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January 8, 1990

Mr. Vic Austin
Virginia Department of Air Pollution Control
Division of Computer Services, Modeling and
Air Quality Analysis
Ninth Street Office Building
Richmond, VA 23219

Subject: **Old Dominion Electric Cooperative**
**Power Plant Project**
**Transmittal of Equivalence Demonstration Plan**

Dear Mr. Austin:

Based on our recent phone conversation, it is my understanding that our draft Equivalence Demonstration Plan for the Integrated Gaussian Model (IGM) - that was faxed to you shortly after our November 21, 1989 meeting - now has your approval. I further understand that Mr. Al Cimorelli of EPA Region III has seen the plan and has raised no objections to it. Enclosed is a finalized version of the plan; it is our intention to follow this plan for the equivalence demonstration.

If you have any questions about the plan, please give me a call at (215) 422-3769.

Sincerely,

George G. McComb, Jr.
Chief, Air Quality & Meteorology

Enclosure

cc: Al Cimorelli, EPA Region III

UNITED ENGINEERS & CONSTRUCTORS

INTEGRATED GAUSSIAN MODEL (IGM) EQUIVALENCE DEMONSTRATION PLAN

The Integrated Gaussian Model (IGM) was developed by UE&C to implement EPA's intermediate terrain policy without post-processing. A key issue in the regulatory application of IGM is its equivalence to ISC and COMPLEX-I for the source, terrain, and meteorological settings in the Clover, VA modeling area. This plan is intended to thoroughly document this equivalence, and to demonstrate further that the intermediate terrain policy is implemented correctly by IGM.

The equivalence demonstration will consist of three parts. The first part is intended to illustrate the basic, underlying "equivalence" of IGM through the use of synthesized meteorological data covering a wide variety of conditions. Part two is intended to establish equivalence in a regulatory mode - exercising the model on a full year of met data with source and receptor information actually used in the Clover analysis. The third part is intended to demonstrate IGM's implementation of the intermediate terrain policy. These three parts are described further below.

Part 1: During the development of IGM, care was taken to ensure that the computational algorithms faithfully reproduced the concentration predictions of both ISC and COMPLEX-I. This was accomplished by running IGM and the regulatory models on large sets of sources,

receptors and meteorological conditions and comparing the results directly. Where concentration differences were identified, intermediate values produced by each model-sigma-y, sigma-z, plume height, dilution wind speed, etc.-were compared directly to determine the cause of the difference and IGM was modified to eliminate the difference. In this section of the equivalency demonstration, the set of sources, receptors, and meteorological conditions (totalling several hundred thousand combinations) will be described and the results of the comparison will be summarized. In addition, input files for ISC, COMPLEX-I and IGM will be provided on floppy disk so that the comparisons can be verified.

Part 2: Carrying the equivalence demonstration further to a regulatory mode is important both to ensure that source/receptor/meteorological combinations present in the actual data base were not missed in Part 1, and to ensure that IGM's averaging, sorting and output routines are functioning properly. This demonstration will consist of running IGM in the "ISC" mode and the "COMPLEX-I" mode on a subset of receptors from the approximately 4,000 that will be analyzed for the Clover submittal.

Approximately 100 receptors will be selected, and the selection will be based on ensuring that the maximum impact of each major source group is represented. All sources will be run on this set of receptors, with groups consisting of "all sources" and "Clover sources". Separate receptor sets will be used for $SO_2$ (point

sources) and PM (including volume and area sources). ISC and COMPLEX-I will also be run on the same sources and receptors. Comparisons will be made, and percent difference calculated, for each receptor for the following averaging times: annual, 24-hour (high and second high), and 3-hour (high and second high). In addition, the "Top 50" values for 24-hour and 3-hour averages will be compared and percent differences calculated. The comparison results will be summarized and tabulated. Equivalence will be demonstrated if no "percent difference" is greater than 2%.

Input files for IGM, ISC, and COMPLEX-I will be provided on floppy disks, along with output files (printed copies of output files will be supplied on request). The files can be used to run further comparisons on additional receptors, as necessary, as well as to verify the original comparisons.

Part 3: The correct implementation of the intermediate terrain policy will be demonstrated in two ways. First, a flow-chart of IGM's logic will be presented to illustrate how the comparisons are made. Portions of the code that implement this flow-chart will be isolated, printed out, and annotated to demonstrate the theoretical basis for the comparison and selection. Second, two sources and two days of meteorological data will be selected from the Clover analysis. At least two receptors (one less than stack height, one or more above stack height to represent intermediate terrain and "COMPLEX-I only" terrain) will be selected for each source/met. data pair. IGM will be run in three modes: ISC, COMPLEX-I, and intermediate terrain.

Concentrations for each source/hour/receptor/mode will be printed out and selection of the right concentration will be made manually. These manually selected concentrations will then be compared to the concentrations selected by IGM. The IGM input files for these model runs will also be provided on floppy disk for verification.