ATTACHMENT NO. 1 TO JPN-85-21

An Evaluation of Interim Measures and Procedures Regarding Redundant Alternate Shutdown System Fuses

New York Power Authority
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333

March 8, 1985

1.0 Introduction

IE Information Notice No. 85-09 (Reference 3) describes a condition at Kansas Gas and Electric Company's Wolf Creek nuclear power plant that could disable the plant's alternate shutdown system in the event of a fire in the control room. Fire damage could open fuses rendering the equipment inoperable if the fuse opens before control is transferred to the alternate shutdown circuit.

As a result of an independent, third party review of the fire protection programs and systems, the Authority has recently identified a similar condition at our FitzPatrick plant. Specifically, the scheme used to transfer control of shutdown systems to the alternate shutdown system does not include redundant fuses.

The Authority has analyzed this condition. This analysis shows that the operators can successfully recover by manually replacing the blown fuse(s). As a result, we will implement both interim compensatory measures until long-term corrective actions are completed.

Section 2 of this report describes the existing alternate shutdown provisions. Section 3 describes the interim compensatory measures that will be implemented until the corrective modifications described in Section 4 can be completed. Section 5 is an analysis to demonstrate that the interim procedures and measures are adequate to prevent the plant from reaching an unrecoverable condition.

2.0 Existing Alternative Shutdown Features

This section describes the major features of the existing alternative shutdown capability at the James A. FitzPatrick Nuclear Power Plant. Included in this description are the locations and functions of the remote shutdown panels.

(A) Remote Shutdown Panel 25 RSP

This remote shutdown panel is located on the south side of the 300 ft. elevation of the Reactor Building. Process parameters needed for safe shutdown using the alternate safe shutdown capability have been provided at 25 RSP. These parameters are as follows:

- Suppression Pool Temperature
- Suppression Pool Level
- RHR Service Water Loop-B Flow
- RHR Loop-B Flow From Loop-B Injection
- RHR Pump-D Discharge Pressure
- Drywell Temperature

Other parameters, including reactor vessel pressure and reactor vessel level are monitored at instrument rack 25-6 located opposite panel 25 RSP. In addition to these available indications, panel 25 RSP has isolation/control

switches and position indication for the following components:

- o 02 SOV-17
- o 27 SOV-126B
- o 27 SOV-129B
- o 10 MOV-66B
- o 10 MOV-25B
- o 10 MOV-89B
- o 23 MOV-16
- o 600V bus 11600 (L16) incoming breaker 11602

Also included on 25 RSP are control switches for RHR Pump D (10 P-3D) and RHR Service Water (RHRSW) Pump B (10P-1B). 25 RSP is provided with a dedicated, sound-powered, communications system which allows communication with other shutdown panels.

(B) Auxiliary Shutdown Panel 25 ASP-1

Auxiliary Shutdown Panel 25 ASP-1 is located on the Reactor Building 272 ft. elevation. 25 ASP-1 provides isolation and control capability for the following valves:

- o 10 MOV-149B (RHRSW to RHR Cross-tie)
- o 10 MOV-12B (RHR Heat Exchanger Outlet)
- o 10 MOV-70B (Steam Inlet Isolation Valve)
- o 10 MOV-166B (Heat Exchanger Vent to Torus)
- o 10 MOV-148B (RHRSW to RHR Cross-tie)

Also included on 25 ASP-1 are position indicators for main steam isolation valves 29 AOV-86 A, B, C, and D and a dedicated communications system.

(C) Auxiliary Shutdown Panel 25 ASP-2

Auxiliary Shutdown Panel 25 ASP-2 is located on the Reactor Building 242 ft. 8 in. elevation. Isolation and control for the following valves are provided there:

- o 10 MOV-13D (RHR Pump D Suction-Torus)
- o 10 MOV-16B (RHR Pump Minimum Flow Bypass)
- o 10 MOV-21B (Heat Exchanger Discharge to Torus)
- o 10 MOV-27B (LPCI Outboard Valve)
- o 10 MOV-15D (Torus Cooling Isolation Valve)
- o 10 MOV-39B (Torus Cooling Isolation Valve)
- o 23 MOV-25 (HPCI Minimum Flow to Suppression Pool)
- o 10 MOV-65B (RHR Heat Exchanger Inlet)
- o 23 MOV-60 (HPCI Outboard Isolation Bypass)
- o 29 MOV-77 (Outside Main Steam Drain Isolation)
- o 12 MOV-18 (RWCU Supply Outboard Isolation)
- o 12 MOV-80 (RWCU Supply Outboard Isolation Bypass)

Like the other alternate shutdown panels, 25 ASP-2 has been provided with a dedicated communication system.

(D) Auxiliary Shutdown Panel 25 ASP-3

Emergency Diesel Generators B and D are provided with local control and isolation from the Main Control Room. The Control Panel is located in the Diesel Generator Switchgear Room B at the 272 ft. elevation. The control panel provides isolation along with local control, indication, and metering capabilities for the Emergency Diesel Generator and emergency bus breakers listed below:

1. Isolation For -

- o Diesel-Generator Voltage Regulation
- o Diesel-Generator Metering
- o Diesel-Generator Synchronizing Permissive
- o Diesel-Generator Engine Speed
- o Diesel-Generator Output Breaker Operation
- o 10P-3D (RHR Pump D)
- o 10P-1B (RHR SW Pump B)

2. Isolation and Control For -

- o Diesel-Generator Start/Stop
- o 46 MOV-102B (Emergency Service Water (ESW) minimum flow valve)
- o 46 MOV-101B (ESW supply to vital equipment)
- o 46 P-2B (ESW pump 2B)
- o Breaker 10614
- o Breaker 10604
- o Breaker 10660
- o Breaker 12602
- o Breaker 10614 Synchronizing Circuit

25 ASP-3 has been provided with a dedicated communications system.

3.0 Interim Measures and Procedures

The Authority will provide procedural measures to compensate for the lack of redundant fuses for alternate shutdown components. These interim measures will remain in effect until the long-term corrective modifications described in Section 4 are complete.

These interim procedures have been drafted based upon the new procedure for alternate shutdown. Operator actions within these procedures have been sequenced to assure that an unrecoverable condition will not occur.

These procedures will require operators to check shutdown panels for indications of open fuses on alternate shutdown equipment. Open or blown fuses are readily detectable by a loss of component indicating lights on the shutdown panel. After having detected an open fuse, the operator is instructed to proceed to the location of the blown fuse. (An exception to this will be if another operator is significantly closer to the open fuse, an operator may ask the operator closer to the fuse's location to perform the replacement.)

Replacement fuses will be located near their respective power sources. Replacement fuses will be clearly labeled to identify them. A fuse puller will also be provided near each location where fuse replacement is required.

The procedure instructs the operator to identify and remove the blown fuse, replacing it with a spare replacement fuse. The operator will then return to the safe shutdown panel and continue the shutdown procedure.

4.0 Long-term Modifications

The Authority will install redundant fuses in alternate shutdown system circuits to correct this condition. Figure No. 1 illustrates this concept for a typical motor operated valve. Redundant fuses will not be in the circuit during normal plant operation.

5.0 Evaluation of Interim Measures

This section will examine the feasibility of replacing blown fuses in hot shutdown systems to restore the equipment to operable. Using the procedure outlined in Section 3 of this report, an estimate of the amount of time required to initiate safe shutdown has been made.

The Authority will conduct a timed walk-through of this interim shutdown procedure to confirm that the required actions can be completed within the time available. This walk-through will be conducted prior to start-up from the (Reload 6/Cycle 7) refueling outage now in progress.

Table No. 1 is a list of the components, fuse locations and isolation switch locations associated with remote shutdown components.

5.1 Assumptions

The following conservative assumptions were made for the purposes of this evaluation:

1. No more than twenty-percent of all fuses (approximately 10 fuses) associated with the control power circuits for alternate shutdown equipment require replacement as the result of a fire in the Control Room, Relay Room or Cable Spreading Room. This assumption is very conservative considering the level of fire protection present and the almost constant presence of plant personnel.

2. No credit has been taken for fire protection measures or systems currently installed in the Control Room, Relay Room or Cable Spreading Room. (A complete description of the existing area-wide carbon dioxide suppression system is in Reference 2.)

3. Only five qualified persons are required to operate the safe shutdown equipment subsequent to a fire. No credit is taken for any personnel not required to be on-site at all times.

4. A period of ten minutes is available from the time that the operator manually scrams the reactor, trips the main turbine, verifies that all control rods are fully inserted, closes the Main Steam Isolation Valves (MSIVs), and leaves the Control Room. At this point, the reactor vessel is fully isolated. The only reactor coolant inventory loss is through the Safety/Relief Valves, which actuate intermittently to relieve pressure and provide core cooling. (The detailed basis for this is described in Attachment 1 to Reference 1, response to Question No. 1.) (The Authority considers the time actually available to be significantly greater than the ten minutes conservatively assumed. If ADS does not occur until 20 minutes after reactor scram and isolation, reactor water level will fall to approximately thirty-six inches below the top of active fuel (TAF) during depressurization and injection. Level will remain below TAF for approximately 120 seconds and then rise above the TAF and continue to increase. This extremely conservative analysis showed that, even after assuming loss of all high pressure makeup coincident with reactor scram and isolation (which is not considered credible), the core will not be uncovered if ADS is actuated within ten minutes.)

5. Control room operators (other than those mentioned in 3 above) who are also members of the plant's fire brigade may be utilized for fuse replacement before assuming their roles as fire brigade members.

6. The analysis assumes that the Shift Supervisor may dispatch one or more operators to the alternate shutdown panels in advance of scramming the reactor and transferring control the shutdown panels. These operator(s) will use this time to familiarize themselves with system lineups, check for and replace any open or blown fuses and establish communications. This is a realistic assumption considering the type of improbable event required for a control room evacuation.

5.2 Operations Required to Achieve Safe Shutdown

This section describes the operations required to achieve safe shutdown using the systems and components identified in previous Authority submittals (Reference 2 and 4).

The post-fire scenario has been depicted on an operator-by-operator basis. The actions required by each operator are depicted in a chronological fashion to describe the integrated operation of the alternative shutdown system. The local control stations to be used, along with the functions to be performed at each, are specified.

Post-fire operational timeliness exemplify the sequence and duration of the required tasks for each operator. The actual sequence of post-fire activities will be determined by the Shift Supervisor. These timelines are not intended to prescribe mandatory actions for fires of lesser magnitude.

Shift Supervisor

As the individual designated to be in charge of shift operations, the Shift Supervisor determines the appropriate response to a severe fire. Station Procedures require the Control Room to announce the receipt of a fire alarm over the station paging system and to notify the fire brigade. If the Shift Supervisor decides that significant potential exists for a situation developing that would require evacuation of the control room, the Shift Supervisor may preliminarily dispatch one or more operators to remote shutdown panels before evacuating the Control Room.

The operators required for safe shutdown will be dispatched as follows:

1. Shift Supervisor (SS). After the reactor has been scrammed, the turbine tripped, and safe shutdown personnel dispatched, the Shift Supervisor will proceed to the Remote Shutdown Panel 25 RSP.

2. Senior Nuclear Operator (SNO). The Senior Nuclear Operator will proceed to Auxiliary Shutdown Panel 25 ASP-3.

3. Nuclear Control Operator (NCO). The Nuclear Control Operator will proceed to Remote Shutdown Panel 25 RSP along with the Shift Supervisor to provide any necessary assistance.

4. Auxiliary Operator. An Auxiliary Operator will proceed to Auxiliary Shutdown Panel 25 ASP-1 after isolating one scram header.

5. Auxiliary Operator. An Auxiliary Operator will proceed to Auxiliary Shutdown Panel 25 ASP-2 after isolating one scram header.

Communications will be established between the operators and the Shift Supervisor through the use of the dedicated communications system at the safe shutdown panels. The Shift Supervisor will direct the actions of the operators controlling the safe shutdown panels.

Shift Supervisor

The Shift Supervisor will be with the NCO at panel 25 RSP. The NCO will be in communication with the other alternate shutdown panels. The SS will use the indication available at panel 25 RSP and information supplied by the remaining operators to evaluate the plant status and coordinate the plant shutdown.

Senior Nuclear Operator (SNO)

The Senior Nuclear Operator will proceed directly to panel 25 ASP-3. The SNO will verify the availability of electric power at the emergency buses. He will also take local control of B and D Emergency Diesel Generator by operating the control switches on 25 ASP-3. Any fuses that require replacement will be replaced to regain control. He will establish communications and report power system status to the NCO. He will then start the emergency diesel-generators, as required. The SS will then direct the SNO in any follow-up actions that are required.

Nuclear Control Operator (NCO)

The Nuclear Control Operator will man the Remote Shutdown Panel 25 RSP with the SS. The NCO will isolate the components controlled on 25 RSP. The NCO will identify any open fuses that may exist, replace them in accordance with the interim alternative shutdown procedure and establish communications with the other operators. The NCO will verify the system lineup at 25 RSP. The SS will direct the NCO to operate the safe shutdown systems as required. This will involve opening blowdown valves after starting the RHR pumps and then injecting water into the vessel.

Auxiliary Operator

One AO will proceed to panel 25 ASP-1 and operate isolation switches to prevent spurious operations. Any fuses which may be open will be replaced by the AO. The AO will establish communications with the NCO, verify the component lineup on 25 ASP-1 and report to the NCO.

Auxiliary Operator

He will proceed to 25 ASP-2 and isolate components, replace open fuses with assistance from NOA, verify system lineup at 25 ASP-2, and report to the NCO.

5.3 Summary

In no situation did the time required to manually actuate the ADS valves exceed ten minutes. This analysis, using conservative assumption, has shown that safe shutdown can be accomplished assuming that a fire in the control room, relay room or cable spreading room blows twenty percent of the fuses associated with alternate shutdown circuits.

6.0 References

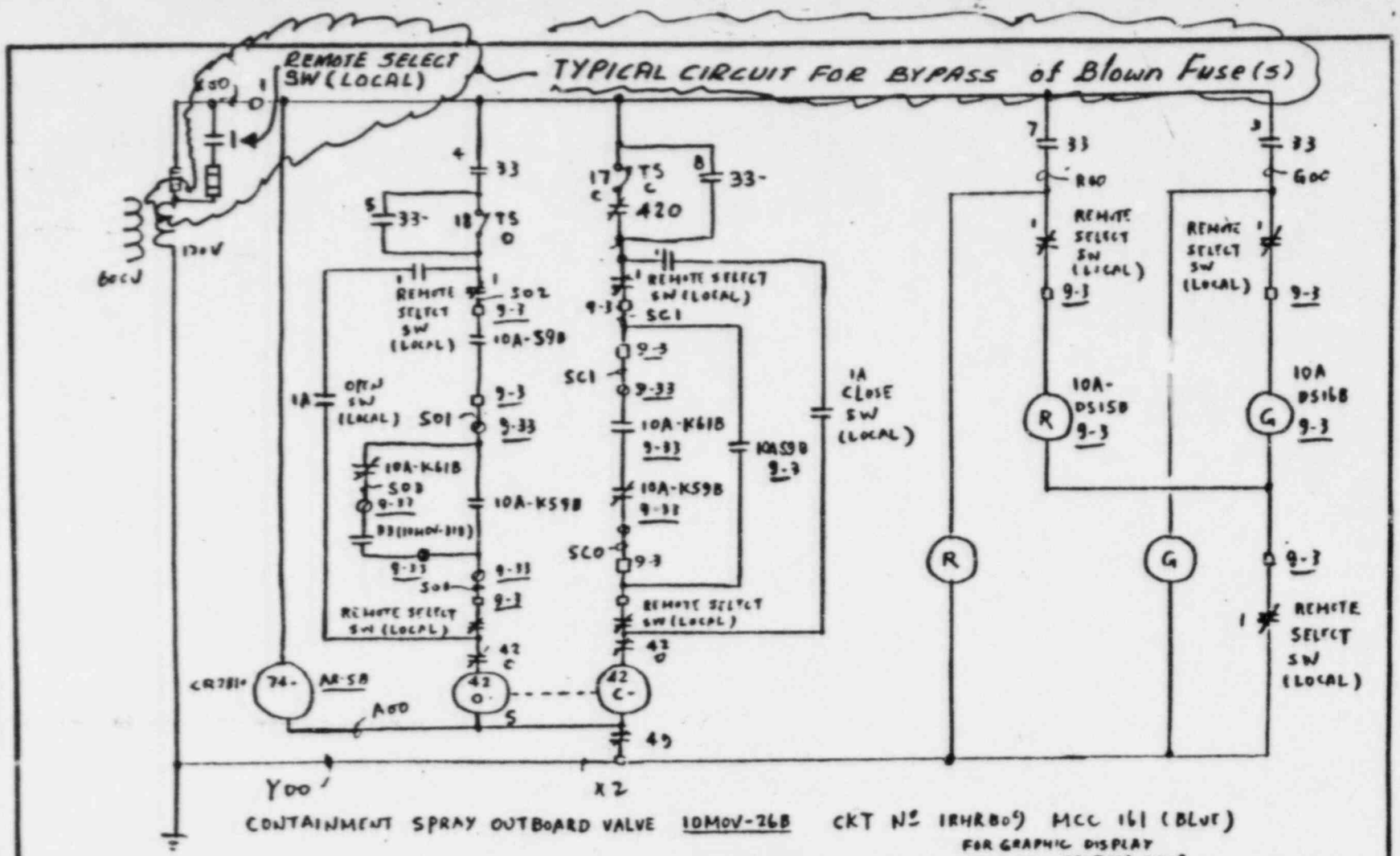
1) PASNY letter, J.P. Bayne to D.B. Vassallo, (JPN-82-87) dated November 22, 1982 regarding reassessment of fire protection features for conformance to Appendix R to 10CFR50.

2) PASNY letter, J.P. Bayne to D.B. Vassallo, (JPN-82-61) dated July 13, 1982 "A Reassessment of the James A. FitzPatrick Nuclear Power Plant for Conformance to the Requirements of Appendix R to 10CFR50", as amended.

3. IE Information Notice No. 85-09, "Isolation transfer Switches and Post-Fire Shutdown Capability," dated January 31, 1985.

4. PASNY letter, J.P. Bayne to T.A. Ippolito, (JPN-80-53) dated November 20, 1980, transmits revised "Safe Shutdown Analysis" dated October 1980.

5. NRC memorandum, L.S. Rubenstein to R.J. Mattson, dated December 3, 1982 regarding use of the Automatic Depressurization System (ADS) and Low Pressure Coolant Injection (LPCI) to meet Appendix R shutdown goals.



TYPICAL CONTROL CIRCUIT - CONTROL ROOM
RELAY ROOM CABLE SPREADING AREA
LOCAL VALVE ISOLATION SWITCHES

Figure No. 1 Typical Modification for Motor Operated Valve to Add Redundant Fuses

NEW YORK POWER AUTHORITY
James A. FitzPatrick Nuclear Power Plant

TABLE 1

Remote Shutdown System Components
FUSES AND ISOLATION SWITCH LOCATIONS

SHUTDOWN COMPONENT ID NO.	FUSE LOCATION MCC/SWGR	FUSE LOCATION ELEVATION	ISOL SW LOCATION PANEL NO.	ISOL SW LOCATION ELEVATION	REMARKS
10P-3D	H06SWGR 10640	DGB-272'	25ASP-3	DGB-272'	
10P-1B	H06SWGR 10620	"	"	"	
46P-2B	L26SWGR BKR12610	ELEC BAY 272'	"	"	NOTES:
10 MOV-66B	MCC 165 COMP B1	RB-243'	25 RSP	RB-300'	1. Distance between fuse located in MCC C163, C 165, BMCC 2 & BMCC 4 and 25 ASP-2, is about 30'.
10 MOV-25B	MCC 165 COMP A4	"	25 RSP	RB-300'	
10 MOV-27B	MCC 165 COMP B2	"	25 ASP-2	RB-243'	
10 MOV-39B	MCC 163 COMP F1	"	25 ASP-2	RB-243'	2. Distance Between fuse located in MCC C161 & 25 ASP-1 is about 20'
10 MOV-13D	MCC 163 COMP J5	"	"	"	
10 MOV-15D	MCC 163 COMP G4	"	"	"	3. Distance between fuse located in H06 breakers and 25 ASP-3 is about 10' and distance between fuse located in diesel generator panels and 25 ASP-3 is about 75'
10 MOV-65B	MCC 163 COMP F2	"	"	"	
10 MOV-16B	MCC 163 COMP H3	"	"	"	
10 MOV-21B	MCC 163 COMP H4	"	"	"	
23 MOV-60	BMCC-2 COMP OE2	"	"	"	
29 MOV-77	BMCC-2 COMP OA1	"	"	"	4. Distance between fuse located in L26 SWGR & MCC C262 and 25 ASP-3 is about 250'.
12 MOV-18	BMCC-4 COMP OB2	"	"	"	
12 MOV-80	BMCC-4 COMP OD1	"	"	"	5. Distance between fuse located in L16 SWGR and 25 RSP is about 100'.
23 MOV-25	BMCC-4 COMP OB1	"	"	"	
10 MOV-148B	MCC C161 COMP-B3	RB-272'	25 ASP-1	RB 272'	
10 MOV-149B	MCC C161 COMP A3	"	"	"	

TABLE - 1 (cont'd)

SHUTDOWN COMPONENT ID NO.	FUSE LOCATION MCC/SWGR	FUSE LOCATION ELEVATION	ISOL SW LOCATION PANEL NO.	ISOL SW LOCATION ELEVATION	REMARKS
10 MOV-12B	MCC C161 COMP B1	RB-272'	25 ASP-1	RB-272'	
10 MOV-70B	MCC C161 COMP A2	"	"	"	
10 MOV-166B	MCC C161 COMP C1	"	"	"	
10 MVO-89B	MCC C161 COMP B2	"	25 RSP	RB-300'	
29 SOV-86A	25 ASP-1	"	25ASP-1	RB-272"	
29 SOV-86B	"	"	"	"	
29 SOV-86C	"	"	"	"	
29 SOV-86D	"	"	"	"	
46MOV-101B	MCC C262 COMP D1	ELEC. BAY 272'	25 ASP-3	DGB-272'	
46MOV-102B	MCC C262 COMP D2	"	"	"	
93-EDGB(cont)	ECPB	DGB-272'	"	"	
93-EDGD(cont)	ECPD	"	"	"	
93-EDGB(inst)	ECPB	"	"	"	
93-EDGD(inst)	ECPD	"	"	"	
93-EDGB	H06 BKR 10602	"	"	"	
93-EDGD	H06 BKR 10612	"	"	"	
TIE BKR	H06 BKR 10604	"	"	"	
TIE BKR	H06 BKR 10614	"	"	"	
BKR 10660	H06 BKR 10660	"	"	"	
23 MOV-16	BMCC 6 COMP-0A1	RB-272'	25 RSP	RB-300'	
BKR 12602	L26 SWGR COMP 2B	ELEC. BAY -272'	25 ASP-3	DGR-272'	
BKR 11602	L16 SWGR COMP 1B	RB-300'	25 RSP	RB-300'	
27 SOV-126B	25 RSP	"	"	"	
27 SOV-129B	25 RSP	"	"	"	
02 SOV-17	25 RSP	"	"	"	