Met-Ed GPU

Metropolitan Edison Company
Post Office Box 480
Middletown, Pennsylvania 17057

Writer's Direct Dial Number

November 9, 1981
L1L 310

RECEIVED
NOV 2 0 1981
U.S. NUCLEAR REGULATORY COMMISSION

Office of Inspection and Enforcement
Attn: R. C. Haynes, Director
Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Response to IE Bulletin 79-27

As a result of the events at Oconee (November 10, 1979) and Crystal River (February 26, 1980), the NRC issued IE Bulletin 79-27 and a letter of March 6, 1980 requesting information. In response Met Ed sent the following letters:

February 29, 1980	(TLL 102)
March 13, 1980	(TLL 114)
March 17, 1980	(TLL 117)
May 29, 1980	(TLL 245)
June 30, 1980	(TLL 309)

TMI-1 Restart Report Supplement 1 Part 1 Question 38
TMI-1 Restart Report Supplement 1 Part 3 Question 12
Discussion before the TMI-1 ACRS Subcommittee November 29, 1981 and June 25, 1981

Subsequently a loss of power study was performed for the ICS/NNI system at TMI-1. The conclusion of that analysis was that certain failures would lead to the loss of instrumentation required to bring the plant to safe shutdown. The attachments to this letter discuss our solutions by way of modifications, changes to procedures and operator training and respond to NRC questions related to IE Bulletin 79-27. Verification by testing is complete, and these tests are under review. We will inform you of the significant results of this review.

Sincerely,

H. D. Hukill

H. D. Hukill
Director, TMI-1

HDH:LWH:vjf
Attachment

IE11
S1/1

Metropolitan Edison Company is a Member of the General Public Utilities System

cc: J. F. Stolz
R. Jacobs

NRC Questions of IE Bulletin 79-27
and Other Additional Questions

Item

1. Actions which will allow the operator to cope with various combinations of loss of instrumentation and control functions. This includes changes in (A) equipment and control systems to give clear indications of functions which are lost or unreliable; (B) procedures and training to assure positive and safe manual response by the operator in the event that competent instruments are unavailable.

Response:

Detailed actions for operators in the case of NNI/ICS power failures resulted in revisions to Emergency Procedures discussed in our letter dated May 29, 1980 (TLL 245). See attachment 1, item E for further details.

Item:

2. Determination of the effects of various combinations of loss of instrumentation and control functions by design review analysis and verification by test.

Response:

The loss of power study identified areas to be corrected as shown in attachment 1, item B & C. In August, 1981 verification tests were conducted which are still under review.

Item:

3. Correction of electrical deficiencies which may allow the power operated relief valve and pressurizer spray valve to open on non-nuclear instrumentation power failures, such as, the event which occurred at Crystal River, Unit 3 on February 26, 1980.

Response:

See response to item 6 (2) and (3) of our letter of March 17, 1980 (TLL 117) and the information provided in the cover letter.

Item:

4. Submit to the NRC a written response to I&E Bulletin 79-27.

Response:

The initial response to IE Bulletin 79-27 was submitted by Met-Ed on February 29, 1980 (TLL 102) which made prev ious reference to the TMI-1 Restart Report Amendment 11 Supplement 1 Part 2 Question 38. Additional items not responded in the initial letter are answered below:

Question A. Review the class-1-E buses supplying power to safety and non-safety related instrumentation and control systems which could affect the ability to achieve a cold shutdown condition using existing procedures or procedures developed under item 2 below. For each bus:

1) identify and review the alarm and/or indication provided in the control room to alert the operator to the loss of power to the bus.

2) identify the instrument and control system loads connected to the bus and evaluate the effects of loss of power to these loads including the ability to achieve a cold shutdown condition.

3) describe any proposed design modifications resulting from these reviews and evaluations, and your proposed schedule for implementing those modifications.

Answer A. See Attachment item D for details.

Question B. Prepare emergency procedures or review existing ones that will be used by control room operators, including procedures required to achieve a cold shutdown condition, upon loss of power to each class 1-E and non-class 1-E bus supplying power to safety and non-safety related instrument and control systems. The emergency procedures should include:

1) the diagnostics/alarms/indicators/symptom resulting from the review and evaluation conducted per item 1 above.

2) the use of alternate indication and/or control circuits which may be power from other non-class 1-E or class 1-E instrumentation and control buses.

3) methods for restoring power to the bus.

Describe any proposed design modification or administrative controls to be implemented resulting from these procedures, and your proposed schedule for implementing the changes.

Answer B: See Attachment 1, item E for details.

Questions C. Re-review IE Circular No. 79-02, Failure of 120 Volt Vital AC Power Supplies, dated January 11, 1979, to include both class 1-E and non-class 1-E safety related power supply inverters. Based on a review of operating experience and your re-review of IE Circular No. 79-02, describe any proposed design modifications or administrative controls to be implemented as a result of the re-review.

Answer C: See Attachment 1, item D 4.

Attachment 1

SUMMARY
Loss of NNI/ICS Power

A. Overview

The following is a summary of the design review, verification tests, changes in controls, additional instrumentation, controls and alarms, and new operating procedures to be implemented at TMI-1 based on our review of the consequences of loss of power to the NNI/ICS.

B. Design Review

The design review was performed which indicated that for losses of some power feeds to the NNI/ICS, inadequate instrumentation existed for power range operation or post-trip decay heat removal using normal methods. Control system action could have produced underfeeding when critical, overcooling after trip, and reactor coolant system depressurization. Furthermore, the occurrences of these power losses were not unambiguously indicated to control room operators. The design review recommended actions in the areas of plant modifications and procedures with the intent of:

1. reducing probability of loss of power,

2. enabling operators to recognize loss of power,

3. enabling decay heat removal using normal methods,

4. providing guidance to operators for dealing with loss of power.

C. Verification Tests

Verification tests performed at TMI-1 confirmed the conclusions of the design review. The results of the testing will be provided at a later date.

D. Control and Instrument Changes and Additions

Plant modifications performed as a result of this study included:

1. Changes to prevent overcooling

   a. Atmospheric dump valve control shifts to manual on loss of "Hand" power. Manual control from the control room is independent of NNI/ICS power. (See TLL 671, January 21, 1981.)

   b. Atmospheric dump valves fail closed on loss of signal.

   c. Turbine bypass valves fail closed on loss of "Hand" power.

2. Changes to prevent depressurization

    a. Pressurizer spray valves fail closed on loss of signal.

    b. Alternate control of reactor coolant system makeup flow independent of NNI/ICS.

3. Instrumentation added to permit post-trip decay heat removal via steam generators. These instruments are independent of NNI/ICS.

    a. Steam generator pressure A & B

    b. Steam generator level A & B

    c. Emergency feedwater flow A & B

    d. Reactor coolant system pressure

    e. Pressurizer level

    f. Makeup tank level

    g. Cold leg temperature A & B

    h. Hot leg temperature A & B.

4. Indication and control added to aid in determining power supply status and reduce probability of loss of power.

    a. Control room annunciators to indicate:

        i. loss of power to ATA bus which feeds NNI/ICS

        ii. loss of any subfeed to NNI/ICS.

    b. Power supply status lights in control room indicate status of key power feeds to controls and instrumentation. Loss of power on any of these feeds causes a loss of NNI/ICS power alarm.

    c. A remote manual bus transfer actuated from the control room to provide backup to the automatic bus transfer supplying ATA.

Figures 1 and 2 summarize the before and after NNI/ICS power distribution. The results of these changes are to:

1. Provide operators unambiguous indication of loss of power to key instrumentation and control circuits.

2. Place control systems in conditions which prevent undesirable plant response on loss of power.

3. Insure adequate instrumentation and control to permit decay heat removal using normal methods (secondary plant with main or emergency feedwater supplying steam generators and using turbine

bypass or atmospheric dump valves).

These modifications have been incorporated into the control room in conjunction with the human factors engineering review. Alarm and indication locations and labeling have been specified to insure prominence when operator attention is required. These modifications will be complete before plant restart.

E. Operator Procedures and Training

Operator actions required to achieve stable plant conditions are dependent on which power supplies are lost. When any of the NNI/ICS feeds are deenergized an alarm on the main annuciator panel energizes. Power supply monitor lights below the annuciator indicate the status of 6 key power feeds. Loss of 4 of the 6 power feeds have a minor impact on the plant in that operation at power may continue. For these situations followup operator action is required to transfer individual instrument power supplies or supply alternate cooling to equipment. Loss of either "Hand" or "Auto" power prevents operation at power and requires operator actions to control feedwater flow, makeup flow, and turbine bypass or atmospheric dump valves. If main feedwater is not available or cannot be adequately controlled, emergency feedwater will be initiated and controlled from the control room independent of the NNI/ICS.

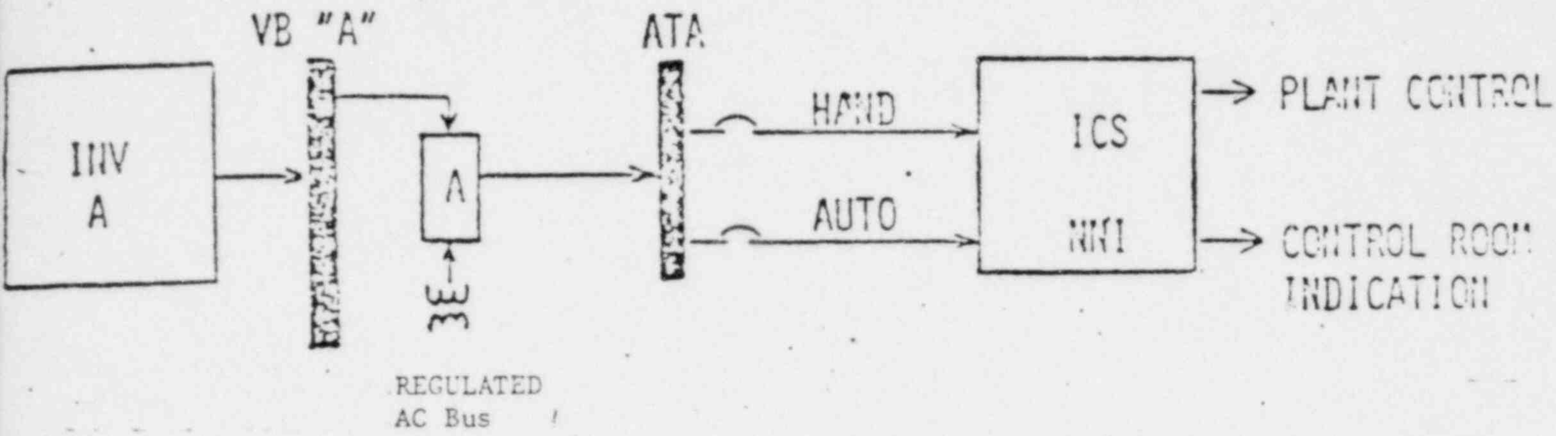
Procedural changes are being prepared to provide guidance to operators under these conditions of NNI/ICS power loss which reflect the plant modifications made as a result of the design review. Procedure revisions and operator training on modifications and procedures will be completed before restart of TMI-1.

F. Summary

A design review of the consequences of loss of power to NNI/ICS indicated that for some failure primary feed-and-bleed would be required to maintain core coolng. Plant modifications which will be in place at the time of TMI-1 restart enable the use of steam generators to provide core cooling following loss of power to NNI/ICS.

ICS/NNI POWER - BEFORE

FIGURE 1

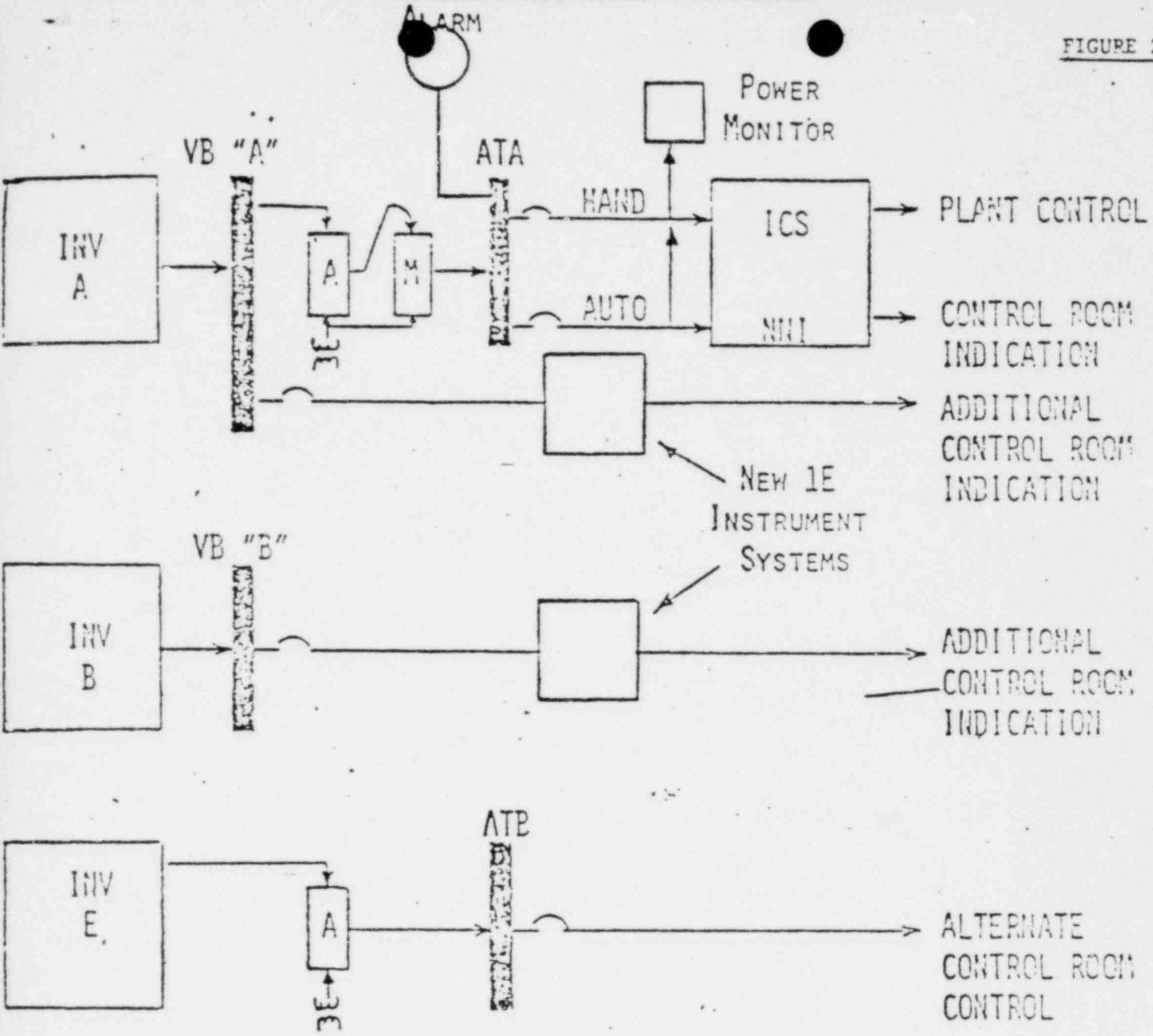


o Loss of Power to ATA or HAND or AUTO to ICS/NNI

- Inadequate Control Room Indication for Hot Shutdown
- Inadequate Control System Operation for Hot Shutdown
- CORE COOLING BY PRIMARY FEED AND BLEED

ICS/NNI POWER - AT RESTART

FIGURE 2



o LOSS OF POWER TO ATA OR HAND OR AUTO TO ICS/NNI

- ADEQUATE CONTROL ROOM INDICATION FOR HOT SHUTDOWN
- ADEQUATE CONTROL FOR HOT SHUTDOWN
- CORE COOLING VIA STEAM GENERATORS

o LOSS OF POWER TO VB "A", VB "B" OR ATB

- NO EFFECT ON NORMAL CONTROL OR INDICATION