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STOLZ,J.F. Operating Reactors Branch 4

SUBJECT: Forwards functional description of proposed upgraded meteorological sys.NRC should conduct preimplementation review of sys rather than post-implementation review to assure that acceptable sys can be installed by Oct 1982.

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November 5, 1981

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

RECEIVED
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U.S. NUCLEAR REGULATORY COMMISSION

Attention: Mr. J. F. Stolz, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

As required by NUREG-0737, Action Plan Item III.A.2. and NUREG-0654, Appendix 2, please find attached a functional description of the proposed upgraded meteorological system for Oconee Nuclear Station. This submittal fulfills the revised requirement to provide such description by January 1, 1982.

It is requested that the NRC Staff conduct pre-implementation review of the attached rather than a post-implementation review as denoted in NUREG-0737. Pre-review and/or approval is desired promptly in order to assure that an acceptable system can be designed, procured, installed and operational by October 1982. A timely response to this submittal would be appreciated.

Very truly yours,

William O. Parker, Jr.

RLG/php
Attachment

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INTRODUCTION

In response to guidance provided by NUREG-0654, Revision 1 and supporting documents, Regulatory Guide 1.23, Proposed Revision 1, Regulatory Guide 1.111, Revision 1, and Regulatory Guide 1.109, Duke has reviewed the existing meteorologcial system at Oconee Nuclear Station and, based on that review, has developed a plan for upgrading the meteorology system. This functional description of the upgraded meteorological system is intended to provide compliance with the January 1, 1982 submittal date.

The present meteorological measurement program at Oconee Nuclear Station was originally designed to best describe the meteorological conditions on-site by taking into account source characteristics, terrain features and modeling needs. Due to revisions to guidelines, Duke has developed changes to upgrade assessment capabilities and reliability of the meteorological programs at Oconee Nuclear Station.

Basically, these changes will:

1) Establish a capability to access near real time (within 15 minutes of request) 15 minute averaged/validated data with a 12-hour recall and associated dose estimates that account for variability in travel path of effluent material.

2) Improve reliability and accuracies through backup instrumentation and upgrading of meteorological data, other dose related measurements, and dose estimates as needed.

EFFLUENT DISPERSION MODEL

The Class A Model which will be used in the transport and diffusion of released effluents is a puff-advection model which incorporates a horizontal wind field that can vary in time and space. It is assumed in the puff-type model that the spread within a puff along the direction of flow is equal to the spread in the lateral direction (i.e., horizontal Guassian symmetry). In the model, concentration averages are provided by total integrated concentrations which are calculated by summing concentrations of individual elements for the grid points over which the puffs pass. Features to be incorporated into the model include the use of predicted and edited primary or backup data, plume rise, terrain effects, building wake effects, ground or elevated release mode, and special features used to describe site-specific meteorology.

INSTRUMENTATION

Table 1 shows the type and number of parameters to be measured at Oconee Nuclear Station after upgrading of the system. The meteorological conditions present at Oconee Nuclear Station warrant a modified meteorological data collection network due to the unique terrain. Under typical meteorological conditions, meteorological characteristics are described by high-level wind speed and wind direction, stability as described by delta temperature, ambient air and dew point temperatures, and precipitation. Due to the forested terrain surrounding the plant, low-level wind speed and wind direction are appropriately extropolated from the high-level measurements. To meet the intent of redundancy described in Regulatory Guide 1.23, Proposed Revision 1, backup wind direction and wind speed measurements will be taken on a 46 meter backup tower. Backup stability will be measured by delta temperature measured from the backup tower.

During certain identifiable meteorological conditions, upslope flow will occur in the river valley below the dam while downslope flow will simultaneously occur above the dam and at upper levels. During these conditions, the flow field is parameterized by instruments described for typical conditions discussed previously plus an additional wind system located in the valley. This parameterization is based on a test series of balloon and smoke releases at Oconee Nuclear Station. This additional wind system will contain primary wind direction and wind speed sensors mounted on the existing 10 meter tower and a backup wind system on a new 10 meter backup tower.

DATA HANDLING

To meet the requirements of a backup dose calculation system as a whole, along with the primary digital system, sensor signals will be used in both an analog chart recording system and a digital recording/storage system. The meteorological variables will be sampled at 60 second intervals for the digital system except for variables used to calculate sigma theta, these will be sampled every 5 seconds.

Prior to meteorological data use or storage, the data will go through a series of edit checks which include range comparisons and data inter-comparisons to determine validity of data and whether backup data should be used.

Upon validation, the data will be placed on 12-hour recall for emergency effluent dispersion modeling and dose calculation. Validated data will also be stored on a magnetic medium as 1-hour averages for future use and to meet the 90% joint annual data recovery requirements.

DOSE ASSESSMENT METHODOLOGY

The dose assessment methodology for Oconee consists of two separate calculations. The first calcuation is based on the amount of radioactivity that has been or is actually being released through the unit vent; the second calculation is based on a potential release using actual source term and design basis assumptions for containment leakage.

To determine the dose from an actual release through the unit vent, both the concentration of isotopes in the unit vent and the unit vent flow rate must be known. Unit vent grab sample analyses are used to determine the isotopic concentrations of the release. When this information is not available, unit vent radiation monitors and their energy dependent sensitivities are used. The flow rate is obtained from the unit vent flow rate monitor. The combination of flow rate and isotopic concentrations is used to determine the actual release rate through the unit vent.

If substantial radioactivity is present in the containment, another calculation is performed. This calculation provides the dose potential for a release based on the radioactivity present in the containment. A containment atmosphere sample is used to determine the isotopic concentrations. If this information is unavailable, the containment building area radiation monitor is used to determine the severity of the accident by comparison with design basis source terms. The containment design leak rate is used unless factors, such as containment pressure, indicate that another value is more realistic. The isotopic concentrations combined with a containment leak rate provides a potential release rate of activity.

This dose model calculates both cumulative and projected doses. Downwind concentrations are determined by applying the relative atmospheric dispersion factor calculated by the meteorological model. Projected concentrations are determined in one-hour increments up to a period of four hours. A forty-year thyroid dose commitment and a whole body dose from exposure to a semi-infinite cloud are determined. The dose conversion factors are derived from Regulatory Guide 1.109.

This dose assessment methodology provides the capability to calculate the dose from actual or potential releases following an accident. Near real time radiation monitor readings and meteorological data are combined automatically to provide timely, realistic dose calculations. However, the flexibility to manually input sample data is also provided. This model meets the guidance of NUREG-0654, Revision 1, Appendix 2 to provide the capability "to assess and monitor actual or potential off-site consequences of a radiological emergency condition".

UPGRADED PHYSICAL SYSTEM DESCRIPTION

The conceptual layout for the meteorological system is presented in Figure 1. The sensors for the primary measurement system are mounted on existing towers. Sensors for the backup system will be mounted on a new 46 meter tower and a new 10 meter tower, located out of the shadows of the primary towers. The signals from the primary system and the backup system will be cabled to the plant separately to prevent a common mode failure. The signals will enter each Unit Operator Aid Computer (OAC) and the analog system. The meteorological data will be stored on the OAC and can be transferred routinely or during an emergency situation to the Distributed Data Processor (DDP) via a manual transfer of a diskette from a OAC disk drive to a remote terminal disk drive. The Class A Model calculations will be made on the DDP system. Routine meteorological data will be stored through the Distributed Data Processor System. In the event of an emergency, it will have the capability to recall 12-hour meteorological data, radiation monitor data, perform Class A Model calcualtions, and provide the inputs and calculated outputs to all appropriate site emergency response areas.

DETAILED DESCRIPTION OF SUBSYSTEMS

Sensors to Operator Aid Computer

The parameters to be measured by the primary and backup systems are listed in Table 1. These meteorological sensors will meet the accuracies suggested in Regulatory Guide 1.23, Proposed Revision 1. Signals from the primary system to the OAC (digital system) and analog charts will be cabled separately to the plant. Housing for signal conditioners and related instrumentation will be located near the primary towers. The signals from the backup system will be cabled separately to the plant OACs and analog charts. Housing for the backup signal conditioners and related instrumentation will be located near the backup towers. Redundant power supplies will be provided to assure continuous operation of the meteorological system. Sensors, conditioning equipment, and instrumentation will have lightning protection and will be heated where necessary to minimize effects of adverse environmental conditions. Signal cables will be shielded to minimize electrical interference. The backup parameter sensors and circuits will be continuously powered such that there will be no need for switchover in the event of a primary failure.

Operator Aid Computer (OAC) to Distributed Data Processor (DDP)

The process computer OAC system which is utilized for data collection consists of GE/Honeywell 4000 series equipment. Inputs from the sensors (Figure 1) will be wired to the OAC and will be scanned according to guidance provided by Regulatory Guide 1.23, Proposed Revision 1. Predefined meteorological inputs will be averaged for 15 minutes and the average will be stored for later use. The OAC has bulk storage capability for 48 hours worth of 15 minute averages.

Data retrieval from the OAC will be initiated at the performance typer in the computer room. Each unit OAC is a backup for the other, capable of supplying the same required meteorological readings. The data will either be printed in a tabular format or stored on a floppy disk (diskette) which is designed for data exchange applications. Upon output completion, the data will be removed from the OAC and additional data can be taken.

By means of a separate floppy disk reader attached to a data communications terminal in proximity to the OAC, the data will be transmitted to an off-line computer facility either on-site, or remote to the station. Each set of data readings will be stored in an on-line data base for recall on demand. The data will be subjected to validation procedures through both software and manual methods. Immediately upon completion of the validation procedures, the data will be available to designated agencies through dial-in terminal facilities. The data will further be available for both periodic archiving and for immediate processing by the puff-advection model. Output from this model may also be made available to designated agencies in a read only mode.

The primary off-line data processing facility will be the station distributed data processor (DDP). First line backup to the station facility (See Figure 2) will be a similar DDP facility in the General Office in Charlotte, North Carolina. Additional backup facilities are available at each of the

other nuclear stations. The capability will also be provided to process this data in the Charlotte Corporate Computer Center.

QUALITY ASSURANCE

In response to point 7, Quality Assurance of Regulatory Guide 1.23, Proposed Revision 1, we plan to purchase new equipment from suppliers who have provided high quality, reliable equipment in the past. Documentation concerning fabrication and assembly of the components will be considered on a case-by-case basis as we normally do for non-10CFR50 Appendix B items.

Tower modifications, cabling and computer hardware will be designed, procured and installed as a non-safety related system. We will provide surveillance during construction as we would any other non-safety system.

Maintenance, calibration and repair procedures, and logs will be available at the site for inspection. The procedures and logs will be designated as site controlled documents. Inventories and meteorological system spare parts, sensors and components will be incorporated into existing company procedures.

METEOROLOGICAL TOWER

As indicated above, the system design is based on mounting wind sensors and temperature sensors measuring delta temperature for the backup capability on a new 46 meter tower and a new 10 meter tower. The 46 meter tower is a modified transmission tower with the backup wind sensors mounted at the top in such a manner that ther will be no interference of airflow due to the tower structure. The 10 meter tower will be either a modified transmission tower or a platform tower. The backup wind sensors will be mounted in a fashion similar to that of the 46 meter tower. The backup towers are sited to provide measurements comparable to that obtained from the primary towers. The backup towers will be located outside the shadow of the primary towers. All towers are proviedd with lightning protection, icing protection and backup power. The transmission towers are designed to withstand high winds and allowable tower stresses will be in accordance with the "Electrical Transmission Line and Tower Design" guide of the Task Committee on tower design of the ASCE.

Figure 1. Oconee Nuclear Station Generalized Met System Sensor to Computer Link

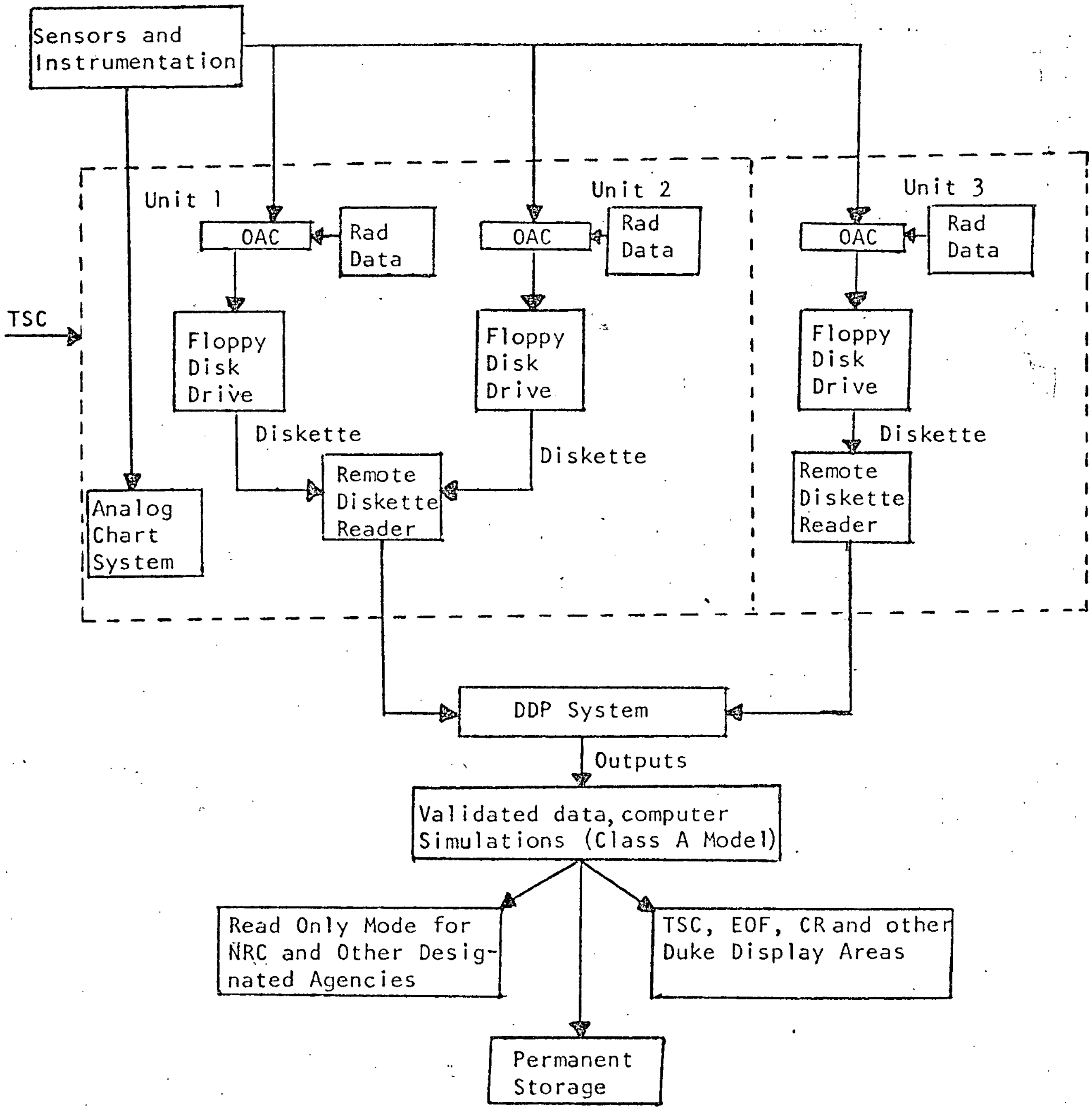
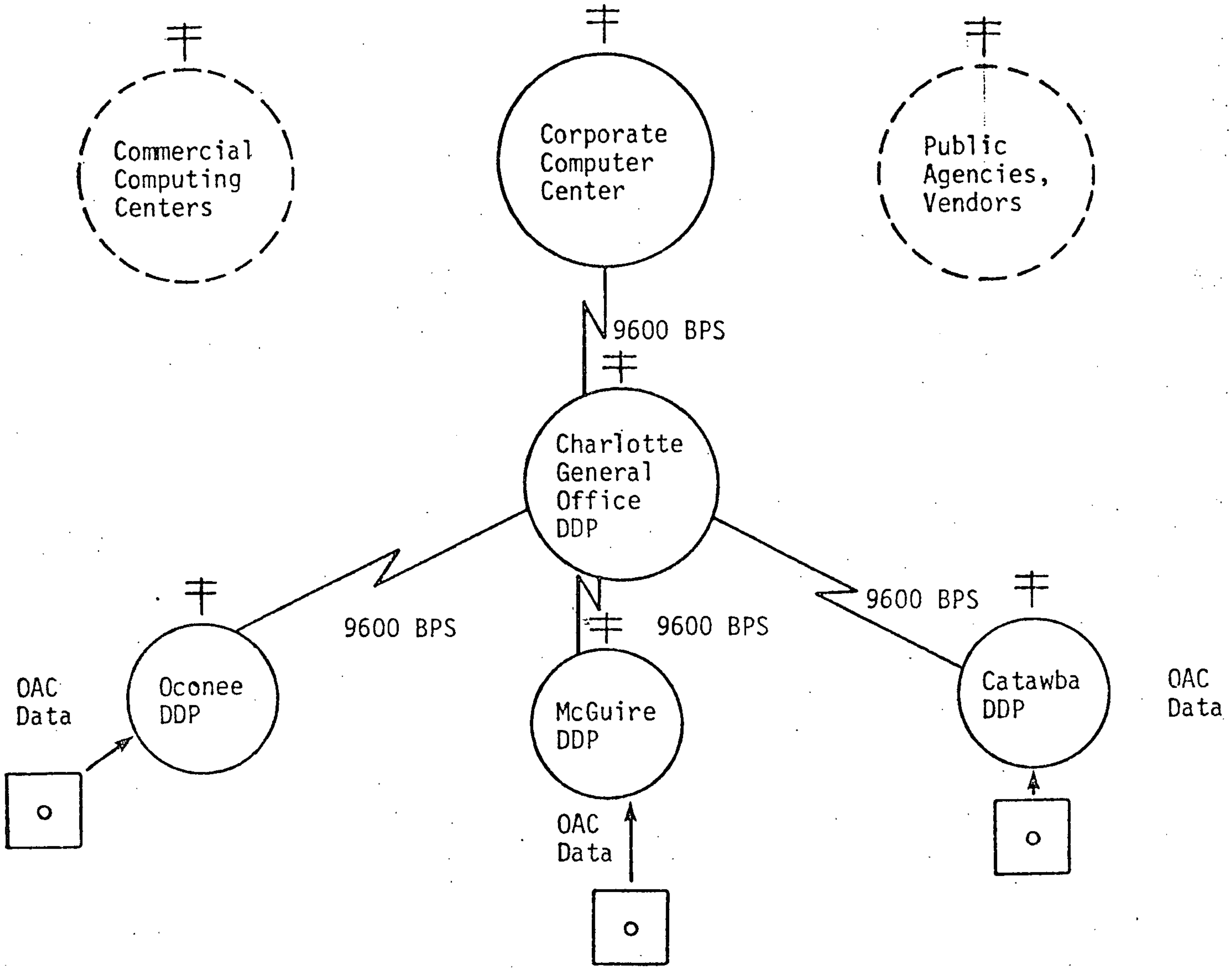


FIGURE 2

NUCLEAR STATION OFFLINE COMPUTER SUPPORT



Notes

1) ⌇ denotes dedicated communications
2) ≢ denotes 4800 BPS dial-up communications capability
3) Dedicated 9600 BPS communications to Corporate Computer Center from each station DDP schedule for 1982.
4) 9600 BPS network of DDP's scheduled for cross-connection (ie., as opposed to current "star" network) in 1983.

TABLE 1

Oconee Nuclear Station

Meteorological Parameters of the Upgraded System

PRIMARY SYSTEM

Ridge System	Existing 46 meter tower	High level wind speed and direction Delta temperature (stability) Dry bulb temperature Dew point temperature Precipiation
Valley System	Existing 10 meter tower	Low level wind speed and direction

BACKUP SYSTEM

Ridge System	New 46 meter tower	High level wind speed and direction Delta temperature (stability)
Valley System	New 10 meter tower	Low level wind speed and direction