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Facility Name: Kewaunee Nuclear Power Plant

Inspection Conducted: September 23-28, 1984

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12/19/84
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Inspection Summary

Inspection Conducted on September 23-28, 1984 (Report No. 50-305/84-14(DRSS))
Areas Inspected: An announced appraisal of the Emergency Response Facilities (ERFs) was conducted using draft Revision 5 of IE Inspection Procedure 82212 to determine if the licensee has successfully implemented the requirements in Supplement 1 of NUREG-0737. The appraisal covered the Technical Support Center (TSC), Operational Support Center (OSC), Radiological Analysis Facility (RAF), Site Access Facility (SAF), Emergency Operations Facility (EOF), data acquisition system, and the instrumentation, supplies and equipment for these facilities. The appraisal involved 296 inspector-hours onsite by six NRC inspectors and three consultants.
Results: No items of noncompliance or deviations were identified. However, five open items were identified that related to testing of the TSC/RAF atmosphere cleanup system; providing quantitative Auxiliary Building vent stack flow rate information; providing quantitative Reactor Building vent flow rate information and incorporating it into the dose assessment model; adding on additional release pathway to the dose assessment model to represent pathways not already represented; and, the incorrect estimation of cladding oxidation from hydrogen production.

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EMERGENCY RESPONSE FACILITY
APPRAISAL EVALUATION

1.0 Technical Support Center (TSC)

1.1 Physical Facilities

1.1.1 Design, Location, and Structure

The Kewaunee Nuclear Power Plant (KNPP) TSC is located below the control room in a building north of and adjacent to the Auxiliary and Turbine Buildings. The TSC's location is within a two minute walk from the control room. There are no major security barriers between these two facilities other than normal access control doors. The TSC contains approximately 1400 square feet of floor space and is capable of accommodating 25 people. The TSC provides facilities near the control room for detailed analyses of plant conditions during abnormal conditions or emergencies. The TSC is designed to have the same radiological habitability as the control room under accident conditions and has permanent monitoring systems which indicate radiation dose rates and airborne radioactivity concentrations. The TSC can continue to function during loss of offsite power since this facility has its own emergency diesel generator. The inspector confirmed that the TSC was as is described in Section 7 of the KNPP Emergency Plan.

1.1.2 Size and Layout

Based on observations during a previous exercise (Report No. 50-305/83-16) and the present ERF appraisal, the staff concludes that the TSC is of sufficient size to accommodate and support licensee predesignated personnel, NRC personnel specified in NUREG-0696, equipment and documentation. Although the layout of the TSC is judged to be adequate for performing necessary TSC functions, substantial improvement could be realized. In its April 15, 1983 response to Supplement 1 of NUREG-0737 (letter from C. W. Giesler to D. G. Eisenhut dated April 15, 1983), the licensee stated, "Following the completion of the Control Room Design Review, a small scale review of the ERFs will be performed to verify that they are appropriately designed from a human engineering perspective."

Although the exact nature and scope of this "small scale review" has not been clarified, the NRC endorses the concept of such a review and suggests that it would provide an appropriate opportunity to upgrade certain aspects of the ERFs from a human factors perspective.

Based on the above reviews, the layout of the TSC should be addressed during the licensee proposed human engineering review of the Kewaunee ERFs. More formal specification of information and traffic flow in the TSC can assist in improving TSC layout. Replacement of the existing chart recorder console with a more compact recorder rack or console will allow a substantial enhancement of the TSC layout. Specific items which should be considered include:

- the location of the DARS printers in relation to other data sources.

- provision for table/wall space for maps and other large documents.

- centralizing the location of the 7 separate status boards.

1.1.3 <u>Habitability/Environment</u>

The TSC and the adjacent Radiological Analysis Facility (RAF) have been designed to be habitable for a 30-day period following a major accident. The licensee's evaluation indicated that whole body and thyroid doses would not exceed 5 and 25 rem, respectively, during this 30-day period. Habitability requirements were met in two ways. First, the building was heavily shielded and the TSC portion was located below grade. Second, a filtered ventilation system has been installed to control airborne radioactivity concentrations.

The ventilation system consists of a 3000-cfm filter train (pre-filter, HEPA filter, charcoal tray) which operates in a recirculation mode, providing atmospheric cleanup. The system also contains a 1700-cfm filter train which causes a slight positive pressure to exist in the TSC (and RAF). According to a licensee representative, this system had never been tested to verify its collection efficiency. While there are no regulatory requirements which mandate that such tests be performed on a routine basis, it is considered good practice to do so, since credit (93-95% removal efficiency) would be taken for the cleanup system following an accident. The licensee representative indicated that a vendor would conduct initial testing of this system during October 1984 using a DOP test for the HEPA filters and a freon test for the charcoal absorbers. It is recommended that a routine testing program be established for the TSC/RAF atmospheric cleanup systems to verify the assumed removal efficiency. This item is considered open and will be tracked under Open Item 305/84-14-01.

1.1.4 Display Interface

In general, TSC display interfaces exhibit reasonable adherence to good human engineering practice and are easy to use, readable and understandable. There are some exceptions, however, which the staff recommends be reviewed in the course of the planned human engineering review of the ERFs. These include, but are not limited to, the following:

- Multi-page menus accessed on the Honeywell Plant Process Computer System (PPCS) terminal (e.g., point summary) or other lists (e.g., alarm list) which are continued on following display pages should be so indicated.

- Differences between function key labels and display page designators should be resolved. For example, "GRAPHIC DISPLAY" function key on the PPCS terminal calls up a display identified as "PAGE DISPLAY".

- Abbreviations and parameter designations, etc., should be standardized across the various display formats. For example, at least four different identifiers are used to indicate the difference in temperature between the 10 and 60 meter levels on the meteorological tower, viz:

EPIP Form ENV-3D.1:	Delta T
EPIP Form ENV-3E.1:	VTD
Honeywell PPCS terminal:	DIFF TEMPERATURE
IBM PC and hardcopy:	DELTA T and DELTA TEMP

- The dose assessment program as implemented on the IBM PC requests wind speed and direction, but does not specify if data required is from the 10 or 60 meter level.

- Potential for error when collecting and transcribing meteorological data would be reduced if more consistent layouts of parameters were used on the various displays and worksheets.

- Several bar charts were stored on display pages that were specified on the menu as being available for future use. These were described by licensee staff as being user generated. While the capability for user selection and generation of bar charts, trend plots, etc. in addition to those pre-specified in the system demonstrates good flexibility of the system, a means for distinguishing user generated displays which are to be saved from those which are expendable should be established.

- Apparent inconsistencies in the use of color for coding among the various displays should be evaluated for possible contribution to user error.

- In response to Task Action Plan Item I.D.1 and Supplement 1 to NUREG-0737, the licensee is conducting a Detailed Control Room Design Review. The staff recommends that any substantive differences between control room displays and similar or nominally identical ERF displays be identified and resolved. Adoption of the same display conventions and principles in the control room and ERFs will minimize the potential for confusion and error and should be verified as part of the licensee's human engineering review of the ERFs.

1.1.5 Radiological Equipment and Supplies

Radiation levels in the TSC are monitored via an installed ARM, continuous air monitor, and portable instrumentation made available from the adjacent RAF. In addition to hand-held monitoring instrumentation having a range up to 1000 R/hr, several types of integrating dosimeters were available in the RAF (TLDs, self-reading pocket dosimeters, and alarming pocket dosimeters). Some of these dosimeters had ranges up to 100 R. Extremity TLDs were also available, as was appropriate readout equipment for the above. Sufficient instrumentation was available in the RAF and Radiation Protection Office (RPO) to support plant entries following a major accident.

With regard to protective supplies and equipment, the licensee maintained an inventory both at the RAF and RPO. Included in this inventory were a full range of protective clothing, including waterproof gear; respiratory protective equipment, including SCBAs; and decontamination supplies, including a shower. Potassium iodide and instructions for its use were available in a locker in the TSC (also Control Room and Site Access Facility).

Fixed radiation monitors (process and area) could be read out in the RAF and RPO via microprocessor in both locations. These processors provide readouts for 21 ARMs, 5 CAMs, 5 high range containment monitors, and 2 SPING units, the latter being located in the Auxiliary Building Vent and the Combined Shield/Containment Building vent. The 21 ARMs were in addition to the 10 ARMs (original plant equipment) which read out in the Control Room. Five of these original 10 ARMs were accessible via the Honeywell computer in the TSC, a location which is readily accessible to the RAF staff. Based on the above review, the following is recommended for improvement:

Provisions should be made for readout of all 10 original ARMs on the Honeywell computer in the TSC, thus avoiding the need to contact the Control Room for a readout of the five units not on the computer. Such an improvement would provide easier access and useability of these data for the RAF staff during the source of an accident.

1.1.6 Non-Radiological Equipment and Supplies

The TSC was determined to be adequately equipped with plant procedures (e.g., EPIPs, EOPs), manuals and records.

The microfiche drawing file and associated reader-printer are assets to the TSC. Other references in the TSC include:

- Computer terminal access to the warehouse spare parts inventory system.
- Surveillance/test results (e.g., ILRT).
- Numerous standard technical references in offices adjoining the TSC (e.g., CRC handbooks, ASME handbooks, etc.).

In addition, the TSC has access to a number of computer routines on the corporate computer in Green Bay (i.e., supplemental to hand calculators and other reference material).

1.1.7 Communications

The licensee has provided multiple systems for transmitting and receiving information between various ERFs and offsite locations during the course of an emergency. The TSC provides the communication interface between the Control Room, RAF, Operational Support Facility (OSF), EOF, Site Access Facility (SAF), and Wisconsin Public Service Corporation headquarters. The licensee uses a stored program PBX telephone system that is powered from an uninterrupted power supply. This system has an internal battery pack to supply power for a short period of time if the primary power service fails. The licensee uses the NAWAS as the primary means of notifying the state and local governmental agencies. A dial select phone system is used to communicate with the Manitowoc and Kewaunee EOCs. The communications systems have been described in Section 7.2 of the KNPP Emergency Plan. Periodic communications tests are conducted and described in Section 8.2 of the Emergency Plan. The communications systems were inspected during July 9-13, 1984 (IE Report No. 50-305/84-07).

1.1.8 Power Supply

The TSC is supplied by an emergency diesel which automatically starts and loads on loss of power. This diesel supplies all receptacles, lighting and hard wired systems. Telephones are all supplied by utility-owned or telephone company battery/inverter backup power.

Records reviewed and discussions with operations personnel indicated that there is an intention to test the TSC diesel twice a year (approximately every 6 months). The diesel was tested 4 times in CY-83, but has only been tested once in CY-1984 (on February 11, 1981). It has been over 7 months since the TSC diesel was tested. For comparison, all ERF emergency diesels reviewed at other facilities have been on either a monthly or quarterly test cycle. The Kewaunee EOF diesel is tested weekly. Based on the above review the following is recommended for improvement:

- Testing of the diesel should be added to a preventive maintenance checklist. Considering that the diesel is a large 600 kW unit, quarterly testing may be more appropriate than semi-annual.

1.1.9 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

1.2 Information Management

1.2.1 Variables Provided

The review of information management variables provided was accomplished by comparing all electronic data sources available in the TSC and RAF to R.G. 1.97 and the functional needs of personnel performing TSC responsibilities.

The TSC is equipped with excellent access to NAWAS, the National Weather Service, emergency medical and vendor information via telephone systems and comprehensive telephone lists.

The newly installed Honeywell plant process computer is supplied with essentially the same parameter inputs as the plants original process computer. Provisions exist to add numerous other data points to the system. The licensee management personnel contacted stated that there is no current plan to provide additional signals to the system beyond those available on the new Eberline SPING system (i.e., new Eberline ARM/PRM signals will be added, but low pressure and high pressure safety injection flow will not be added).

The current location of the data output terminal for the new Eberline ARM/PRM system is in the RAF. The close proximity (in same ventilation envelope) of the RAF to the TSC does not pose a problem accessing this radiological data. Plans exist to feed these signals to the Honeywell system in the TSC at some time in the future.

The older DARS system has been retained in the TSC. This system includes three dedicated printers which print about 40 variables and about 20 Texas Instruments strip chart recorders. Approximately 40 parameters are provided by this older system. Portions of this DARS system cannot be eliminated unless the signals are connected to the Honeywell System, since the DARS is the sole source of these parameters. These important parameters include: main steam line radiation, HP and LP safety injection flow and auxiliary feedwater flow. The DARS system is connected directly to isolation transformers in the instrument loops (i.e., Foxboro cabinets).

Based on the technical support functions provided by the TSC, a comparison to R.G. 1.97 variables and a comparison to currently available (electronically) parameters, it was determined that five additional parameters (currently available only by telephone) should be added to the "data acquisition system" or treated more rigorously in a telephone or status board system. A brief discussion of each parameter is provided below:

(a) Auxiliary Building Ventilation Flow

Auxiliary Building vent stack flow is available to the TSC only by calling the Control Room and obtaining a status of the six primary Auxiliary Building vent fans. KNPP does not have installed flow measuring devices in the vent stacks. This requires stack flows to be estimated. The program in the IBM PC dose assessment computer uses design values plus 10% for each possible running combination of fans. The present lack of quantitative flow rate data presented problems for the TSC staff during the TSC walkthrough where a no fans running situation was presented.

To correct deficiencies in this area, the licensee should either: (1) install a vent stack flow measuring device and make the data directly available to the TSC electronically or via telephone to a data sheet for use in manual or computer aided dose assessment/projection, or (2) develop a matrix showing various fan combinations, including unusual situations such as no fans and unusual damper alignments, so that TSC personnel may better understand and more accurately estimate vent flow rates based on fan and damper status. This approach would also require a more formal method of obtaining and recording ventilation equipment status from the Control Room via a phone circuit (see Section 1.2.5). This area is considered open and will be tracked under Open Item No. 305/84-14-02.

(b) Reactor Building Vent Flow

The discussion above concerning Auxiliary Building vent flow rate applies to Reactor Building vent flow rate with the following additional points: the current dose assessment computer program does not consider the Reactor Building vent stack as a release point. Therefore, the program contains no default flow rates or calculational models for releases via the containment purge system or the annulus vent/recirculation system. Since the annulus vent fans start automatically on an SI signal, this release pathway is probably more likely than the Auxiliary Building vent. In addition to making available actual or estimated Reactor Building vent flow to TSC personnel, the dose assessment procedures should be revised to include this release pathway (see Section 1.2.5). This area is considered open and will be tracked under Open Item No. 305/84-14-03.

(c) Containment Spray Flow

The TSC data acquisition system (DAS) does not address this particular R G. 1.97 variable, however, this is not considered a major problem, since the spray systems affect on containment temperature and pressure could be easily followed from the presently configured DAS.

(d) RWST Level

The lack of this R.G. 1.97 variable on the TSC DAS would be of concern during any accident sequence where SI, and particularly containment spray, were initiated since the RWST would rapidly decrease in level to the recirculation initiation point (typically 20-30 minutes with containment spray or LPI operating). Tracking the level decrease would be difficult via telephone.

(e) Containment Isolation Valve Position

While containment isolation valve position is not currently displayed on the TSC DAS, it is recognized that addition of this information represents a very large number of signals and considerable expense. It is also recognized that a tabular listing of valve open-shut status on the TSC DAS would be very difficult to use.

Based on the above review the following are recommended for improvement:

- Ensure, through training, that the status of containment spray can be obtained via phones when concern over the containment integrity critical safety function (CSF) is raised. If additional parameters are considered for connection to the TSC DAS, place a high priority on adding containment spray flow or discharge header pressure.

- Place a high priority on adding RWST level on the TSC DAS.

- Through training, ensure that TSC communicators are able to obtain containment isolation valve status from the Control Room display. Reporting of valve status should be by exception from "normal" positions for the isolation signals and equipment running status in effect. If value status is added to the DAS, strong consideration should be given to providing a mimic display for major containment isolation valves.

1.2.2 Data Acquisition

Data acquisition is performed by a redundant Honeywell 4500 computer system and a Honeywell SEER 2200E data acquisition/data base software package. Figures 1 and 2 are block diagrams of the Honeywell 4500 system and peripherals.

Input from some 500 analog and 300 digital sensors is gathered by front end multiplexers (Honeywell's process interface units) and transmitted to the Honeywell 4500 computers. If either a test is run to check out noncomputerized reporting instrumentation or a turbine trip occurs, a series of strip chart recorders are started in the TSC to report critical data. The following is a list of noted sensor outputs to TSC strip chart recorders:

No of Recorders	Sensor Information
5	In-core thermocouples
1	Primary coolant system
1	Pressurizer level
2	Steam generator IA steam outlet
2	Steam generator water level
1	Containment wide range
1	Auxiliary building vent stack
1	ASB containment hydrogen

The Honeywell computer system has demonstrated the capability to acquire data from sensors sufficient to meet Reg. Guide 1.97 requirements. The Honeywell system can monitor an additional 80 analog and 323 digital sensors. For additional system expansion costs the Honeywell 4500 can collect data from additional sensors.

The time resolution for the transmission of data is adequate to assure transmission without loss since the data acquisition rate is low speed.

The following is a list of sensor sampling frequencies and conditions:

No. of Sensors	Sampling Frequency	Mode
1	Continuous	Operator selection
All	Every hour	Normal
100 (selected)	Every 2 minutes	Post trip
100 (selected)	Every 2 minutes	Operator selection

In a letter from C. W. Giesler to D. G. Eisenhut dated August 1, 1984 (NRC-84-123) KNPP described the testing used to verify the isolation of the installed Honeywell system.

1.2.3 Data Communications

The Honeywell computer system has some five coaxial driver input/output lines to communicate with terminals in the Control Room supervisors office, TSC and EOF plus one line to communicate with an IBM/PC and a mainframe IBM computer system.

The Honeywell system should be able to communicate with at least 10 channels without significant response degradation. Additional channel control boards could be acquired if needed to expand communication capability. Peak load and/or accident conditions are not expected to be restricted or degraded with the current input/output channel configuration.

Error detecting for the Honeywell 4500 and peripherals is accomplished by first, parity checking for error detection and second, request to sender for retransmission for error correction. The error detection and correction is performed by both the Honeywell 4500 communication devices and the Honeywell display terminal's communication hardware.

This error checking technique does assure transmission error detection; however, communication line random noise could be interpreted as valid data or commands by the Honeywell 4500. Significant line noise for distances of 50 to 300 ft using coaxial cable for the Control Room and the TSC display terminals is unlikely. Line noise interpreted by the Honeywell 4500 from the TSC and Control Room terminals would in most cases be treated as invalid commands.

Sensors are signal conditioned and multiplexed by a Honeywell front end and then transmitted to the Honeywell 4500.

Date transmission between ERFs is done using coaxial calling or twisted pair RS232C lines. The Honeywell 4500 input/output lines multiplexer transmits and receives data to the terminals and printers in the ERFs.

Data transmission is adequate between the TSC, the Control Room, and the EOF. The transmission between the Honeywell 4500 and the EOF depends on two serial RS232C phone lines. Should both lines fail, the Honeywell 4500 would be unable to communicate with the EOF and information could only be obtained manually be telephone or radio communications.

Based on the above review, the following is recommended for improvement:

- Acquire a 1200-baud dial-up modem for backup emergency data acquisition at the EOF.

1.2.4 Dose Assessment

The primary means of dose assessment at the TSC is by use of an IBM PC personal computer and a dose assessment program stored on a diskette. The program uses radionuclide release concentrations and flow rate, plus meteorological data as input, and calculates projected doses using a straight-line Gaussian diffusion dispersion model. Because of the release point and building geometry, releases are treated as ground level. A back-up means of dose assessment uses a computer terminal and the IBM mainframe computer in the company offices in Green Bay. A further backup is described in the Emergency Plan Implementing Procedures (EPIPs) as a manual calculation procedure. With these three means, the licensee has adequate dose assessment calculation capability.

The procedure using the IBM PC personal computer is relatively simple, and with ready availability of meteorological data in the TSC, the licensee has the capability to provide dose projections as frequently as every 15 minutes. If the nature of the accident is such that the licensee can rapidly determine the concentrations of radionuclides being released and their flow rate, the licensee can make timely dose projections to 10 miles based on whole body and thyroid doses from exposure to the plume.

Based on the above review, the following is recommended for improvement:

- The approach taken with regarded to the milk ingestion pathway and whole body exposure due to ground contamination is to rely on measurements made in the field. It is recommended that a procedure be developed using early field measurements and/or release information for making projections of potential contamination levels and whole body dose rates from ground contamination. At present, the field monitoring data would be used primarily to project the spatial extent of currently existing conditions.

1.2.5 Source Term

There are many sources of information available in the TSC to determine or predict releases to the environment. These include monitors and samples from the Auxiliary Building Vent Stack and the Shield Building Vent Stack, samples from the Post-Accident Sampling System (PASS), area and process radiation monitors, containment monitors, samples for hydrogen concentration in the containment, core status indications, and samples from the environment. The dose assessment code is written to effectively and quickly handle noble gas and iodine source terms via three pathways: a steam release, releases via the Auxiliary Building fans, and releases via the Special Ventilation Zone fans.

The code can also be used to calculate offsite doses based on offsite sample radionuclide concentrations, but cannot be used to determine a source term from this. Dose calculations based on samples taken by environmental monitoring teams outside the plant would likely be available too late to aid in optimal emergency response.

Although the three pathways mentioned above are important release pathways and may cover the majority of pathways from non-severe accidents, there are other release pathways that could be postulated in both design basis and severe (beyond design basis) accidents. The foremost of these is a release via the Shield Building Ventilation System out the Reactor Building Discharge Vent. (See Section 1.2.1) Apparently, this pathway is not incorporated in the dose assessment model because of difficulty in estimating the flow rate. In spite of this difficulty, some provision should be made in an Emergency Plan Implementing Procedure (EPIP) to estimate the flow rate from the Shield Building, and this pathway should be included in the dose assessment code. The ideal means of estimating the flow rate would be a flow meter on the Shield Building Ventilation System. Alternatively, the flow out the Reactor Building Discharge Vent could be estimated by calculations. These calculations would be done in advance, based on design and testing information for both the containment (from which leakage might occur that would increase with containment pressure), and for the Shield Building (through which inleakage from the environment to the annular space would occur). From this information, algorithms could be written for an EPIP to permit estimation of flow rate out the vent as a function of, for instance, containment pressure. This is tracked under Open Item No. 305/84-14-03. Also, actual stack flow rates for the Auxiliary Building Vent Stack are not an input option for the dose assessment code, even though determining radionuclide release rates using stack flow rates is discussed in the Emergency Plan. (See Section 1.2.2) This is being tracked under Open Item No. 305/84-14-02.

In addition to adding the Shield Building Vent as an optional release pathway, another, more flexible, release should be added to the dose assessment code. This could represent any other release pathway - whether or not it was from a stack, driven by an fan, monitored, etc. This would be to cover any of a number of unexpected, and probably unfiltered, release that might follow an accident with degraded Engineered Safety Features. This release pathway could have a flow rate and isotopic distribution defined by the user, with the option of either an elevated (energetic) or ground-level release. The other sources of information mentioned above could be used to characterize this release. This will be tracked under Open Item No. 305/84-14-04.

Procedure EP-TSC-6 was examined and determined to incorrectly estimate cladding oxidation from hydrogen production. The licensee committed to correct this error by January 1, 1985. This will be tracked under Open Item No. 305/84-14-05.

The dose assessment code provides for pre-calculated mixes of noble gases and iodines, or specification of each of eight noble gases and I-131. The eight noble gas isotopes chosen dominate the risk from noble gases, and I-131 is the risk-dominant iodine isotope. EP-ENV-3G correctly notes that accounting for exposure from I-131 alone, and no other iodine isotopes, gives only an approximation to the total iodine dose. The I-131 dose will always be an underestimation, but the underestimation will be small after a few hours of decay.

Based on the above review, the following are recommended for improvement:

- In EP-TSC-6 a refinement to improve the correction for depletion of oxidation is recommended (depleted oxygen would indicate some oxidation of hydrogen in the containment, but the oxygen volume fraction can decrease either by actual depletion, or by dilution with steam or gas).

- Although iodines and noble gases are treated adequately, there could be better procedures and code options for handling other isotopes. NUREG-0654 identifies Cs-134, Te-132, Ru-106, and Ce-144 as being important in accident assessment. Specifically, these isotopes could be large contributors to the immersion and/or inhalation doses for accidents involving sustained high temperatures in the core. The isotopes would likely be released to the environment as airborne particles (aerosols), as would iodine, in some cases. Therefore, the ability to interpret the particulate readings from monitors and samples is key to including other isotopes in the dose assessment scheme. Although the Emergency Plan indicates that calculations to project doses due to particulates (as well as noble gases and iodines) would be done, the EPIPs and the dose assessment code do not reflect this. Also, the EPIPs could include a method for sampling particulates from a highly contaminated containment atmosphere e.g., by using a small flow rate or a short sampling time.

- In addition to greater flexibility in the selection of release paths, the EPIPs could have better provisions for projecting or predicting source terms. For some severe accident scenarios, prediction source terms before their release could permit timely emergency response decisions, and may allow for evacuation before a release occurs. EP-TSC-6, "Assessing Reactor Core Damage," helps to provide the initial information for predicting source terms but no EPIP or feature of the dose assessment code would help the licensee staff translate core damage into the timing or magnitude of potential releases. An EPIP could give guidance in diagnosing and assessing the potential releases of severe accidents likely to contribute to the accidental risk at Kewaunee (and for which emergency response would be very useful) such as an interfacing systems LOCA which bypasses containment, or a plant blackout leading to a pump seal failure LOCA.

More general guidance could include consideration of initial sources of radionuclides (the core, coolant, spent fuel pool, or waste handling system), their potential flow paths through the plant (evaporation, aero-ionization, unisolated vents or liquid-carrying lines, leaks due to overpressure), and natural or artificial means of mitigating the release of nuclides (condensation, deposition, removal by sprays, and filtration). For instance, an EPIP could indicate a realistic temperature range in which the containment would likely fail, so that realistic containment failure times could be projected for severe accidents. Use of the containment design pressure as the pressure of ultimate failure is likely to be unnecessarily conservative. On the other hand, very high containment temperatures may cause containment leakage through penetration seals, even at moderate pressures.

1.2.6. Meteorology

Onsite meteorological data is available in the TSC on analog charts and in digital form on the plant process computer (Honeywell). An acceptable backup power supply is available for maintaining access to the onsite meteorological information. Meteorological parameters available are: 10 meters (primary and backup towers) - wind speed, wind direction, sigma theta; 60 meters - wind speed, wind direction; 60 to 10 meters - temperature differential. In the event that site data are not available, procedures exist for obtaining meteorological information from the National Weather Service. Examination of digitally supplied meteorological data determined that wind direction and temperature differential were instantaneous values, and not averaged values. The licensee committed to provide these data in the form of 15-minute averages for digital display.

The failure of providing averaged meteorological data was identified in Inspection Report No. 50-305/84-07, and Open Item No. 305/84-07-02 already relating to this item will remain open.

Atmospheric transport and diffusion is characterized by a straight-line gaussian model. In the complex lake shore environment that exists at KNPP, this type of model is limited in its ability to adequately assess and project the transport and diffusion of effluents. This limited modeling capability has been accepted on an interim basis pending the results of an NRC sponsored lake-breeze diffusion study conducted in 1982 (Open Item No. 305/81-13-53). The licensee has committed to incorporate the results of this study into their modeling capability once it is available. The NRC will re-evaluate the adequacy of KNPPs meteorological modeling of atmosphere transport and diffusion at that time. During this interim period, the licensee is using a simplified methodology for determining if a lake breeze event exists and the location of the lake breeze front.

The meteorological monitoring system at KNPP provides a reliable indication of the meteorological variables (wind direction, wind speed and atmosphere stability). Whether the single onsite monitoring location is sufficient to characterize meteorological conditions out to about ten miles from the site will be examined by the licensee based on the 1982 lake-breeze study when the results are available. The representativeness of the meteorological monitoring program will be determined in conjunction with the re-evaluation of the licensee's meteorological modeling capability.

Based on the above review, the following recommendations are made for improvement:

- Modify the procedures to specify that digital meteorolgical data should always be used as a first choice, with analog used only if the digital is not available.

- Modify the dose assessment model to allow input of the 60 meter wind speed for elevated release situations.

1.2.7. Data Storage

The Honeywell 4500 at Kewaunee is configured with 768K bytes of read/write memory with 5.1 MB of read/write data storage memory and a 80 MB hard disk. No processing or storage deficiencies were noted.

Some application programs are being developed to execute on the Honeywell 4500 system; however, the system is not expected to significantly lose response time.

Data acquisition and storage tasks are executed on a priority basis.

Data storage is conceptually and practically adequate for the routine data requirements. However, the loss of disk data because of a head crash or disk directory damage could result in the loss of up to 20 days of irreplaceable historical data.

Data storage capability is adequate to allow analytical review of plant response to transients. For example, on a turbine trip, complete data collection is done every 2 minutes instead of every hour. Currently trending can only be done on printers and cannot be done on the Honeywell display terminals.

In the case of an accident condition, data storage requirements would be increased roughly 30 times. The primary historical disk file would fill up in about 24 hours. No problems are expected because of this since the data base could be transferred to magnetic tape once per day instead of once every 21 days.

Based on the above review, the following are recommended for improvement:

- The feasibility of continuous data backup by either addition of another disk or routine storage of sampling data to magnetic tape should be reviewed.

- Two functions should be added to the software c apability to improve trending presentation; namely,

  (1) provide software to plot historical data on the display terminals

  (2) acquire industry standard graphics devices to allow hard copy graphical output (e.g., Tektronix, Calcomp, Versatek, etc.)

1.2.8. System Reliability

Two things were done to validate and verify the reactor sensors. First, selected sensors were checked to verify that sensor wiring correctly traced back to the computer data base location. Second, National Bureau of Standards traceable electronic signal sources were input into sensor lines to assure data collection system accuracy. Quality assurance documentation was reviewed at Kewaunee to verify validation and verification.

The reliability of the Honeywell computer system is tracked using an availability log. The Honeywell computer system and TSC peripherals are powered by the TSC uninterruptible power supply system (UPS). The TSC UPS is expected to supply the Honeywell system for approximately 6 hours. Emergency generator power or second source power is expected to be available before the 6 hours have lapsed.

No formal method appears to be used for assuring the reliability of manually gathered, processed or displayed data. It was stated by licensee staff that questionable or unusual data is rechecked.

Based on the above review, the following are recommended for improvement:

- Kewaunee personnel should review the feasibility of acquiring an NBS traceable voltage or current source to be read routinely as an analog sensor. The NBS traceable source should be monitored by each system multiplexer to provide a continuous quality assurance check of the multiplexer and analog to digital converter. It is possible that yearly validation costs may be significantly reduced by using a continuous validation approach.

- A more consistently applied means for confirming correct transmission of manual data between source and destination, e.g. readback, independent confirmation, etc., should be implemented.

1.2.9 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

1.3 Functional Capability

1.3.1 Operations

This appraisal included discussions with licensee personnel concerning the notification process and subsequent manning of the TSC. During normal working hours, emergency response personnel are notified by telephones and pagers. Initial notifications of key personnel for shift augmentation are made by commercial telephone if time permits, with an extensive voice-message pager system as backup. One pager code calls all primary designated directors while other pager codes call alternate directors and plant support personnel. If the pager system was used during an offshift emergency, all emergency response personnel would initially arrive onsite. The staffing needs would then be determined and excess personnel would return home and prepare to relieve the initial shift when called. The licensee performs quarterly augmentation drills which test the response times against the 30 and 60 minute time goals of Table TSP 44-3.7 by using the tone voice radio pager. These augmentation drills were inspected during July 9-13, 1984 (Inspection Report No. 50-305/84-07). The inspector reviewed the TSC staffing levels and determined that the licensee met the minimum staff augmentation requirements of Table 2 of NUREG-0737 Supplement 1. The inspector interviewed licensee personnel and reviewed the licensee's procedures to determine how the transfer of various responsibilities and functions are made, including notification of offsite agencies, emergency direction and control, protective action decisionmaking and recommendations, and dose assessment. The transfer of offsite notification responsibilities from the TSC to EOF is addressed clearly in EP-EOF-2. Initially, the protective action recommendation responsibility is with the Shift Supervisor in the Control Room until relieved by the Emergency Director (ED) in the TSC as described in EP-AD-1. EP-EOF-1 lists the protective action recommendation evaluation responsibility with the Emergency Response Manager (ERM) in the EOF, once the EOF becomes activated. However, the ERM will consult with the ED, the Radiological Protection Director in the TSC, and the Environmental Protection Director in the EOF when evaluating the need for recommending protective actions. Based on licensee interviews, dose assessment computations derived from plant data are performed initially in the TSC before being transferred to the EOF. It should be noted, that the TSC continues to perform dose assessment calculations, primarily based on plant data, in support of EOF operations. Both the TSC and EOF concur before issuing dose assessment information when this need arises, with the EOF relying heavily on the TSC for plant radiological data that can be easily plugged into their dose assessment program. Based on the above review, the following is recommended for improvement:

- Dose assessment responsibility should be addressed more clearly in the procedures, being more specific to differentiate the responsibilities between the TSC and EOF.

1.3.2 Control Room Support

The functional capability of the TSC was evaluated by presenting a NRC developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. Licensee personnel responded to the postulated circumstances by describing their actions and how the equipment and supplies available in the TSC would be used. The evaluation showed that the TSC would be adequately staffed and capable of performing the assigned functions. The only area which presented a temporary problem was the lack of stack flow data and the lack of versatility in the IBM PC dose assessment computer.

1.3.3 Conclusion

Based on these findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

2.0 Operational Support Facility (OSF)

2.1 Physical Facilities

2.1.1 Design, Location, Habitability

The OSF, (termed an Operational Support Center by the NRC), is located in the Conference and Assembly Rooms on the mezzanine level (606 ft) of the Administrative Building. During non-emergency periods, these rooms are used as meeting facilities by the licensee. The Administration Building has neither a specially-filtered ventilation system nor any special shielding; thus, it has not been designed to be habitable under accident conditions. An alternative OSF is located in the Radiological Analysis Facility (RAF), which is adjacent to and part of the TSC complex. The alternate location is not identified in the EP-OSF series of procedures which relate to the activation, staffing, and conduct of operation in the OSF (the point at which evacuation of the OSF should be considered is mentioned in EP-OSF-2; however, the alternate location is not).

In addition to the above-mentioned Conference and Assembly Rooms, the OSF requires, in order to function properly, access to the file room on the upper level of the Administration Building, as well as access to the 606 ft level of the Auxiliary Building. Prior to plant entries, maintenance teams need to report to either the Radiation Protection Office (RPO) or the Radiological Analysis Facility (RAF) for radiation protection briefing after gathering tools and equipment from the maintenance shop and receiving a briefing from the OSF management staff. Other than an available chalkboard, there are no displays in the Operational Support Facility.

Based on the above review, the following are recommended for improvement:

- Selected plant information should be provided and kept current in the OSF including, for example, indication of assigned personnel responsibilities and emergency work crew locations.

2.1.2 Equipment and Supplies

The OSF has been furnished with minimal equipment and supplies and is used primarily as an assembly point. Tools and equipment are gathered as indicated in Section 2.1.1. General plant arrangement drawings, P&IDs, electrical schematics, and related material are contained in the File Room on the level above the OSF. A file cabinet in the OSF contains the Emergency Plan and Implementing Procedures, as well as forms to be used during an emergency, e.g., Accountability, Tagout Control Sheet, Materials Request, and Work Request. With the exception of the instrumentation mentioned below, all radiological monitoring equipment and supplies, protective clothing, respiratory protective equipment, and personnel dosimeters are stored at the RPO and RAF. Also available at the RPO/RAF were an adequate supply of survey maps, procedures, emergency RWPs, survey data sheets, and the like.

Habitability of the OSF is determined via an Area Radiation Monitor (ARM) located in the Conference Room and a Continuous Air Monitor located in the Assembly Room. In addition, in-plant teams would periodically assess airborne and direct radiation levels in this area. The Assembly Room is susceptible to direct radiation (shine) from containment, as it is not "shadowed" by an in-plant shield wall as is the Conference Room. The Assembly Room lacks an ARM, which would be important in the assessment of potentially rapidly changing radiation levels in this area following a major accident.

Based on the above review, the following is recommended for improvement:

- An ARM should be made available in the OSF/Assembly Room to provide for increased personnel protection in this unshielded area following an accident.

2.1.3 Communications

In addition to the PBX telephone system that was described in Section 1.1.7 of this report, the OSF and RPO also have a Gaitronics public address system. A radio base station is located in the Control Room, with remote console stations in the RAF, EOF, and SAF. The base and remote stations are used to communicate with the radiation emergency teams, environmental monitoring teams, and the emergency vehicle, via hand-held radios.

2.1.4 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

2.2 Functional Capability

2.2.1 Staffing

The functional capability of the OSF was evaluated by presenting an NRC-developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. Licensee personnel responded to the postulated circumstances by describing the action that would be taken and how the equipment and supplies necessary for the OSF to function would be obtained. The evaluation showed that the OSF would be adequately staffed.

2.2.2 Operations

During the functional capability assessment of the OSF, the Support Activities Director discussed repair activities which would be coordinated by the OSF in response to a scenario-dictated RHR pump failure. Interfaces with the TSC and Control Room were discussed, as well as the use of Emergency Design Change Requests, Work Requests, Tagout Control Sheets, Materials Requests, and Emergency RWPs. The evaluation showed that the OSF would be capable of performing assigned functions

2.2.3 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

3.0 Emergency Operations Facility (EOF)

3.1 Physical Facilities

3.1.1 Design, Location, Structure

The EOF is a designated area in the Wisconsin Public Service Corporation Lake Shore Division office located in

Two Rivers, Wisconsin and is located approximately 17 miles from KNPP. The location of the EOF meets the criteria of Option 2 of Table 1 in Supplement 1 to NUREG-0737 and is, therefore, acceptable.

Overall, the EOF (which occupies about 1600 square feet) is of sufficient size to accommodate the necessary personnel, equipment, and documentation. The EOF has adequate lighting, restroom facilities, and other features essential for its operation.

The facility has been constructed to meet the Wisconsin Building code. Because of the distance from the site, the EOF has not been designed to be habitable under accident conditions. A 25 KV diesel generator for emergency backup power is available for EOF use; however, the diesel generator's primary function is to serve emergency power to the Lake Shore Division office.

The layout of the EOF is acceptable; however, the physical separation of the Environmental Calculation Room could introduce a security and personnel movement problem if the intervening office space is open to public access during EOF activation. Also, some clutter is evident in the Coordination Center, primarily due to the placement of telephone cords.

Based on the above review, the following is recommended for improvement:

- The EOF layout should be reviewed as part of the licensee's planned human engineering review of the ERFs. Particular emphasis should be on identifying traffic flow within the Coordination Center to optimize layout.

3.1.2 Equipment and Supplies

Radiological equipment and supplies are not maintained at the EOF because: (1) as discussed in Section 3.1.1, the EOF is located sufficiently far from the plant to not require habitability monitoring, and (2) environmental monitoring teams are dispatched from the Site Access Facility (SAF) (within 1 mile from the plant) and all equipment and supplies are located there. Teams are directed from the EOF.

The reference material in the EOF is satisfactory if the following conditions are maintained:

(1) The source term for dose assessment is calculated for the EOF by the TSC.

(2) All dose assessment results are checked with TSC results prior to making protective action recommendations.

(3) The EOF is not depended upon for strong reactor/control room technical support.

The EOF files contain copies of the Kewaunee Emergency Plan and Procedures; updated FSAR; plant systems description manual; structural, mechanical, and electrical drawings; directories of regional parts suppliers/vendors; as well as other supporting references. A quarterly inventory of emergency equipment and supplies is conducted in accordance with ACD 12.2, "Emergency Equipment Quarterly Inventory."

3.1.3 Display Interfaces

In general, the EOF display interfaces are acceptable. For those displays which are common to the EOF and TSC, the comments in Section 1.1.4 apply. Based on the above review, the following is recommended for improvement:

- The Honeywell PPCS Terminal in the EOF, currently the "engineering model", should be replaced by a "TSC operator" model, due to differences in terminal layout.
- Consider a layout change in the EOF since considerable glare was evident on both the PPCS CRT and the large status board due primarily to relationship of these displays to windows.
- Minor differences were observed between the layout of information on data collection forms and the status board. Resolution of these differences will reduce the likelihood of transcribing errors.

3.1.4 Communications

The EOF has reliable communication links with the Control Room, TSC, OSF, RAF, SAF, Joint Public Information Center (JPIC), and offsite agencies. The licensee uses the NAWAS as the primary means of notifying the state and local governmental agencies. A dial select phone system is used to communicate with both Manitowac and Kewaunee Emergency Operations Centers. The licensee uses a stored-program PBX telephone system that is powered from an uninterruptible power supply. The system has an internal battery pack to supply power for a short period of time (approximately three hours) if the primary power source fails. If there is a complete and total loss of the system, there are four independent trunk lines available from an outside source. These systems have been described in the KNPP Emergency Plan (Section 7.2). The communications systems were inspected during the period July 9-13, 1984 (Inspection Report No. 50-305/84-07).

The appraisal included discussions with licensee personnel concerning the notification process and subsequent manning of the EOF. During normal working hours, emergency response personnel are notified by telephones and pagers. Initial notifications for shift augmentation are made by a commercial telephone auto dialer for key personnel if time permits, and a normal phone for other personnel, with an extensive voice-message pager system as backup. One pager code calls all primary designated directors, while another pager code calls alternates.

3.1.5 Conclusion

Based on the above findings, this part of the licensee's program meets the requirements of Supplement 1 of NUREG-0737.

3.2 Information Management

3.2.1 Variables and Parameters

Most of the variables and parameters available in the EOF are the same as the TSC, and were discussed in Sections 1.2.1 and 1.2.2. The EOF does not currently have electronic access to the SPING output to the Honeywell system. The EOF must currently depend upon the TSC to provide all source term related parameters. The problems with determining vent flows in the TSC naturally pass on to the EOF. Correction of the vent flow problem in the TSC and addition of the SPING output to the Honeywell will resolve this item for the EOF. Based on the above review, the following is recommended for improvement:

- The emergency generator at the EOF should be tied into the EOF receptacles to provide reliable backup power for the DAS.

3.2.2 Data Communication

Currently two dedicated telephone lines are used for EOF terminal to Honeywell 4500 communications. Details of the Honeywell 4500 system is contained in Sections 1.2.2 and 1.2.3. Based on the above review, the following is recommended for improvement:

- Low cost (approximately $500-$1000) dial-up modems be acquired to provide emergency EOF backup communications.

3.2.3 Data Storage and Reliability

Central processor capability and storage capacities are adequate to meet current TSC and EOF computer needs (see Section 1.2.7).

Quality assurance checks have been done to assure: first, that each sensor location monitored by the Honeywell computer system maps exactly into the computer data base; and secondly, known signals input into a sensor line are accurately measured by the data acquisition system (see Section 1.2.8).

For the plant parameters on the Honeywell plant process computer, data storage for trending is limited. At present, it permits trending only from the moment of trending initiation forward. No past data can be directly electronically accessed and incorporated in the trending analysis. The present system permits trending for about twenty minutes, on the video display. At the EOF, electronic data storage availability is limited to the Honeywell system. All other data would be handled and stored in hardcopy.

3.2.4 Dose Assessment

Once the IBM PC personal computer has been brought from corporate headquarters to the EOF in Two Rivers, Wisconsin, and set up as part of the EOF activation, the EOF has the same primary computerized accident dose computer and capability as the TSC, and is discussed in detail in Sections 1.2.4, 1.2.5 and 1.2.6.

The arrangements made for the EOF permit the licensee to promptly relay information from the TSC to the EOF and to make timely plume exposure dose projections out to about 10 miles from the site for protective action recommendations.

The licensee's dose calculation program assumes a straight-line Ganssian-type plume; therefore, to estimate doses at any receptor location that is impacted by more than one set of meteorological and release conditions, doses at that location will be calculated separately for each set of conditions and summed by hand.

Dose assessments of the ingestion pathway to about 50 miles from the site can be made to determine the necessity of deploying monitoring teams.

Field monitoring data can be used to correct and modify dose projections. However, rapid feedback from the field relies on simple instrument-readout data, requiring simplifying assumptions. For sample analyses, the samples will be brought to the plant; thus collection and analysis time requirements will delay more accurate input.

Based on the above review, the following is recommended for improvement:

- The dose assessment capability at the EOF should be augmented by maintaining a collection of dose assessment reference literature at the EOF, which would provide a broader basis on which to address dose assessment questions which differ substantially from those the computer program calculates.

3.2.5 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

3.3 Functional Capability

3.3.1 Operations

The functional capability of the EOF was evaluated by presenting an accident scenario to key members of the EOF staff normally assigned to the facility during an emergency. The individuals responded to the postulated circumstances by describing the actions that could be taken and by demonstrating how the equipment and supplies available in the EOF would be used. The scenario involved discussions with licensee personnel concerning the notification process and subsequent staffing of the EOF. This notification process has been described in Section 1.3.1 of this report. The inspectors reviewed the EOF staffing levels and determined that the licensee met the minimum staffing requirements of Table 2 of NUREG-0737, Supplement 1.

Radiological and environmental assessment are coordinated at the EOF. Environmental monitoring teams are coordinated from the EOF. An adequate number of monitoring points have been pre-selected and teams can be dispatched to other points readily. The excellent grid of roads in the plant vicinity has enabled monitoring locations to be clearly and unambiguously communicated by reference to the road grid. The licensee has provided the capability to make adequate readings to characterize the plume, and has provided adequate communications capability.

3.3.2 TSC Support

Based upon the current division of responsibility between the TSC and EOF, the EOF provides little or no "technical support" to the TSC. Under this arrangement, the TSC would have to perform all of the basic research on logistics needs before turning procurement over to the EOF. For example, if a part for a vital piece of equipment were required to effect an emergency repair, the TSC would have to research and determine manufacturer, part or piece number, dimensions and a likely source. The actual procurement could then be turned over to the EOF. If there is any intention for the EOF to play a larger role in logistics support, then large amounts of reference material would have to be added to the EOF library (and additional, qualified personnel to perform a detailed level of research).

The licensee places primary reliance on the TSC for dose assessment. Therefore, although the EOF has a dose assessment capability, it appears that dose assessment of alternative mitigative actions would be performed in the TSC. Aside from this, the EOF does provide assistance to the TSC in the determination of the advisability of mitigative actions, particularly in coordination with Federal, State and local governments. The EOF does coordinate radiological and other environmental assessments of implemented mitigative actions, including with offsite agencies.

3.3.3 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737.

4.0 Exit Meeting

On September 28, 1984, an exit meeting was held with the licensee to discuss the preliminary findings of the appraisal. Licensee personnel who attended this meeting are identified in the Attachment to this report. The licensee was informed that no deficiencies were identified during the appraisal. However, five items were identified and discussed that will be tracked as Open Items. The licensee was informed that recommendations for improving the emergency response facilities, equipment and employee actions that were identified during the appraisal would be documented in the appraisal report. These recommendations were discussed during the exit meeting.

Attachment: Individuals Contacted

Figures 1 & 2: System Block Diagram
for Honeywell Computer

Attachment

Wisconsin Public Service Corporation - Individuals Contacted

* D. Hintz, Manager - Nuclear Power

* C. Steinhardt, Plant Manager

* D. Seebart, Nuclear Emergency Preparedness Coordinator

* M. Marchi, Plant Technical and Services Superintendent

* S. Gunn, Nuclear Technical Review Supervisor

* R. Pulec, Plant Technical Supervisor

* C. Schrock, Nuclear Licensing and Systems Superintendent

* D. Ropson, System and Licensing Superintendent

* D. Masarik, Operation Assessment Supervisor

* C. Long, Assistant Radiation Protection Supervisor

* W. Bartelme, Emergency Plan Specialist

* D. Morgan, Lead Radiation Technologist

G. Van Helvoirt, Environmental Analyst

J. Chadek, Nuclear Software Technician

J. Wallace, Nuclear Computer Supervisor

D. Berg, Quality Control Supervisor

P. Lindberg, Plant Technical Projects Engineer

R. Repshas, Maintenance Supervisor

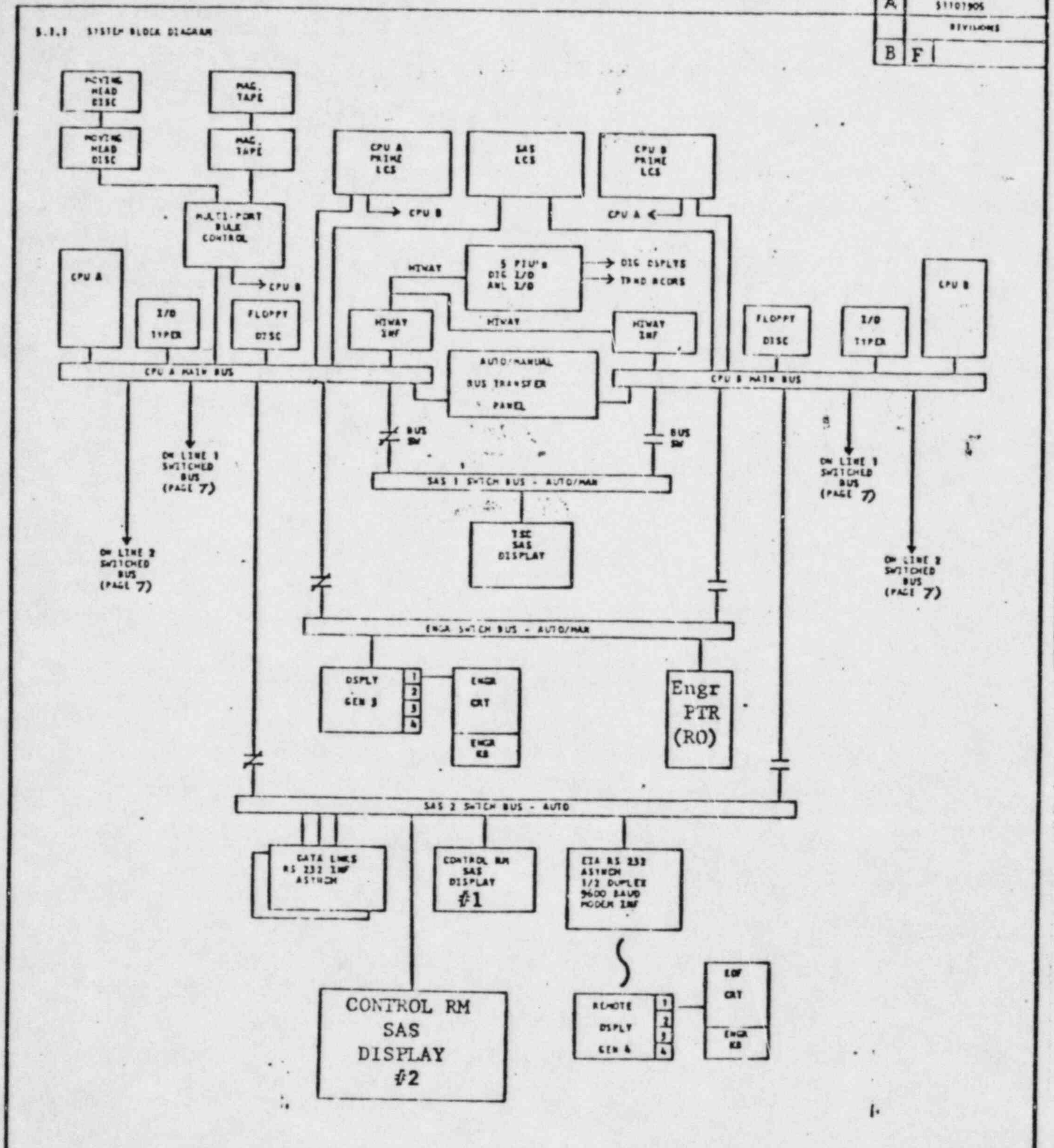
C. Smoker, Plant Systems/Reliability Supervisor

M. Reinhart, Radiation Protection Supervisor

P. Dufek, Chemistry Technician

D. Padula, Plant Health Physicist

* Denotes those present at the September 28, 1984 exit meeting.



A	51107905	
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FCF	TITLE SYS. SPEC. 5 REHAUNCE SAS/PC			Honeywell PROCESS MANAGEMENT SYSTEMS DIVISION/PHOENIX
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FIGURE 1

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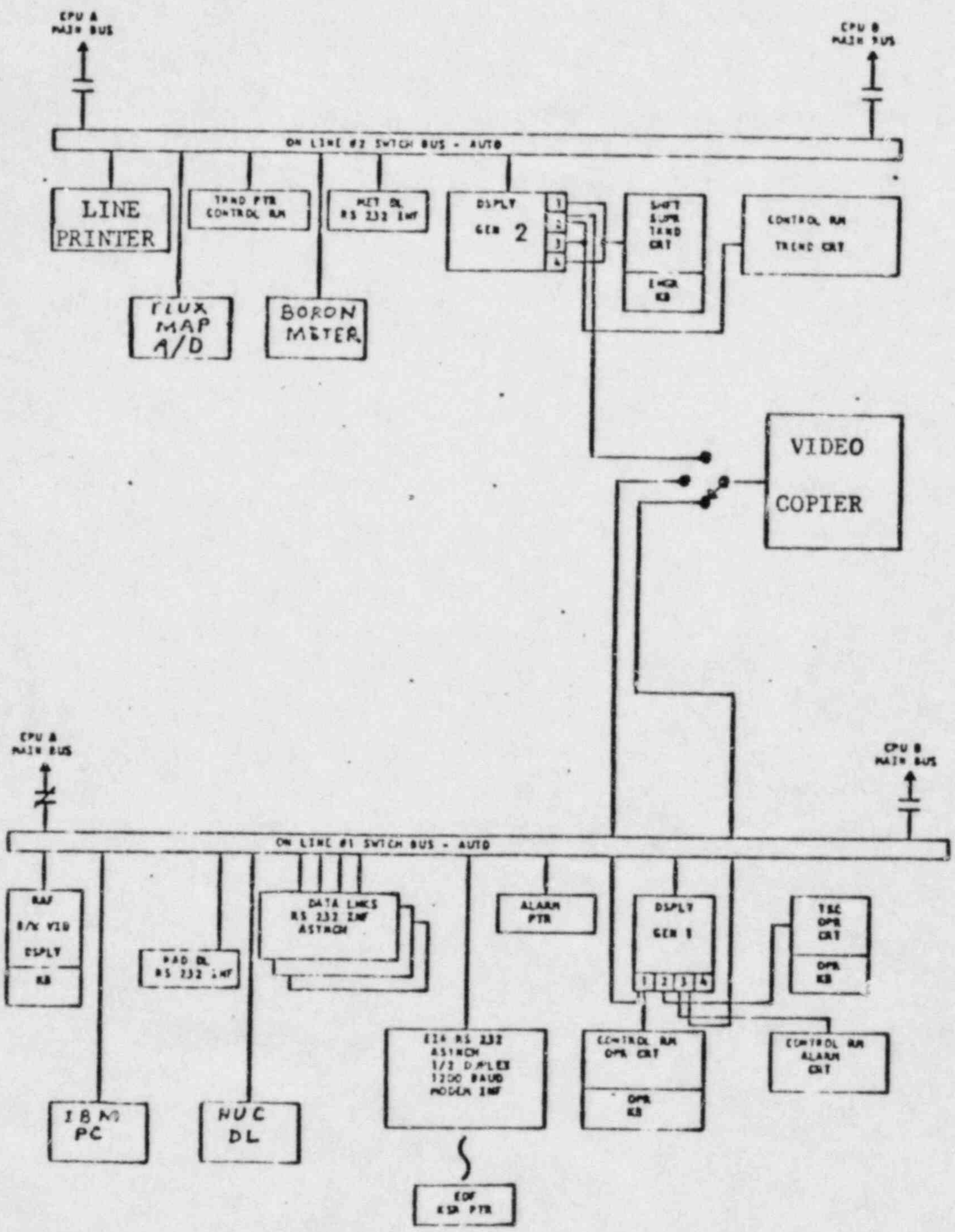
5.2.1 SYSTEM BLOCK DIAGRAM



FCF	TITLE SYS. SPEC. 5 KEWAUNEE SAS/PC		Honeywell PROCESS MANAGEMENT SYSTEMS DIVISION/PHOENIX	
FMF ESGF				
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FIGURE 2