Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

April 16, 1993

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attn: Document Control Desk

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
Additional Information Pertaining to The
Resolution of Single Failure Vulnerabilities
Associated with Combustible Gas Control
NRC Docket Nos. 50-237/50-249 & 50-254/50-265

References:
(a) A.W. Dromerick Summary of December 6, 1991 Meeting between General Public Utilities Nuclear and NRR, dated December 11, 1991.

(b) Conference Call between NRR (R. Barrett, et al) and Commonwealth Edison Company (J. Schrage, et al) on December 6, 1991.

(c) J.L. Schrage to T.E. Murley letter dated March 6, 1992.

(d) J.L. Schrage to T.E. Murley letter dated July 15, 1992.

(e) Meeting between NRR (L. Olshan, J. Kudrick) and Commonwealth Edison (J. Schrage, et al) on August 24 and 25, 1992.

Dear Dr. Murley:

During the December 6, 1991 meeting between General Public Utilities Nuclear (GPUN) and NRR (Reference(a)), NRR provided guidance on verifying the ability of normal containment inerting systems to function under accident conditions in order to meet 10 CFR 50.44 requirements, including the associated General Design Criteria (GDC 41, 42 and 43). This guidance instructed GPUN to identify the single failure vulnerabilities of the normal containment inerting systems; discuss the actions necessary to correct and resolve these vulnerabilities through pre-planned repair procedures; and justify the acceptability of these procedures given the time frame necessary to implement the procedures.

ZNLD:1316:28

A001 1/1

As a result of the meeting, which was attended by a Commonwealth Edison Company (CECo) representative, NRR and CECo conducted a teleconference (Reference (b)) to evaluate the guidance as it related to the current 10 CFR 50.44 compliance status at Dresden and Quad Cities Stations. At that time, CECo indicated that single failure vulnerabilities had been identified for the normal containment inerting system for both Dresden and Quad Cities Stations. Reference (c) transmitted CECo's proposed method to correct and resolve these vulnerabilities through pre-planned repair procedures, and justification for these procedures, given the time frame necessary for implementation.

In response to NRC questions presented during a May 20, 1992 CECo/NRR teleconference, CECo presented additional information in Reference (d).

The information provided in References (c) and (d) was discussed during a technical meeting between NRR and CECo on August 24 and 25, 1992 at the Quad Cities Nuclear Station (Reference (e)). During that meeting, the NRC identified a technical concern and additional technical/operational questions with respect to CECo's proposed methodology for resolving single failure vulnerabilities. The NRC indicated that the technical concern must be resolved, and the questions answered, prior to approval of the proposed methodology.

The technical concern and operational questions, including the associated resolution/responses are described in Attachment A.

After further evaluation and review of the technical concern and operational questions, CECo identified an additional single failure vulnerability on the Nitrogen Inerting system pathway at Dresden and Quad Cities stations. In order to resolve this vulnerability, CECo has proposed a modification to the Nitrogen Inerting system pathway at both stations. In addition, CECo has proposed an identical modification to the Nitrogen Makeup system pathway, and the installation of a new atmospheric vaporizer at both stations. The additional modifications will enhance the use of the Nitrogen Inerting and Makeup system for compliance with 10 CFR 50.44. The modifications are described in Attachment B (including a proposed timeframe for implementation of the modifications) and in Figures 3 and 4.

Based upon the information in Attachment A and B, CECo has developed a detailed timeline for the use of the Nitrogen Inerting and Makeup system to comply with the intent of 10 CFR 50.44. This includes an implementation process for the compensatory measures necessary for resolution of single failure vulnerabilities. The timeline and implementation process for compensatory measures are described in Attachment C.

Commonwealth Edison respectfully requests NRC approval of the modifications and coping methodology described in the attachments to this letter. Upon receipt of written NRC approval for the proposed coping methodology, and resolution of the BWROG/EPG repressurization issue, CECo will initiate detailed engineering and design activities for the proposed modifications.

To the best of my knowledge and belief, the statements contained above and in the Attachments and Figures are true and correct. In some respect these statements are not based on my personal knowledge, but obtained information furnished by other Commonwealth Edison employees, contractor employees, and consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

If there are any further questions or comments, please contact John L. Schrage at 708-515-7283.

Sincerely,

John L. Schrage
Nuclear Licensing Administrator

JLS/dj

Attachments A, B and C

Figures 1, 2, 3, 4, and 5

cc: J. Martin, Regional Administrator-RIII
J. Dyer, Project Director-NRR
J. Stang, Project Manager-NRR
C. Patel, Project Manager-NRR
T. Taylor, Senior Resident Inspector-Quad Cities
M. Leach, Senior Resident Inspector-Dresden
Office of Nuclear Safety-IDNS

ATTACHMENT A

NRC Technical Concern and Operational Questions
Combustible Gas Control
Dresden and Quad Cities Station

1. OVERVIEW

During a technical meeting between NRC-NRR and CECo on August 24 and 25, 1992, the NRC identified a technical concern and additional questions with Commonwealth Edison's (CECo) proposed methodology for resolving single failure vulnerabilities associated with Combustible Gas Control (References (c) and (d)). CECo has completed a technical review of the concern and questions. The technical concern and additional questions, including CECo's response is described below.

2. TECHNICAL CONCERN

Instrument Air Repressurization and Diesel Generator Loading

In Reference (c), CECo identified that the motive power for the Nitrogen Inerting and Makeup system Primary Containment Isolation valves (PCIVs) is supplied by the non-Safety Related Instrument Air system. The original design intent for these types of containment isolation valves is either to close upon a LOCA or to fail closed upon loss of valve motive power. In order to cope with this vulnerability, CECo stated that during a design basis accident (LOCA concurrent with a Loss-of-Offsite Power (LOOP)), power to the Instrument Air compressors on the unaffected unit could be obtained through backfeed procedures from an operating diesel generator. This would reestablish valve motive force to the pneumatic isolation valves, and allow operators to open the valves and inject nitrogen (see Attachment C, Section 3.a for a discussion of restoration of power to the PCIV solenoids).

The NRC expressed a concern with the amount of time required for repressurization of the Instrument Air header once electrical power to the compressors is reestablished. In addition, the NRC expressed a concern with the ability to add the compressors to the Emergency Diesel Generators (EDG) during LOCA/LOOP conditions.

CECo has evaluated the repressurization time for Instrument Air at Quad Cities Station, and has determined that the Instrument Air header will repressurize within 45 minutes of the re-establishment of compressor operation. Based upon the similarity of the Dresden Station Instrument Air system to the Quad Cities system, CECo has concluded that the repressurization time for the Dresden system will be of the same order of magnitude as the Quad Cities system (approximately 45 minutes).

CECo has also evaluated the ability to backfeed the Instrument Air Compressors (and required supporting equipment) from emergency diesel generators during LOCA/LOOP conditions. CECo has concluded that sufficient diesel generator capacity will be provided at both Dresden and Quad Cities stations by the existing Emergency Diesel Generators and the alternate AC (AAC) power source, committed to in response to 10 CFR 50.63, Station Blackout Rule (reference May 18, 1990 and February 15, 1991 M. Richter to T.E. Murley letters and December 11, 1990 and July 18, 1991 NRC Safety Evaluations). Figures 1 and 2 describe the electrical distribution configuration for Dresden and Quad Cities Stations, including the anticipated connection for the AAC (SBO diesel generators). CECo has evaluated the time to implement the backfeed operation, and has concluded that it can be completed within one hour (see Attachment C, Section 3.b).

In addition to the evaluation of backfeed capability, CECo has performed research in support of the Station Blackout issue. This research identified the very high probabilities associated with the restoration of offsite power sources within the timeline required for containment reinerting. Based upon: 1) this research; 2) the ability to provide emergency power to the Instrument Air system (and the required supporting equipment); and, 3) the engineering evaluations describing the timeframe for repressurization of the Instrument Air system, CECo has determined that motive power for the Nitrogen Inerting and Makeup system PCIVs would be reestablished within the timeframe necessary to initiate containment inerting following a LOCA/LOOP (15 hours).

3. OPERATIONAL QUESTIONS

a. Reliability of System Valves (other than PCIVs)

Identify all valves (other than PCIVs) which are required to operate for system initiation. Describe the program which will ensure the operability and reliability of the valves. This should include an analysis of the maintenance history and location/accessibility of the valves.

All existing valves which may be required for system initiation and operation (after the proposed modifications are installed and not including the PCIVs) are manually operated valves. The location of these valves is adjacent to the nitrogen storage tank and vaporizer. New valves which will be added to the system (see Attachment B for a complete description of proposed modifications) are also manual valves located near the nitrogen tank. The valves will be accessible under post-LOCA conditions since they are located outside of secondary containment. The existing manual valves necessary for system initiation are listed below:

NOTE

This list incorporates the valves added with the proposed modifications described in Attachment B. Each valve may not need to be actuated following a LOCA due to normal operating valve lineups. A description of the proposed valve operations for each pathway is described in Attachment C.

DRESDEN	QUAD CITIES
2/3-8599-685	1/2-8799-89
2/3-8505-500	1(2)-8799-72
2/3-8599-720	1(2)-8799-74
2/3-8599-722	

These existing manual valves have no record of failure, based upon a review of station specific maintenance/failure history. In addition, the reliability of the Nitrogen Makeup system valves are continually tested during routine day-to-day power operation, while the Nitrogen Inerting system valves required for post-LOCA system initiation (after the proposed modifications are installed) will be tested each time the containment is inerted during startup. To enhance valve reliability and ensure system operability, CECo proposes the following actions:

- Quarterly walkdowns will be performed by system engineers to monitor and evaluate any visible valve degradation.
- Station procedures which provide guidance on prioritization of nuclear work requests will be reviewed to identify potential enhancements which will ensure that work requests for Nitrogen Inerting and Makeup system components are assigned a priority equivalent to, or greater than, similar Emergency Operating Procedure (EOP) equipment.

NOTE

The Technical Specifications for Dresden and Quad Cities Station currently require an inerted containment during power operation. In the event that degraded Nitrogen Makeup system components render the system inoperable, the priority for associated work requests will be based upon the ability to satisfy the Technical Specification requirement.

b. Reliability of System Instrumentation

Identify the minimum instrumentation required for system initiation and operation. This information should include the safety grade of the instrumentation. For non-Safety Related instruments, describe the program which will ensure the operability and reliability of the instruments. This should include an analysis of the maintenance history and location/accessibility of the instruments.

The instrumentation necessary for system initiation and operation can be grouped into the following categories:

- Primary Containment Monitoring

  Primary containment hydrogen/oxygen monitoring
  Primary containment pressure monitoring

  The primary containment monitoring equipment is composed of redundant, safety related post-accident monitoring equipment per Regulatory Guide 1.97. This monitoring equipment is described and controlled by the Station Technical Specifications.

- Nitrogen Supply Monitoring

  Nitrogen gas supply pressure
  Nitrogen gas supply temperature
  Nitrogen gas flow rate

  This monitoring equipment will be furnished as new equipment to support the operation of a new atmospheric vaporizer (see Attachment B). The function of these instruments will be to provide indication of vaporizer performance and to assure that sufficient flow and pressure are achieved for successful nitrogen injection. These instruments will be non-safety related, and will be located at the Nitrogen vaporizer, and therefore accessible in a post-LOCA environment. The instruments will be direct reading local indications with no external power requirements. CECo will ensure the operability and reliability of the instrumentation by inclusion of the equipment into the Balance-of-Plant (BOP) general surveillance program at each station. The surveillance frequencies for the instrumentation will be established based upon manufacturer's recommendations and the surveillance frequencies for other similar station instrumentation.

- Nitrogen Supply System Status

  Nitrogen tank level

  Each of the existing liquid nitrogen supply tanks has a liquid level indicator for tank volume. These indicators are non-safety related devices, and are checked on at least a daily basis to monitor tank level. In addition, CECo will ensure the operability and reliability of this instrument by inclusion in the Balance-of-Plant (BOP) general surveillance program at each station. The surveillance frequency for the level instrument will be established based upon manufacturer's recommendations and the surveillance frequencies for other similar station instrumentation.

c. Design Differences between Dresden and Quad Cities Stations

Identify the design differences between the Dresden and Quad Cities systems.

The primary design differences between the Nitrogen Inerting and Makeup system at Dresden and Quad Cities station are depicted in Figures 3 and 4, and listed below. However, following implementation of the proposed modifications (see Attachment B), the post-LOCA design configuration at Dresden and Quad Cities stations will be essentially identical.

NOTE

Figures 3 and 4 include the proposed modifications described in Attachment B.

DRESDEN	QUAD CITIES
Primary and auxiliary nitrogen tanks	Single main nitrogen tank
Atmospheric vaporizer (Makeup pathway)	Two electric vaporizers
Single flow path from each tank with crosstie between tanks	Redundant flowpath from single tank (with crosstie)
No Cold valves	Cold valves on each flowpath

d. Instrumentation and Controls which Preclude the Entry of Liquid Nitrogen

Provide information on the instrumentation and controls which automatically preclude the entry of liquid nitrogen into containment, including potential failure modes and coping measures.

The Nitrogen Inerting and Makeup system at Dresden Station is not equipped with any active components which would automatically preclude the entry of liquid nitrogen into containment.

The Nitrogen Inerting and Makeup system at Quad Cities Station is equipped with "Cold" valves, which are designed to automatically prevent the entry of liquid nitrogen into containment. However, upon installation of the modifications described in Attachment B, the Cold valves at Quad Cities Station will be bypassed during post-LOCA inerting operations. This configuration will not preclude the injection of nitrogen into the containment upon failure of the Cold valves (see Figures 3 and 4).

The modifications described in Attachment B also include an ambient air vaporizer and flow orifices in the redundant nitrogen injection lines. These components will be designed to ensure complete vaporization of the maximum possible nitrogen flow.

e. Reg Guide 1.7 Analysis

Provide information on the Reg Guide (RG) 1.7 Analysis with respect to the use of a one-volume versus two-volume model.

The General Electric RG 1.7 analysis utilizes a single volume model.

f. Description of System Initiation/Operation

Provide a detailed description of the system operation/initiation, including a time-line for required actions.

A detailed description of system operation and initiation, including a time-line are described in Attachment C.

g. Delivery of Supplemental Nitrogen Supplies

Provide a description of the arrangements for delivery and connection of gaseous nitrogen from off-site vendors.

CECo has verified that liquid nitrogen can be obtained (via tank truck) at both Dresden and Quad Cities stations within eight hours of a telephone order. The table below identifies the current vendor; originating location; emergency transit time to each station; and the type of physical connection for the addition of liquid nitrogen. CECo will evaluate the current procurement contract with the vendor to identify potential enhancements which will provide additional assurance that vendor performance under all conditions will meet the requirements for reinerting containment.

	DRESDEN	**QUAD CITIES**
Vendor	Liquid Air Corp.	Liquid Air Corp.
Location	LaPorte, IN	LaPorte, IN
Transit Time	≤ 8 hours*	≤ 8 hours*
Connection	Threaded	Threaded

* NOTE

This represents an upper bound estimate for transit time, and is based upon the postulated availability of drivers under worst case scenarios.

ATTACHMENT B

Proposed Modifications - Combustible Gas Control Dresden and Quad Cities Station

1. SINGLE FAILURE VULNERABILITY

As a result of the ongoing evaluation to resolve the NRC technical concern and questions described in Attachment A, CECo identified an additional single failure vulnerability in the use of the Nitrogen Inerting system pathway for Combustible Gas Control. The Nitrogen Inerting system is equipped with two manual isolation valves at Quad Cities Station (8799-14 and 8799-17) and one manual isolation valve at Dresden (8503-500) which are located on top of the Torus at both stations. The valves are normally closed, and would be required to be opened to inject nitrogen through this flowpath. Because of the location, these valves would be inaccessible during a LOCA/LOOP.

2. PROPOSED RESOLUTION

CECo has developed a proposed resolution to this vulnerability which would require a modification to the system (Figures 3 and 4). This proposed modification involves the addition of a redundant line around the inaccessible manual isolation valve(s) for each unit at Dresden and Quad Cities Stations. Each redundant line will be equipped with two manual isolation valves. One of the new manual isolation valves will be located at the nitrogen tank, outside of the Reactor Building, and therefore will be accessible following a LOCA. An additional manual isolation valve for each redundant line will be located directly inside the Reactor Building. Due to the post-LOCA conditions in the Reactor Building, these valves will be locked open during normal power operation. In order to minimize the potential for inadvertent containment pressurization during normal power operation, the new manual isolation valves located at the nitrogen tank will be locked closed during normal power operation.

3. ADDITIONAL MODIFICATIONS

In addition to resolving the single failure vulnerability associated with the existing manual isolation valves, CECo proposes to enhance the use of the Nitrogen Inerting and Makeup system for compliance with 10 CFR 50.44 by implementing the following modifications at Dresden and Quad Cities Stations (Figures 3 and 4):

- Addition of a redundant line (with manual isolation valves) to the Makeup pathway for each unit;
- Installation of a flow orifice in each redundant line, sized to deliver 30 scfm at 30 psig in containment; and,
- Installation of an atmospheric vaporizer with monitoring instrumentation, sized to be capable of vaporizing the maximum postulated nitrogen flow.

This proposed configuration will then: 1) provide a bypass around the manual isolation valves, pressure reducer, and Pressure Control Valve (PCV) on the Inerting system; 2) provide a bypass around the PCV, pressure reducer, and Cold valves (Quad Cities specific) on the Makeup system; and, 3) provide a passive method to vaporize liquid nitrogen provided by off-site vendors. These enhancements will:

- Eliminate the single failure vulnerability associated with the inaccessible Nitrogen Inerting system manual isolation valves.
- Eliminate the compensatory measures associated with the control circuitry of the pressure transmitter and controller (see Reference (c)).

4. PROPOSED SCHEDULE FOR IMPLEMENTATION OF MODIFICATIONS

CECo will initiate detailed design engineering and installation of the modifications described above upon NRC resolution of the BWROG/EPG repressurization issue, and written approval (Safety Evaluation) of the proposed modifications and coping methodology. Given an expeditious resolution of the BWROG/EPG repressurization issue, and expeditious NRC approval of the CECo proposed modifications/coping methodology, CECo anticipates that the modifications could be completed during the following refuel outages:

Dresden Unit 2	D2R15	(expected start date of February 1996)
Dresden Unit 3	D3R16	(expected start date of September 1997)
Quad Cities Unit 1	Q1R15	(expected start date of March 1997)
Quad Cities Unit 2	Q2R15	(expected start date of September 1997)

These installation schedules are dependent upon the completion date for resolution of the BWROG/EPG repressurization issue and NRC written approval of the CECo proposal. Potential delays in the completion of these two items (i.e., within 18 months of the scheduled start dates for the outages) would impact the proposed implementation schedules.

ATTACHMENT C

Post-LOCA System Inerting Pathways
Compensatory Measure Implementation
Combustible Gas Control
Dresden and Quad Cities Station

1. POST-LOCA NITROGEN SUPPLY

Following implementation of the proposed passive atmospheric vaporizer described in Attachment B, each station will be equipped with redundant supplies of gaseous nitrogen following a LOCA/LOOP. At both Dresden and Quad Cities stations, either the existing nitrogen tank (primary tank at Dresden) or a vendor-supplied tank truck will provide liquid nitrogen to the new atmospheric vaporizer (see Figures 3 and 4).

2. POST-LOCA INERTING PATHWAYS AND REQUIRED ACTIONS

Following implementation of the proposed modifications described in Attachment B, each station will be equipped with similar, redundant nitrogen pathways for reinerting the containment following a LOCA/LOOP. These pathways, including the required valve manipulations, are described below. All valves listed below (with the exception of the PCIVs) are manual isolation valves located at the nitrogen tank/atmospheric vaporizer. CECo has determined that an operator could be dispatched from the Operational Support Center (OSC), arrive at the nitrogen tank, establish the connection with the existing nitrogen tank or the vendor-supplied tank truck, and effect the valve manipulations, in one hour.

a. Pathway 1

Following a LOCA on Unit 2 at Dresden Station and Unit 1 at Quad Cities Station, pathway 1 would provide liquid nitrogen from a vendor-supplied tank truck sequentially through the following components (see Figures 3 and 4):

Manual valve X-01
Atmospheric vaporizer
Manual valve X-03
Manual valve X-04
Manual valve X-08 (locked open)
PCIV MO-57 and AO-59

NOTE

For injection of gaseous nitrogen into the Torus through Pathway 1, flow would be directed through PCIVs MO-57 and AO-56. If the existing nitrogen tank (primary tank at Dresden) is available, flow would be directed through manual valve X-02 instead of X-01.

Utilization of this pathway would require the following manual valve manipulations from the normal operating configuration (in addition to compensatory measures described in Section 3 of this attachment):

Dresden

Close valve 2/3-8599-685
Close valve 2/3-8505-500
Open valve X-01 (X-02)
Open valve X-03
Open valve X-04

Quad Cities

Close valve 1/2-8799-89
Close valve 1-8799-72
Close valve 1-8799-74
Open valve X-01 (X-02)
Open valve X-03
Open valve X-04

b. Pathway 2

Following a LOCA on Unit 2 at Dresden Station and Unit 1 at Quad Cities Station, pathway 2 would provide liquid nitrogen from a vendor-supplied tank truck sequentially through the following components (see Figures 3 and 4):

Manual valve X-01
Atmospheric vaporizer
Manual valve X-03
Manual valve 2/3-8599-720 (Dresden)
Manual valve 2/3-8599-722 (Dresden)
Manual valve X-05
Manual valve X-09 (locked open)
PCIV AO-55 and AO-21

NOTE

For injection of gaseous nitrogen into the Torus through Pathway 1, flow would be directed through PCIVs AO-55 and AO-58. If the existing nitrogen tank (primary tank at Dresden) is available, flow would be directed through manual valve X-02 instead of X-01.

Utilization of this pathway would require the following manual valve manipulations from the normal operating configuration (in addition to compensatory measures described in Section 3 of this attachment).

Dresden	**Quad Cities**
Close valve 2/3-8599-685	Close valve 1/2-8799-89
Close valve 2/3-8505-500	Close valve 1-8799-68
Open valve 2/3-8599-720	Close valve 1-8799-70
Open valve 2/3-8599-722	Open valve X-01 (X-02)
Open valve X-01 (X-02)	Open valve X-03
Open valve X-03	Open valve X-05
Open valve X-05	

3. SINGLE FAILURE VULNERABILITIES / COMPENSATORY MEASURES

This section describes the single failure vulnerabilities of the Nitrogen Inerting and Makeup System, and the proposed compensatory measures necessary to demonstrate compliance with the intent of 10 CFR 50.44.

a. Electrical

The Primary Containment Isolation System (PCIS) design for both Dresden and Quad Cities Stations utilizes a 120 volt AC bus for all inboard isolation valve pilot solenoids and a separate 120 volt AC bus for all outboard isolation valve pilot solenoids. The valves are designed to close upon a LOCA or to fail closed upon loss of either electrical control power or valve motive power. In order to reinert the Primary Containment following a LOCA, at least two normally closed containment isolation valves must be opened, i.e. one outboard valve and one inboard valve.

If a failure occurred in either 120 volt AC bus, power can be restored to the required valves by lifting two wires (hot and neutral) that connect the valve group to the failed supply and then connecting a separate 120 volt AC power supply from an alternate supply of 120 volt AC power. These actions would be performed at the main control panels in the control room (901-3, 902-3, or 903-3).

In addition to providing power to the 120 volt AC bus, the containment isolation signal must also be overridden to open the required valves. This signal isolates power from the pilot solenoids, causing the containment isolation valves to close. In order to override this signal, two jumpers (one for each inboard and outboard valve) must be placed in the same panels discussed above. These jumpers will provide the operator with normal control at the control switches. CECo has determined that these actions could be completed within two hours.

In order to accomplish these compensatory measures following a LOCA, CECo will incorporate the compensatory measures into existing station procedures, and deploy pre-staged jumper kits in the Control Room.

b. Valve Operator Pneumatic Supply

The valve motive power for the applicable Primary Containment Isolation Valves is supplied by the Instrument Air System. All but one of the valves are fed from this system (one valve is operated with a motor), and all valves are located outside of primary containment. The air operated valves are designed to close upon a LOCA or to fail closed upon loss of either electrical control power or valve motive power. Since the design basis for both Dresden and Quad Cities Stations is a LOCA concurrent with a LOOP, the Instrument Air System would be depressurized after a finite period of time, thus causing the air operated containment isolation valves to fail closed

The Instrument Air System can be crosstied between both units. Five air compressors at Dresden and four air compressors at Quad Cities supply a common air header when the system is crosstied between the units. Following a LOCA, the preferred method for restoring instrument air to the LOCA unit would be from the unaffected unit's compressors through the instrument air crosstie.

Instrument Air compressors are typically cooled by the Turbine Closed Cooling Water System (TBCCW), which in turn is cooled by the Service Water System. Each unit has a dedicated TBCCW system consisting of two heat exchangers and two pumps. During shutdown of the unaffected unit, one TBCCW pump and heat exchanger are sufficient to accommodate system loads, including Instrument Air compressor loads.

CECo has determined that power can be restored to the unaffected unit's Instrument Air compressors (and supporting equipment) through a backfeed operation from operating diesel generators (existing Diesel Generators and Station Blackout Diesel Generators (AAC)).

Following a LOOP, the non-emergency 4 kV buses (buses 23(33)/24(34) at Dresden and 13(23)/14(24) at Quad Cities) would be deenergized. Prior to repowering these buses, the 4 kV loads would be stripped manually from the buses by placing the control switches in Pull-to-Lock. These control switches are located in the Control Room. Once the 4 kV loads have been stripped, the crosstie breakers from the power supply would be closed, and the 4kV loads and 480 volt SWGR would be sequenced onto the repowered 4 kV bus.

Once power has been restored to the 4 kV loads and 480 volt SWGR equipment, the operating compressors can be crosstied to the affected unit's instrument air system. CECo calculations have demonstrated that the operating compressors will repressurize the instrument air header in approximately 45 minutes.

CECo has evaluated the time to accomplish the backfeed operations for 4 kV and 480 volt SWGR equipment. All 480 volt SWGR and 480 volt Motor Control Centers are located in the Turbine Building and are accessible following a postulated LOCA. CECo performed a simulation of the in-plant backfeed actions with Operations personnel to determine an approximate implementation time. This simulation resulted in a conservative estimate of one hour to complete the necessary in-plant actions.

c. Nitrogen Supply

There is a single source of liquid nitrogen at each station which is shared between the units. The system has historically been reliable, based upon the failure history. However, the nitrogen supply system is not safety related, and therefore susceptible to a single failure. This vulnerability could preclude post-LOCA inerting of the containment.

Commonwealth Edison has verified that the off-site vendor for liquid nitrogen, Liquid Air Corporation (located in LaPorte, IN), will be able to provide an initial tank truck of liquid nitrogen to either Dresden or Quad Cities Station under emergency conditions in less than or equal to eight hours. In order to provide additional assurance that the offsite vendor will be able to meet the delivery requirements, CECo will evaluate the current procurement contract to identify potential enhancements.

4. SYSTEM INITIATION TIMELINE

A proposed timeline for system initiation following a design basis LOCA/LOOP is provided in Figure 5, with references to the appropriate sections of this attachment for a detailed description of the various actions.

FIGURE 1
DRESDEN STATION 4160/480V DISTRIBUTION

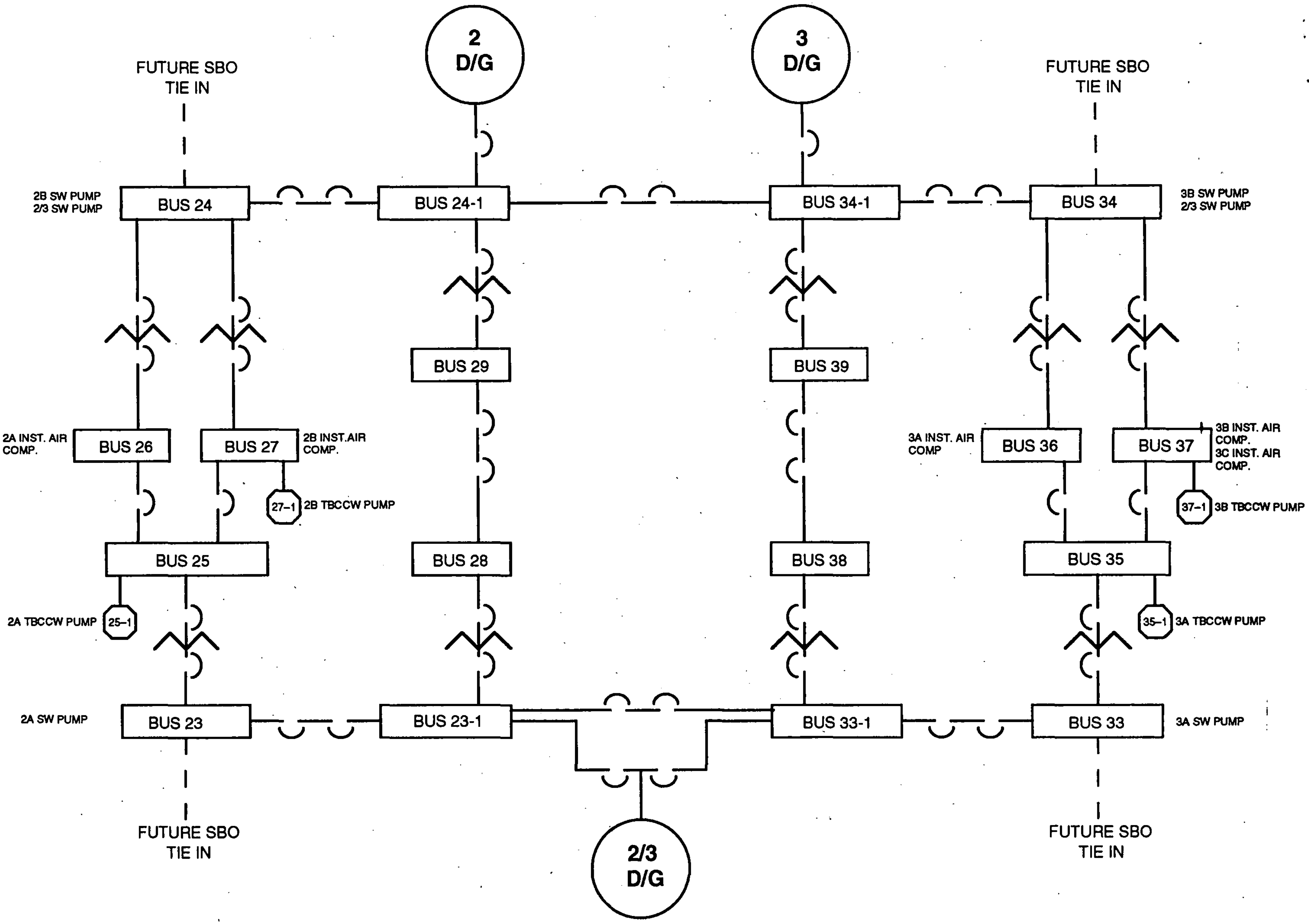
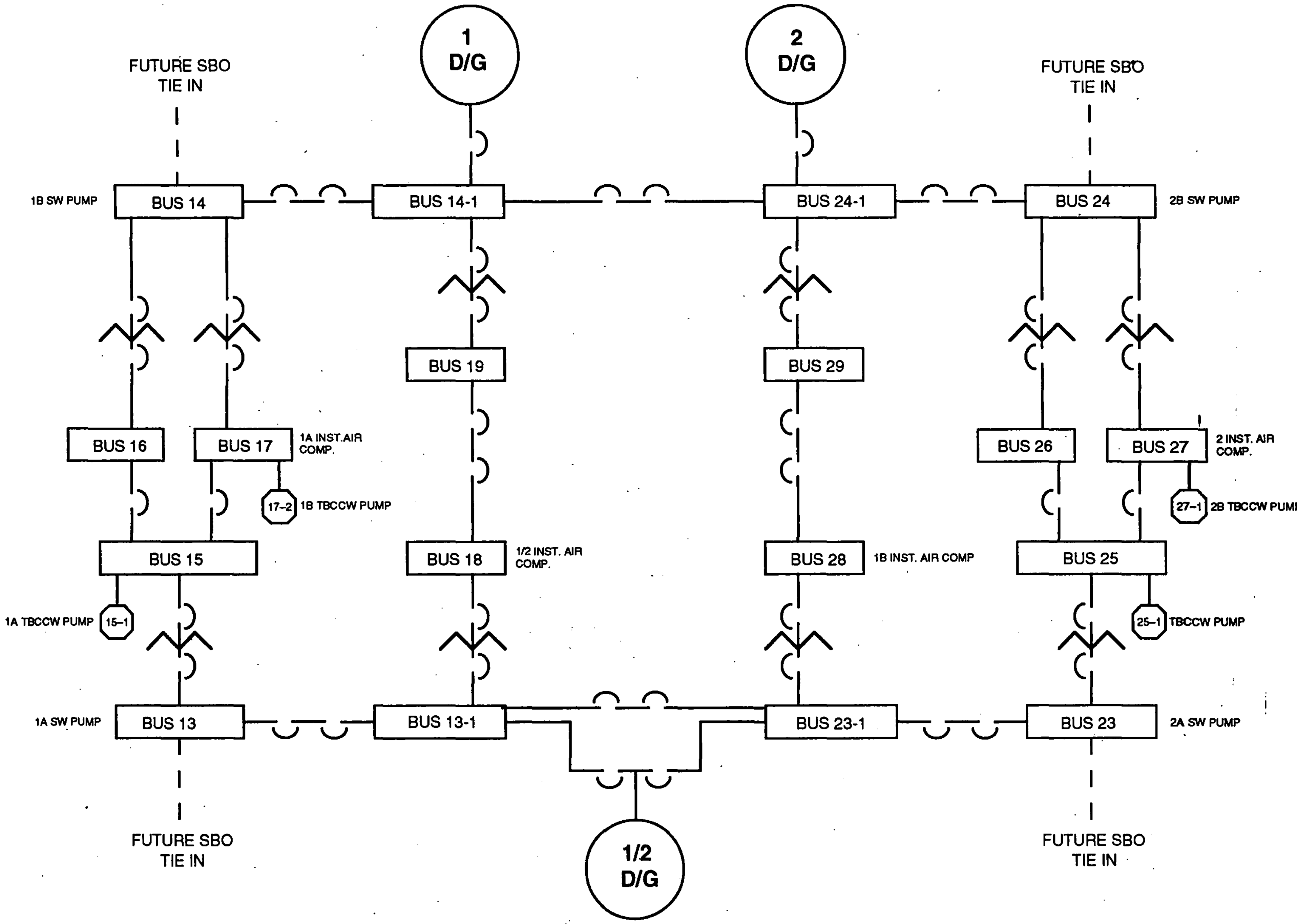
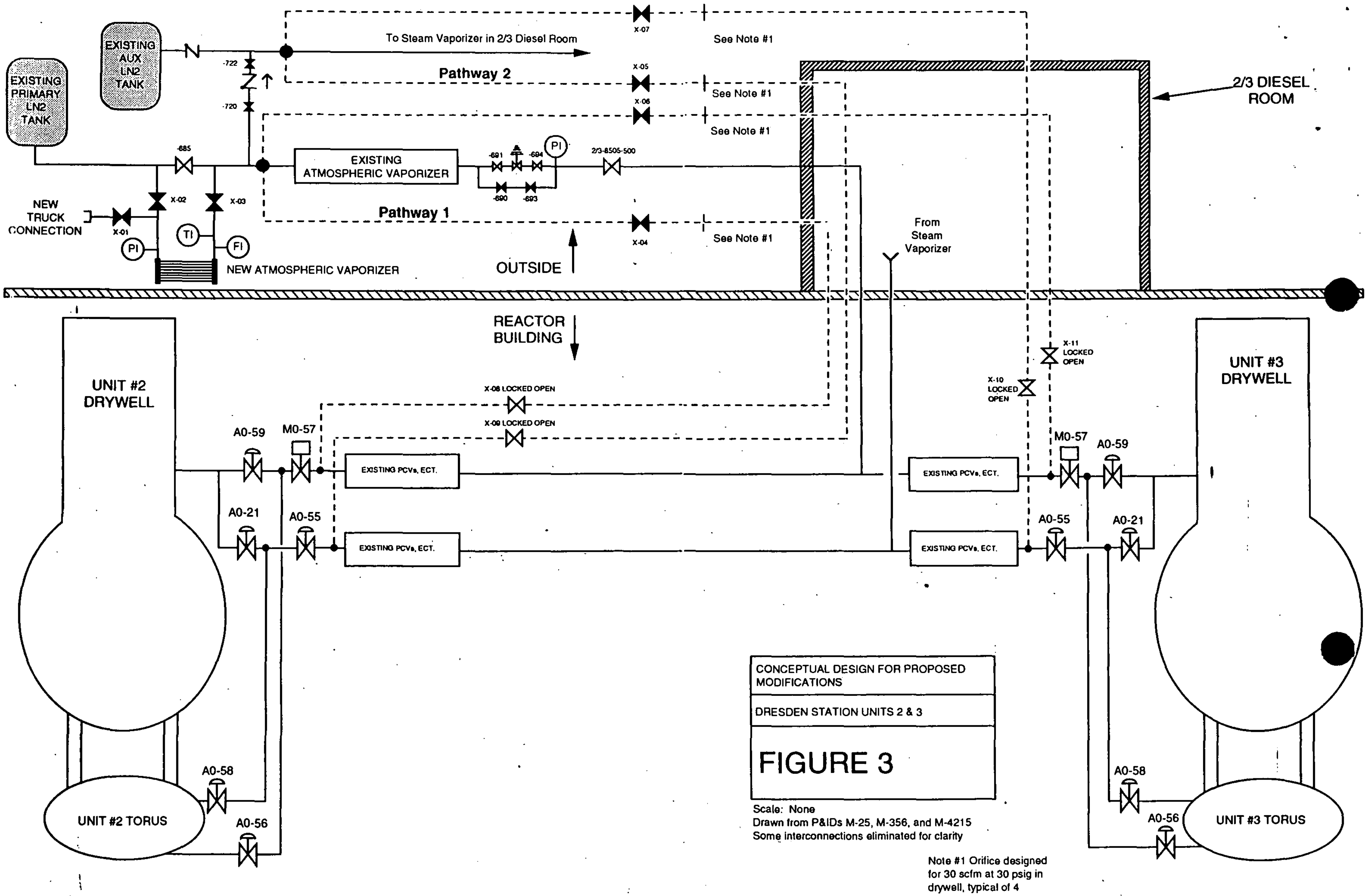


FIGURE 2
QUAD CITIES STATION 4160/480V DISTRIBUTION





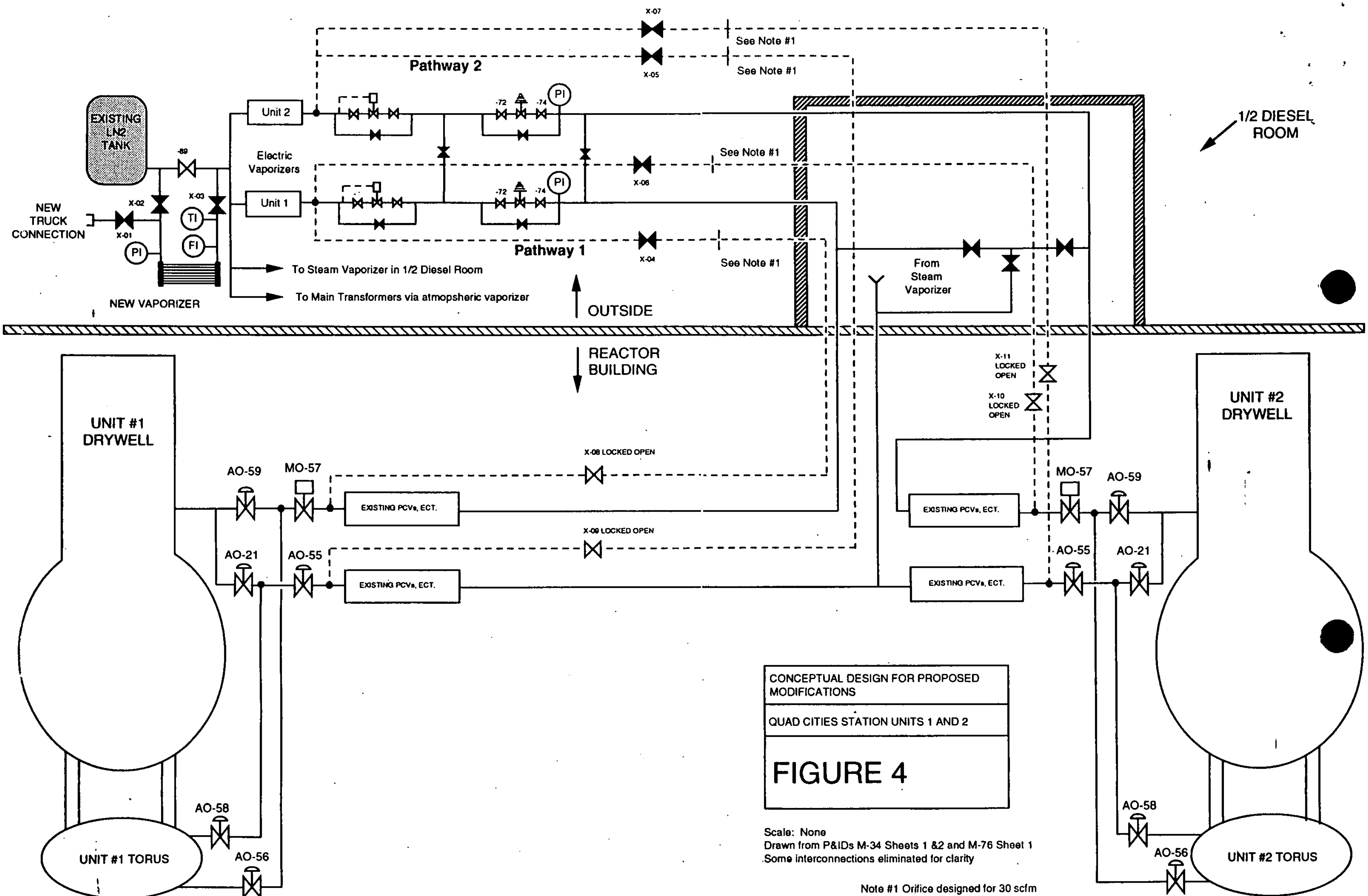
CONCEPTUAL DESIGN FOR PROPOSED MODIFICATIONS

DRESDEN STATION UNITS 2 & 3

FIGURE 3

Scale: None
Drawn from P&IDs M-25, M-356, and M-4215
Some interconnections eliminated for clarity

Note #1 Orifice designed for 30 scfm at 30 psig in drywell, typical of 4



CONCEPTUAL DESIGN FOR PROPOSED MODIFICATIONS

QUAD CITIES STATION UNITS 1 AND 2

FIGURE 4

Scale: None
Drawn from P&IDs M-34 Sheets 1 &2 and M-76 Sheet 1
Some interconnections eliminated for clarity

Note #1 Orifice designed for 30 scfm at 30 psig in drywell, typical of 4

FIGURE 5
TIMELINE FOR POST – LOCA SYSTEM INITIATION