

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
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SUBJECT: Use of CTSCREEN/ISCST2 For Multiple Source
Complex Terrain Applications

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TO: Joseph A. Tikvart, Leader
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During the 1994 Regional/State Modeler's Workshop the Complex/Intermediate Terrain Workgroup Group (Issue Group #1) addressed the problems associated with combining the use of ISCST2 and CTSCREEN in a multi-source analysis. This issue (Issue 1.2), along with the Group's recommendation, is described in the Workgroup report which was sent from Annamaria Colecchia to you on 7/15/94. For terrain between the tallest and shortest stacks, the group recommended

"... that each model be run separately, with the complete inventory, on a common receptor grid covering the area between the heights of the shortest and tallest stacks. Then, on a receptor by receptor basis, the higher of the two predictions is selected. (Since CTSCREEN is applicable down to stack top, the intermediate terrain policy is not an issue)."

That is, the total concentration at each receptor results from modeling the full inventory with either ISCST2, CTSCREEN or both. Unlike the "intermediate terrain policy", the total concentration at a single receptor **can not** result from a mix of the two models. Concentrations from receptors located above the height of the tallest stack will always be estimated from CTSCREEN; while at locations below the height of the shortest stack ISCST2 is used exclusively. The total concentration at a receptor between these heights is based either on CTSCREEN or ISCST2 depending on which model produced the highest **total** concentration. Furthermore, the Workgroup recommended that this technique be accepted on a case-by-case basis through the model clearinghouse process. In your 8/25/94 memo to the workshop participants you state, that acceptance of this technique will "Await a request to the Model Clearinghouse concerning a specific application".

At the present time, Region III is involved with two multi-source complex terrain applications in which we propose the combined use of CTSCREEN and ISCST2, as described in

the Group recommendation. Therefore, as agreed upon, we request that the Model Clearinghouse consider the acceptance of the Group's recommendation for Issue 1.2 as it relates to these applications. The applications involved are: (1) The Kammer Power Station SO₂ **single source** SIP revision, and (2) The **area-wide** SO₂ non-attainment replanning effort in WV's New Manchester-Grant Magisterial District. A short description of each follows.

KAMMER:

Kammer is a 35 year old, 630 MW, coal-fired power plant located in Marshall County, West Virginia. The plant is owned by Ohio Power Company, a subsidiary of American Electric Power (AEP). Terrain in this portion of the upper Ohio river valley is rugged and rises between 400 and 600 feet above the river.

Two other major power plants are located in close proximity to the Kammer station. Ohio Power's Mitchell, and Ohio Edison's Burger power plants are 1.5 miles south and 4 miles north northwest of Kammer, respectively. The stacks from each of the three plants rise well above the surrounding terrain; thus, allowing for simple terrain model application. Pittsburgh NWS meteorology has been used, historically, to model these plants. In addition to the large power stations, a few-low level sources are present in the area. Most notable is the VENCO facility (formally: Mountaineer Carbon, MOCAR & BP), a carbon black producer located within 1km of Kammer. Maximum impacts from VENCO occur from impaction on the terrain directly adjacent to Kammer.

In 1976 AEP replaced the two existing 600' stacks at Kammer with a single 900' stack. A fluid modeling study, in response to Section 123 of the 1977 Clean Air Act Amendments, was performed by Kammer to justify the increased stack height. The fluid modeling was informally approved by EPA but then invalidated by the 1985 stack height regulations. These regulations require a showing of violation at either the presumptive NSPS limit or a demonstrated Best Available Retrofit technology limit (BART). Although the current federally approved state SIP limits Kammer to 2.7 lbs/MMBTU, West Virginia revised Kammer's limit to 6.8 lbs/MMBTU in 1978. EPA approval of this SIP revision was delayed pending the outcome of the fluid modeling study.

The state has now reopened this case with plans to submit a single-source SIP revision for Kammer. Considering the mix of complex and simple terrain sources, and the lack of interest in collecting on-site meteorological data, we propose to apply the Workgroup's CTSCREEN/ISCST2 recommendation to this application.

The procedure would be as follows for the Kammer SIP revision:

1. FOR ALL RECEPTORS BELOW THE HEIGHT OF VENCO's SHORTEST STACK:
The ISCST2 model will be used exclusively with the appropriate NWS meteorological data.
2. FOR ALL RECEPTORS ABOVE THE HEIGHT OF THE VENCO's SHORTEST STACK:
 - a. The full emissions inventory will be run twice.
 - i. ISCST2 will be run with NWS data, as in 1. above
 - ii. CTSCREEN will be run with its assumed worst case meteorology.
 - b. Design concentrations will use the higher of either the CTSCREEN or ISCST2 results, applied on a receptor-by-receptor basis.

NEW MANCHESTER-GRANT MAGISTERIAL DISTRICT:

In 1978, the New Manchester-Grant Magisterial District in Hancock County, WV was designated as non-attainment for SO₂. This area has remained non-attainment since that time. In the remaining area of Hancock County (Weirton area), more recent monitored violations of the SO₂ standard have been measured. Based on these readings, EPA formally redesignated the Weirton area to non-attainment on 12/21/93. All of Hancock is now designated non-attainment. As a result, the state of WV is presently involved in the development of two area-wide SIP revisions that will address all of Hancock County.

The Hancock County area of WV contains a high density of industrial facilities located within the upper Ohio River Valley. The area is characterized by large power plants with stacks which rise well above the local terrain and short stacked industrial sources (predominantly steel mills) whose maximum impacts result from terrain impaction. In order to model this diverse area a protocol which addresses the area's unique circumstances has been developed. A copy of this protocol is attached for background information.

Located in the northern portion of the New Manchester-Grant Magisterial District is the Quaker State refinery. This facility contains a number of boilers and process heaters with varying stack heights, and plumes which do not escape the surrounding valley. The Hancock County protocol requires that the Quaker State sources be modeled with the Integrated Gaussian Model (IGM) and representative on-site data. However, since the state has been unable to locate on-site data, and statutory time-frames preclude its collection, we propose to apply the Workgroup's CTSCREEN/ISCST2 recommendation to this application.

The procedure would be as follows for the New Manchester-Grant Magisterial District SIP revision:

1. FOR ALL AREAS OF THE MODELING DOMAIN EXCEPT THE QUAKER STATE AREA:

The protocol will be applied as written

2. FOR THE IMMEDIATE QUAKER STATE AREA:

a. FOR ALL RECEPTORS BELOW THE HEIGHT OF THE SHORTEST QUAKER STATE STACK:

The protocol will be applied as written for all sources except Quaker State. Quaker State's contribution will be based on the exclusive use of ISCST2 with appropriate NWS meteorological data.

b. FOR ALL RECEPTORS ABOVE THE HEIGHT OF THE TALLEST QUAKER STATE STACK:

The protocol will be applied as written for all sources other than Quaker State.

c. FOR ALL RECEPTORS BETWEEN THE HEIGHT OF THE SHORTEST AND THE TALLEST QUAKER STATE STACK:

i. Two runs will be performed:

(1) Apply the protocol as written, with the exception that ISCST2 will be run for all Quaker State sources.

(2) Apply the protocol as written for all sources other than Quaker State. Then, to this concentration Quaker State's contribution, as predicted by CTSCREEN, will be added receptor-by-receptor.

ii. The field of design concentrations will be constructed by choosing the higher of the two model runs applied on a receptor-by-receptor basis, not hour-by-hour.

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