SOUTH CAROLINA ELECTRIC & GAS COMPANY
POST OFFICE BOX 764
COLUMBIA, SOUTH CAROLINA 29218

T. C. NICHOLS, JR.
VICE PRESIDENT AND GROUP EXECUTIVE
NUCLEAR OPERATIONS

December 23, 1980

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

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Upgraded Meteorological System

Dear Mr. Denton:

As requested by the NRC, South Carolina Electric and Gas Company, acting for itself and agent for South Carolina Public Service Authority, provides additional meteorological information regarding NUREG 0654, revision 1. This information, which is given as a revision to FSAR section 2.3, will be included in the next amendment to the FSAR.

If you have any questions, please let us know.

Very truly yours,

T C Nichols, Jr

T. C. Nichols, Jr.

RBC:TCN:glb
Enclosure
cc: V. C. Summer w/o enclosures
G. H. Fischer w/o enclosures
T. C. Nichols, Jr. w/o enclosures
E. H. Crews, Jr.
O. W. Dixon, Jr.
D. A. Nauman
O. S. Bradham
W. A. Williams, Jr.
A. A. Smith
A. R. Koon
R. B. Clary
J. B. Knotts, Jr.
J. L. Skolds
B. A. Bursey
NPCF/Whitaker
File

The secondary measurements are needed only during periods of outage of the primary system. It should be noted that the entire wind measurement (wind speed and direction both) is replaced with secondary sensor data when either the primary wind speed or wind direction is invalid. Since the 1975 data period had almost 100 percent recovery of the primary variables, no substitution of the secondary variables was used in the data analyses.

The final step in the data reduction program is the listing, in sequential order, of the concurrent, hourly averaged values of the meteorological variables observed at the site. A sequential listing of the hourly data for a full year constitutes the annual meteorological record of the site. The annual record provides the input data for all types of meteorological analyses needed to define the site atmospheric dispersive qualities.

2.3.3.2 Operational Program

The operational meteorological monitoring program for the Virgil C. Summer Nuclear Station will basically be a continuation of selected parameters of the preoperational program. The purposes of the operational program are to provide:

1. Meteorological data useful in the estimation of short term diffusion characteristics to plant personnel on a timely basis.

2. A data base of certain meteorological information for the assessment of plant operational impacts.

The equipment currently utilized in the preoperational program will be used in the operational program. However, the specific method of digital data recording (pulse tapes) ~~presently used may~~ be replaced. Possible
in use will

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2 alternatives to the present digital system include analog to digital conversion, microprocessor averaging and/or direct output of time averaged values to an in plant data reduction system for ease of correlation of information which may be required on a continuing operational basis. Regardless of the digital recording system utilized, the goals of accuracy and data recovery per Regulatory Guide 1.23 (February 17, 1972) will be maintained. Meteorological Site 2 (pole) equipment will be maintained and operated for a one year period after commercial station operation commences to provide comparative (vs. Site 1 tower) data from which environmental heat dissipation system effects may be estimated. During this period, the Site 2 system will provide backup of primary meteorological measurements by dispatching, as needed, a technician to Site 2. The near site measurements may be transmitted via radio to accident assessment personnel in the Technical Support Center, Emergency Operations Facility and/or the Control Room.

3 Parameters to be measured in the meteorological heat dissipation study are to include: A) Site 1: wind, speed, wind direction, differential and ambient temperature and dewpoint B) Site 2: wind speed, wind direction, ambient temperature and dewpoint.

After the data base for assessing these effects has been acquired, the pole (Site 2) site will be deactivated along with those measurement systems at the tower site (Site 1) which are not utilized in the estimation of diffusion characteristics. The equipment will then be relocated on site and similarly interfaced to the DAM System in order to provide primary system backup.

1 Parameters to be measured on a continuing basis for the operational estimation of diffusion characteristics on site include differential temperature, wind speed and wind direction. ~~Lower wind speed and direction and differential (10-61M) temperature strip chart recorders will be deleted from the tower enclosure.~~ Primary meteorological system lower wind speed and wind direction and differential (10-61M) temperature observations ~~will be~~ are redundantly recorded on

13 strip charts on the main control board in the control room.

INSERT A

Table 2.3-85F lists the digital system accuracies thus calculated for 5 and 15 minute averaging periods along with accuracy values presented in Regulatory Guide 1.23, Revision 1.

Meteorological Site 2 (pole) equipment will be maintained and operated for at least a one year period after commercial station operation commences to provide comparative (vs. Site 1 tower) data from which environmental heat dissipation system effects may be estimated. During this period, the Site 2 system will provide backup of primary meteorological measurements by dispatching, as needed, a technician to Site 2. The near site measurements may be transmitted via radio to accident assessment personnel in the Technical Support Center, Emergency Operating Facility, Control Room, etc.

Parameters to be measured in the meteorological heat dissipation study are to include: A) Site 1: wind, speed, wind direction, differential and ambient temperature and dewpoint B) Site 2: wind speed, wind direction, ambient temperature and dewpoint. After the data base for assessing these effects has been acquired, the pole (Site 2) site will be deactivated.

Parameters to be measured on a continuing basis for the operational estimation of diffusion characteristics on site include differential temperature, wind speed, wind direction, and precipitation. Primary meteorological system wind speed and wind direction and differential (10-61M) temperature observations are redundantly recorded on strip charts on the main control board in the control room.

The major hardware of the upgraded operational digital recording system consists of a rack mounted Monitor Labs System 9300 Data Logger, necessary signal conversion and conditioning, and a Techtran Model 950 Micro Disc (i.e., floppy disk) located in the Meteorological (Site 1) Shed which will interconnect to the Dose Assessment and Monitoring System (DAMS) located in the Control Building's Technical Support Center. Power for the measurement and digital recording system is provided by a redundant power source. The ML 9300 is configured for 20 analog input channels and is expandable to a maximum of 1040 input channels. The ML 9300 is configured with the following hardware features:

- 20 analog input channels alphanumeric printer.
- 6-line/sec, 16 column alphanumeric printer.
- Clock, DDD:HH:MM:SS, with battery take over in the event of power outage.
- High resolution digitizer (0.01%, 0.1°F or 0.1°C), 30,000 counts per voltage range.
- 4 voltage ranges: $\pm$ 3.000mV, $\pm$ 300.0mV, $\pm$ 3.0000V, $\pm$ 12.000V with auto ranging.
- Scaling: Digital spans and zero supression (Y=M+B) programmable by channel. This feature scales inputs to engineering units.
- Digital Averaging: Averaging interval is selectable; per Channel enabling of averaging; invalid (ovverrange) data are excluded from average.
- Program save memory: Permits storage of channel parameters with automatic restart on power up.
- Data output interface to Techtran Model 950 Micro-Disc.
- Self-Test: Self Diagnostics are executed through internal programs of the 9300. These programs allow checkout of the digitizer, 9300 CPU, EAROM, dynamic RAM, clock, keyboard, display and printer.

The ML 9300 is interfaced to the 9 parameters presently being monitored by the Westinghouse Environmental Monitoring System at the primary Meteorological Site; namely, two levels of wind speed and direction (10.5 and 61.5 meters), dewpoint (10 meter), ambient temperature (10 meter), two differential temperatures (10-61 meters and 10-40 meters) and precipitation. Since wind direction parameters require two input channels each, a total of 11 ML 9300 input channels are utilized. This leaves 9 spare input channels for later expansion. Climatronics translator cards are provided to convert precipitation instrument pulses and delta temperature instrument milliamps to the 0-5 volt range. This allows compatibility between all instrumentation signals and the ML 9300.

The ML 9300 is interfaced to a Techtran Model 950 Micro-Disc having 200,000 characters of storage capacity. This allows over 7 days of data storage (15 minute intervals) for the present configuration of 9 parameters. The Techtran 950 utilizes simple remote terminal protocol, i.e., simple ASCII character commands actuate the unit. Surge protection against power surges for both the ML 9300 and the Techtran Model 950 Micro-Disc is provided.

The DAMS minicomputer system located in the control building's Technical Support Center will be utilized to access data from the Techtran 950 Micro-Disc located about 1500 feet away at the meteorological shed via an RS232C serial interface. The DAMS minicomputer will be programmed to communicate with the Techtran 950 Micro-Disc either on demand or according to a pre-defined schedule (say, each 24 hours) to retrieve data for the period and store this data on a disk file for later reporting, averaging and utilization in estimation of doses due to both planned and unplanned radioactive releases. The DAM System is interfaced to the Westinghouse Computer in the TSC thus providing the capability for remote interrogation by the licensee and/or other emergency response organizations.

The meteorological inputs are digitized, converted to engineering units and averages into 15 (or 5) minute averages by the ML 9300. These averages are then output to the Techtran Model 950 Micro-Disc for storage. Each output record to the Model 950 is prefixed by the clock time (in days, hours, minutes, seconds) and system status (which will indicate whether a power failure occurred during the averaging period) followed by the parameter data. Each parameter's data include number, sign and five digits for the data plus a decimal point, three alphanumeric characters for the engineering units and 3 digits indicating the number of samples included in the average. The average will be considered valid if at least 10 minutes (i.e., 60 scans) of data were collected during a 15 minute averaging period. Normally, the Monitor Labs 9300 data logger calculates 15 minute averages using 89 ten second samples for all parameters with the exception of precipitation which is sampled once each 15 minutes. (Note that there are 89 instead of 90 ten second samples collected each 15 minutes because one ten second sample is not collected due to the time required for the data logger to output 15 minute data to the Techtran 950 Micro-Disc.) The system may also be programmed for a 5 minute averaging period with a corresponding reduction in the total number of samples (scans) taken.

The digital system accuracy according to the Proposed Revision 1 to Regulatory Guide 1.23 (Onsite Meteorological Programs) and the Draft ANS-2.5 (Standard for Obtaining Meteorological Information at Nuclear Power Sites, dated May 23, 1979) is determined as follows. "For individual samples all components from the sensors to the recording systems which contribute to measurement error are collectively defined by the Root Sum of the Squares

(RSS) method as the system accuracy. The RSS is calculated by squaring each error, summing the squared errors and taking the square root of the sum. For time averaged values, those parts of the error budget which are truly random may be decreased from their instantaneous value by dividing by the square root of the number of samples used to define the average value. Then the RSS calculation can be made."

The digital system accuracy is composed of errors contributed from the sensor, processor card and Monitor Labs System 9300 data logger. Two types of errors will be considered.

- Type 1: Absolute error-random. Errors in this category are sensor and processor errors which include other "noise" sources. Sensor and processor errors are generally assumed not to be independent, in the absence of direct evidence of such independence.
- Type 2: Absolute error-Systematic. Errors in this category are of the "calibration" type and are expected to be steady over each averaging period (i.e., 15 minutes). The digital data logger analog to digital converter errors are treated as Type 2.

Assume that Type 1 errors consist of (a) sensor errors and (b) processor (i.e., translator card) errors and that these are not independent. Type 2 errors consist of (c) the analog to digital conversion performed by the data logger. Then the digital system accuracy as defined by the RSS calculation is:

Digital System Accuracy (parameter, 15 minute average)

$= \sqrt{(a + b)^2/N + c^2}$; for all parameters except precipitation
N = number of samples = 89

For the precipitation parameter:

Digital System Accuracy (Precipitation, 15 minute sample)

$= \sqrt{(a + b)^2 + c^2}$

Type 1 errors are determined from instrument manufacturers' specifications.

These errors are listed in Section 2.3.3.1.1 and Table 2.3-85. In addition, Climatronics Corporation translator cards with a maximum error of 0.5% are supplied to interface the differential temperature and precipitation parameters to the data logger.

The Monitor Labs System 9300 (i.e., the data logger) has a Type 2 error equal to $\pm$ 0.02% of Reading, $\pm$ 0.01% of Range, $\pm$ 1 Count. For purposes of this discussion (and in order to present the worst case) the "Reading" will be the parameter full scale value (i.e., 5 volts); the "Range" will be the maximum $\pm$ 12.000 Volt range permitted; the "$\pm$ 1 Count" will be equal to the digitizer resulution for this range (i.e., 12V : 1200 Counts = 0.001V). The error due to the digital data logger analog to digital converter is computed by determining the square root of the sum of the squares (i.e., the RSS) of the following error values:

$\pm$ 0.02% Reading + $\pm$ 0.0002 *5V = $\pm$ 0.001V

$\pm$ 0.01% Range = $\pm$ 0.001 *12 = $\pm$ 0.0012V

$\pm$ Count = 0.001V

The data logger error is, therefore, equal to 0.00185 Volts at the full scale reading of 5 Volts. This may also be expressed as 0.0371% of full scale (i.e., either 5 Volts or corresponding engineering units). Note that the data logger digitizing error is conservative since all three parts of the error were maximized and considered systematic and not random.

To illustrate the method of calculating the data logger error consider the wind speed parameter. The parameter range is 0 to 100 mph corresponding to 0 to 5 Volts. The error due to the data logger is:

0.000371 * 100 mph = 0.0371 mph

TABLE 2.3-85F
Meteorological Monitoring System Accuracies

	Parameter	Reg. Guide 1.23 System Accuracy Design, Basis	Digital Systems Accuracy (for 15 minute period)	Digital System Accuracy (for 5 minute perio
A.	Wind Speed	± .5 mph	± 0.122 mph	± .20 8 mph
B.	Wind Direction	± 5 degrees	± 0.669 degrees	± 1.136 degree
C.	Dew Point	± 1.5°C	± 0.0475°C	± 0.0639°C
D.	Ambient Temperature	± .5°C	± 0.0475°C	± 0.0639°C
E.	Differential Temperature	± .15°F	± 0.0230°F	± .038°F
F.	Total Precipitation	± 10	± 0.0055 inch	± .0055 inch