion.

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SECTION I

A list was prepared of all safety related air operated components. Thi list consisted of 173 valves and dampers. Purchase specifications for majority of the above were reviewed for air quality requirements. They specified only clean, dry air. The major manufacturers were also conta to determine if there was any specific air quality requirements for the equipment. They confirmed that the only requirement was for clean, dry air.

The purchase specifications for the instrument air supply system, i.e. compressors, dryers, etc., were then reviewed for quality requirements o the discharged air. The only requirements were to provide clean, dry ai

The pre-operational startup flush procedures (SFL-23-001 through 005) for the instrument air system were reviewed. The acceptance criteria for particulate and organics were as follows:

1. No particulate will be larger than 1/32 inch by 1/16 inch when air is sampled through a mesh filter for a 1-minute blowdown.

2. The system piping shall be free of organics as verified by black ligh examination of the sample filter cloth.

These criteria were documented as met.

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The pre-operational startup test procedure (SPO-23-001) was also reviewed The acceptance criteria for the instrument air dryer was an outlet dewpoi temperature of -40 degrees F or lower. This criterion was documented as met.

Prior to the issuance of Generic Letter 88-14, Waterford 3 did not have a instrument air sampling program. In response to this letter a sampling program has been initiated.

LP&L has reviewed applicable instrument air system drawings and identifie those headers which feed the majority of the safety-related air operated valves. From this, fifteen (15) locations were then identified at which t draw samples. Samples will be taken from five (5) sample points at least once each refueling cycle on a rotating basis. In this way all 15 points will be sampled once every three refueling cycles. A contract has been awarded to an outside laboratory to analyze these samples. In order to obtain suitable samples for analysis, special sampling equipment is required. This equipment is described below.

1. sampling pump equipped with adjustable flow meter and preweighed nucleopore filters
2. tedlar bag equipped with isolation valve
3. hygrometer

The appropriate test procedure to instruct personnel how and where to draw the air samples, will be in place prior to the next refueling outage.

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Although the instrument air sampling procedure is not complete, a specia test procedure on work authorization (WA) 01032052 was issued to perform the initial instrument air sampling. The air sample drawn during this t will be analyzed for moisture, particulate and hydrocarbons. The acceptance criteria are as follows:

Particulate	10 microns
Dewpoint	-10°F
Hydrocarbons	3 ppm

The acceptance criteria for particulate was based on the presently installed dryer filter size of 10 microns. For dewpoint, local climatic conditions were reviewed and used to determine the acceptance criteria.

The hydrocarbon acceptance criteria was based on information from the startup flush packages. Because the compressors are an oil free type, no oil or hydrocarbons were found in the original flush samples. The three (3) ppm acceptance criteria was based on this with a slight allowance for natural background levels of methane.

Testing for hydrocarbons will be performed during this special test and then only after a major system modification, i.e. compressor replacement with different type. Nash air compressors are oil free, water-ring type compressors. The dryers are an activated dessicant type. Introduction of oil into the instrument air system from these components is not credible. Therefore, pending satisfactory results on the initial sample, no further hydrocarbon testing will be performed except as previously stated.

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The instrument air sample for the special test was taken on February 13 1989 and sent to Environmental Industrial Research Associates (EIRA) fo analysis. The results of the air sample are not expected before this response is due to the NRC. Therefore, within 30 days of receipt, LP&L will provide the NRC a statement of Waterford 3 instrument air quality.

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SECTION II

A list was prepared of the major instrument air system components. Maintenance procedures, calibration procedures and repetitive tasks for these components were identified and reviewed for adequacy.

This review, as well as compressor flow tests which shall be discussed further in Section III, identified several deficiencies. The vendor manu. used to rework the Nash air compressors was found to be inadequate. With vendor assistance, the vendor manual was reviewed and the deficiencies we: identified. This manual is to be revised to incorporate the necessary information. To ensure the adequacy of the updated manual information, this information was utilized to rework a station air compressor, whose output had degraded. (NOTE: Waterford 3 uses the same model Nash compressor in both the instrument and station air systems.) The result wa: that compressor capacity was returned to an acceptable level.

Another problem associated with the above was a lack of post maintenance flow testing. Prior to those conducted in December 1988, flow tests were not performed following repairs or overhauls of instrument or service air compressors. The requirements to perform a flow test following compressor maintenance will be incorporated into the appropriate procedures. No other deficiencies were identified with the instrument air system component procedures.

In addition to the above, maintenance procedures, calibration procedures and repetitive tasks for the safety related air operated components were reviewed for adequacy. No major deficiencies were discovered by this review. Several enhancements were identified and are being evaluated fo possible implementation.

A review of normal, emergency and off-normal operating procedures was performed to determine which addressed or needed to address actions following loss of instrument air. In addition to the nine (9) Emergency Operating Procedures (EOPs), the following five (5) procedures were identified.

1. OP-500-005, Annunciator Response for Control Room Cabinet E
2. OP-500-008, Annunciator Response for Control Room Cabinet H
3. OP-500-010, Annunciator Response for Control Room Cabinet L
4. OP-901-038, Instrument Air System Malfunction
5. OP-03-016, Instrument Air System

The following items were identified as potential deficiencies. They are presently being reviewed with Operations personnel. Appropriate procedure changes will be implemented by the next refueling outage for those items confirmed as deficiencies.

1. OP-500-010 does not require blowdown of the instrument air system downstream of the dryers whenever the Instrument Air Dryer Bypassed, H-7 alarm is received.

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Maintenance personnel, excluding engineers and supervisors, receive gene: plant system training and specific training in their respective discipli: i.e. electrical. No specific training is given the maintenance craft personnel regarding loss of instrument air and/or the related procedures. This training would not be relevant to the duties these individuals are expected to perform.

Engineering personnel including Maintenance engineers and supervisors are offered instrument air system training under the "system of the month training program. This training not only covers system and component operating parameters but also provides training on the following procedures:

1. Operating Procedure OP-3-016: Instrument Air System
2. Off-Normal Procedure OP-901-038: Instrument Air System Malfunction

This training has been reviewed and considered adequate for these individuals.

Operations personnel, as part of their license training, receive system an off-normal procedure training. They also receive simulator training involving loss of instrument air. A review of this training has been performed and found to be adequate.

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SECTION III

A review of the instrument air supply system was performed by LP&L. The ability of the system to supply the required quantity and quality of air was reevaluated. Testing was also performed to determine the present condition of the equipment.

As previously discussed in Section I, the only air quality requirements for the supply system or air operated components are clean, dry air. The acceptance criteria established in the sampling procedure will satisfy these air requirements. It is anticipated that when the results of the initial air sample are received, the acceptance criteria will be met.

Instrument air compressor design and performance were reviewed. The original system design required the capacity of each compressor to be 280 SCFM at 100 PSIG. Compressor capacity tests performed in December, 1988 showed that both instrument air compressors were operating at considerably less than this capacity. A detailed analysis performed by LP&L determined that the plant air demand was approximately 280 SCFM.

The operation of the filter/dryer assemblies was also reviewed. Each assembly is rated at 360 SCFM. While in operation, each filter/dryer assembly requires approximately 60 SCFM continuous flow for regeneration. This regeneration flow is discharged to atmosphere and is therefore lost from the system. Compressor output is split between the two assemblies. Except for maintenance periods, both dryers are continuously in service. This means a regeneration flow of approximately 120 SCFM is continuously lost to atmosphere.

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Given a system demand of approximately 280 SCFM and filter/dryer purge requirements of approximately 120 SCFM, a total of approximately 400 SCFM is needed for normal plant operation. In their present condition, both compressors are required full time to meet the flow requirements. Once the compressors are reworked, one compressor operating full time and another loading intermittently should provide the required flow. Rework of the instrument air compressors will be completed by the next refueling outage.

To reduce compressor demands, the possibility of using one filter/dryer assembly at a time is being considered. Full flow through one assembly has been attempted with unsatisfactory results. The pressure drop across the assembly exceeded vendor recommendations. The cause of the pressure drop across the filter/dryer assembly is being investigated. Depending on the results of this investigation, the use of a single assembly with the other in standby is being considered. This should reduce the regeneration flow requirements considerably thereby decreasing compressor demands.

While evaluating system performance, several items which could increase system reliability were identified. These items will be evaluated for possible incorporation. They are as follows:

1. Replace 10 micron dryer afterfilters with 0.3 micron absolute filters.
2. Install automatic drain valves in the dryer prefilters.

3. Install manual drain valves on instrument and service air receivers.

4. Reevaluate the filter/dryer bypass setpoint value.

On the basis of the above evaluation, the instrument air system is meeti its intended function; providing adequate amounts of clean, dry air. E with the compressors at less than rated capacity, the system's performan is adequate to satisfy plant requirements.

The system as it is presently operating was compared to the FSAR system description. Several minor discrepancies were found. As previously discussed, several ideas for possibly increasing system reliability and/c efficiency were identified during system review. These items are current being evaluated for possible incorporation. After making the final determination as to which, if any, of the above will be added to the system, the FSAR will then be revised to make necessary corrections and reflect all enhancements.

As stated in Section I, Waterford 3 has 173 safety-related valves and dampers. The failure position, following loss of instrument air, for eac component was identified. This was then compared to the actual component failure position. All components failed to the required position. Periodic surveillances are performed to ensure valve operability. In addition to this, air operated components were successfully tested for lo of instrument air and power during pre-operational startup testing. Each component was tested individually as part of its respective system's pre-operational test.

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A further review of the above components was performed to determine whic received an Engineered Safety Feature (ESF) actuation signal. The signa and corresponding position for each component was identified. The positions these components were required to move to on their respective actuation signals were verified to be correct. These valve operations a tested periodically under the following surveillance procedures:

OP-903-029, Safety Injection Actuation Signal Test

OP-903-032, Quarterly ISI Valve Tests

OP-903-033, Cold Shutdown ISI Valve Tests

OP-903-036, Containment Spray Actuation Signal Test

OP-903-040, Containment Isolation Actuation Signal Test

OP-903-047, Emergency Feedwater Actuation Signal Test

OP-903-091, Recirculation Actuation Signal Test

OP-903-092, Main Steam Isolation Actuation Signal Test

OP-903-094, ESFAS Subgroup Relay Test - Operating

OP-903-095, ESFAS Subgroup Relay Test - Shutdown

A review of all safety-related valves was also performed to identify which were serviced by accumulators. Thirty-four (34) valves use nitrogen accumulators and 24 are provided with air accumulators. Four (4) other components, to be addressed later in this section, were identified as needing further evaluation.

LP&L has reviewed the design of the nitrogen accumulator systems. There are ten accumulators which service 34 valves. These accumulators were verified to be of sufficient size to satisfy the time and stroke requirements of their respective valves. LP&L also reviewed design

drawings to verify that the seismic and piping class requirements were correct for the nitrogen accumulator systems. These were found to be acceptable for their intended functions.

It should be noted that the seismic qualification of individual componen associated with valves and/or valve operators, i.e. filter regulators, electric/pneumatic transducers etc., were not reviewed. This individual component record search and verification was determined to be beyond the scope of Generic Letter 88-14.

Air accumulators are installed on 24 valves. The function of these 24 valves was re-reviewed to determine their requirements for operating post accident. Of the 24 valves, only 2 (SI 602A & B; Safety Injection Recirculation Sump Outlet Valves) were required to change position following loss of instrument air to mitigate the consequences of an accident. One (1) valve (CC 620; Fuel Pool Heat Exchanger Temperature Control Valve) required an accumulator only to close to its "fail safe" position on loss of instrument air.. For the remaining 21 valves, the position they fail to on loss of instrument air was determined to be a safe position. These valves are not required to change from this position for safe shutdown or accident mitigation. Their respective accumulators, therefore perform no safety-related functions associated with valve actuation. Although it may be convenient from an operational standpoint to operate these 21 valves following loss of instrument air, it is not required. The accumulators for these 21 valves are therefore not within the purview of this generic letter and will not be addressed further. For the remaining 3 valves with air accumulators (CC 620, SI

602A & B), a review of capacity, seismic and piping class requirements was performed by LP&L and found to be adequate as is.

The air accumulators associated with valves SI 602A & B were sized to all each valve to cycle once within an hour of losing instrument air. This w verified by test in August, 1988 under WA 99000219. However, during desi review, the possibility these valves may need to operate beyond the prese: 60 minute limit was identified. This situation is being reviewed further by LP&L under Problem Evaluation/Information Request (PEIR) 10673.

During the above reviews, four (4) additional components were identified whose position for an Engineered Safety Feature (ESF) actuation signal is different from its loss of instrument air position. These components either do not have accumulators or have ones that have not been tested. They are:

SVS 101 & 103; Switchgear Makeup Dampers

FW 184A & B; Feedwater Isolation Valves

Valves FW 184A & B must close on a main steam isolation signal (MSIS). These valves have small accumulators as part of their operator assemblies, but are not leak tested. This situation was reviewed by LP&L. The feedwater regulator valves FW 173A & B and the startup regulator valves FW 166A & B fail closed on a loss of instrument air. Therefore, feedwater isolation valves 184A & B are redundant for isolating feedwater flow. In the unlikely event these valves fail "as is" on loss of instrument air, FW 173A & B and FW 166A & B will close. Surveillance testing of these valves to insure operability is discussed later in this section.

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SVS 101 & 102 are fail open dampers which were originally designed to clo on a safety injection actuation signal (SIAS). These components do not have accumulators. LP&L, under PEIR 10672, has reviewed the above and determined the SIAS to these components is not required for safe shutdown of the plant or to mitigate the consequences of an accident. Therefore, the fail open position on loss of instrument air is acceptable.

Leak testing of the accumulator systems had only been performed on the nitrogen accumulators. During startup, the ten (10) nitrogen accumulators were tested in accordance with SPO-25-001. During operation, surveillance procedure OP-903-032 leak tested the two check valves associated with each accumulator system. A review of this procedure identified a need to reevaluate the test duration and acceptance criteria.

Test requirements have been re-evaluated and the above procedure will be revised. Two (2) separate tests will now be performed on each nitrogen accumulator. The first is a check valve operability test to be performed once a quarter. This is a functional test to insure the check valves are not stuck in the open position.

The second is a system leakage test which will be performed once every 18 months. Each nitrogen accumulator will be isolated from its respective air and nitrogen sources for a predetermined time. Any leaking components within the test boundary will be identified. At the end of the time, the pressure drop and subsequent leakage for the accumulator will be determined. This testing will be added to surveillance procedure OP-903-032.

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As discussed earlier in this section, only three (3) of the 24 valves wi air accumulators are within the scope of this report and require testing The accumulator leakage tests for valves SI 602A & B have been added to surveillance procedure OP-903-032. The fail safe position of valve CC 6 is closed. It has no safety related requirement to move from this position. The only function of the accumulator is to fail this modulati valve closed on loss of instrument air. A leak or capacity test is not applicable in this instance. To ensure valve operability, a functional test, which fails air to the valve and verifies closure, will be performe once every 18 months. This functional test will also be part of OP-903-033.

As previously discussed, the closing of valves FW 173A & B and FW 166A & I on loss of instrument air is used in lieu of leak testing the accumulators on FW 184A & B. To insure the above, a functional test which fails air to the FW 173A & B and FW 166A & B and verifies closure will be performed onc every cold shutdown. This functional test will be part of OP-903-033.

The above changes will be incorporated into surveillance procedures OP-903-032 and OP-903-033 by the next refueling outage. With the completion of these procedure revisions, testing will be adequate to insure operability of the required accumulator systems.

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2. OP-901-038 does not list those components whose position on an ESF signal is different than it's failure position on a loss of Instrum Air.

3. Neither OP-901-038 nor OP-500-008 reference the inflatable Spent Fue Pool seals.

4. OP-3-016 did not describe how to set the purge rate on the Instrumen Air Dryers.

5. OP-3-016, Step 6.1.11 only requires blowdown of the system during startup through SA-1271 and IA-140. This is satisfactory if no moisture is discovered during blowdown. If moisture is found, then additional blowdown at other points may be necessary to ensure there is no moisture in the system.

6. The Emergency Operating Procedure (EOP) checklists reference valves PSL 404-A(B) and PSL 406-A(B). The Unique Number Identification (UNID) numbers for these valves have been changed to SSL 8004-A(B) and SSL 8006-A(B).

A review of the training received by Operations, Maintenance and Engineering personnel was performed. The review was to determine which groups received or needed to receive training related to a loss of instrument air event and the adequacy thereof.