UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

DATE: November 6, 1991

SUBJECT: Proposal to Use a Non-Guideline Model to Satisfy Intermediate Terrain Policy in New Source Permitting (Pine State Power; Jay, Maine)

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This memo seeks your concurrence with Region I plans to accept Pine State Power's (PSP's) implementation of the intermediate terrain policy (ITP) in a PSD permit application. Briefly, we propose to accept an equivalency demonstration prior to the formal permitting process, and determine that PSP's use of a non-guideline model will satisfy EPA's ITP. Section E. below details our proposals. The next several sections provide background on PSP's proposal, state the requirements we mean to address, and explain why section E. recommends what it does.

A. Summary of Pine State Power's Proposal

Pine State Power plans to construct a natural gas fired combined cycle cogeneration plant at the site of International Paper's Androsgoggin Mill in Jay, Maine, and there produce 190 MW for sale to Central Maine Power. The plant could also burn distillate fuel oil and its steam would replace that from the paper mill's residual oil fired boilers. Maine's regulations require PSP to obtain a PSD permit before starting construction on the new plant.

On 2 November 1990 Pine State Power submitted a modeling protocol to Maine DEP's Division of Technical Services. The protocol proposed to model the new plant and nearby sources with a hybrid model, ISCMX. C.T.Main, PSP's consultant, developed the model to emulate ISCST at receptors below stack top, emulate COMPLEX1 at receptors above plume height, and use whichever model gives the higher concentration at receptors in between. PSP plans to meet EPA's ITP with the hybrid model. Appendix E. of the protocol presented an equivalency demonstration. DEP has accepted C.T.Main's equivalency demonstration and on April 2, 1991 asked EPA to concur with and approve PSP's use of ISCMX in writing.

For violations on complex terrain "largely attributable to the COMPLEX1 predictions," PSP proposed to use RTDM alone. DEP informs us that ISCMX does, in fact, predict COMPLEX1-dominated SO2 violations on intermediate terrain. Furthermore, the consultant requested that impacts at these receptors be reevaluated with RTDM alone, without any repeat ITP analysis. Region I has advised DEP that, where a required ITP analysis fails, a more refined ITP analysis must be performed. That is, more refined modeling with a technique inappropriate for receptor elevations less than stack height would not satisfy EPA's ITP. As a result of these developments, Maine DEP and C.T.Main inform us that PSP will include an equivalency demonstration for an ISCST/RTDM hybrid in its PSD permit application. Presumably this second hybrid will yield more realistic impact estimates, but PSP may use ISCMX to model pollutants besides SO2, and therefore DEP has not withdrawn its request to accept ISCMX.

B. The Procedural Question

The current Guideline on Air Quality Models (GAQM) specifies no single model appropriate for implementing EPA's ITP. Therefore 40 CFR 51.166(l)(2) bears on PSP's proposal to use a non-GAQM model. The sited section, like Maine's PSD regulations which satisfy it, allows case-by-case model modifications or substitutions when the GAQM contains no appropriate recommendation. As required, Maine's EPA-approved regulation conditions alternate modeling techniques on:

(1) EPA's written approval of use of the non-GAQM alternative.

(2) Notice by the state and an opportunity for public comment on the use of the non-GAQM technique.

Ordinarily, we prefer sources to propose use of a non-GAQM technique as part of a request for EPA to review, comment, and approve a detailed dispersion modeling protocol. Therefore, if a permit applicant plans to use a non-GAQM 'equivalent' technique, the protocol must say so and include an equivalency demonstration. If EPA were not the permitting authority, the state or local agency involved must request EPA's review of the the protocol on behalf of the applicant. This approach simplifies the equivalency review because it should give enough background specifics to allow reviewers to set priorities, abbreviate unimportant aspects of the review, and drop irrelevant caveats. An advantage for the source is that approval of the non-GAQM model at the protocol stage invokes the 'grandfathering' policy explained in Joseph A. Tikvart's memo "Regional Implementation of Modeling Guidance" (2 January 1985). After EPA approval, the source could prepare a

formal application and submit it to the permitting authority, who could then make a completeness determination, make a preliminary determination, and finally a propose acceptance of the non-GAQM model in the required public notice.

This is not the situation at PSP - perhaps because EPA has issued no general guidance on the non-GAQM approval process in PSD permitting. We understand that the Model Clearinghouse must respond to specific questions of immediate consequence that arise in formal regulatory procedures involving either EPA directly or in an oversight role. This suggests that after the protocol review stage, EPA might only approve the use of substitute or modifed models packaged in a formal permit application. For PSP, however, we believe the circumstances warrant review after the model protocol stage, before a formal permit application, and a response as follows:

(1) Director of Region I's Air, Pesticides, and Toxics Management Division replies in writing for the Administrator.

(2) EPA approves PSP's use of a non-GAQM model, contingent on public notice by the state, a hearing if requested, and a satisfactory response by the state to substantive public comments against use of the non-GAQM model.

(3) EPA's approval will become null and void if for any use submitted in a permit application designated complete after a revision to the GAQM makes the alternate model unnecessary.

With regard to item 1, the Administrator has delegated authority for the preconstruction review of stationary sources (e.g., PSD permitting) to the Regional Administrators. As suggested in the GAQM's Section 3.3, this includes the authority to approve applications of non-GAQM models. On 21 January 1983, the Regional Administrator redelegated this authority to the Director of the Air Management Division. Following precedent set in other regions, Region I's Air Division Director can use this delegation to approve the use of non-GAQM models in state permitting programs.

C. Is PSP's Use of a Non-GAQM Procedure Necessary?

EPA's regulation at 40 CFR 51.166(l)(2) only allows approval of a modified or substitute model when there is no appropriate GAQM model. Although no single GAQM model implements the ITP, PSP does not show that its proposal needs a full ITP analysis. A source must conduct such an evaluation where:

(1) At least one receptor has ground elevation greater than at least one plume's release height but less than its final elevation. In other words, there is an intermediate terrain receptor.

(2) For at least one intermediate terrain receptor, neither the simple (aka plane displacement) nor complex (aka plume impaction) treatments gives the higher impact over all meteorological conditions.

(3) Design concentrations are known not to occur at some other receptor.

In situations that do not meet these conditions, the ITP cannot motivate the use of an alternate dispersion model.

The request from Maine DEP and PSP's submittal do not address this matter directly. From screening mode ISCST plume rises and topographic map copies, however, it's clear there is intermediate terrain around PSP's proposed site (condition 1). In the screening modeling, COMPLEX1 does not always predict the more severe intermediate terrain impact, but since C.T.Main only considered hypothetical receptors, this does not mean condition 2 above applies to PSP. However, the equivalency demonstration modeled a wide collection of actual sources and it seems very likely from the variation in stack parameters, etc. that some intermediate terrain receptor fufills condition 2. We conclude therefore that the GAQM contains no recommendation appropriate for PSP's needs and that the source may at some stage request approval of a non-GAQM procedure for permitting in Jay.

D. ISCMX Equivalency Demonstration

In "Part A: Model Description" of its equivalency demonstration C.T.Main describes what ISCMX attempts to calculate, under what conditions, and how. "Part B: Equivalency Demonstration" consists of screening mode ISCST, COMPLEX1, and ISCMX modeling predictions at 18 hypothetical receptors for each of the eight point sources that PSP might model in preparing its PSD permit application. The meteorological conditions used include all 33 conditions SCREEN examines plus 'F' stability with 5 m/s winds as Maine requires. The demonstration also compared the models' predictions at receptors 5 and 15 degrees off the plume centerline. In addition, C.T.Main used ISCMX-worst day 1987 meteorology and PSP's proposed stack parameters to compare the models at an ISCMX-highest impact receptor.

We agree with Maine DEP's (Lise Dietrich, 2 April 1991) conclusion that C.T.Main has demonstrated that ISCMX as applied to PSP is equivalent to ISCST or COMPLEX1. We add the following remarks, however:

(1) Because ISCST and COMPLEX1 yield different effective plume heights under certain conditions, intermediate terrain might be defined as terrain above physical stack height and below either ISCST or COMPLEX1 plume height. C.T. Main used ISCST plume rise to bound intermediate terrain. This should not be a major issue in ITP implementation, and, despite a minor consistency problem, EPA should accept use of either ISCST or COMPLEX1 plume height to bound intermediate terrain.

(2) PSP's ISCMX in screening mode reproduced ISCST and COMPLEX1 predictions well within 2% where either model makes valid predictions. Screening mode runs also showed that ISCMX selects the higher concentration, whether ISCST- or COMPLEX1-like, at receptors on intermediate terrain.

(3) For all potentially intermediate terrain elevations PSP first needed to show that ISCMX was equivalent to ISCST, then that it was equivalent to COMPLEX1. As a minimum in each equivalency demonstration, PSP should have exercised the models over the parameters and inputs that would vary in the proposed application and affect concentration predictions. The following items develop this remark...

(4) PSP compared ISCMX against each GAQM model under a exhaustive set of wind speed and stability combinations. PSP also investigated off-centerline impacts adequately.

(5) PSP performed screening mode runs to compare ISCMX against ISCST and COMPLEX1 for each of the eight sources that might be explicitly modeled for the permit application. With one exception, the screening mode equivalency demonstrations have covered the full range of stack heights, source parameters, and building dimensions that ISCMX might have to address in this application.

(6) The exception involves direction dependent building dimensions as required for the Schulman-Scire downwash estimates needed for four of the sources (viz., two lime kilns and two smelt tanks). Because PSP did not input direction varying building dimensions, its equivalency demonstration's use of Schulman-Scire could not exercise the direction dependency in its plume rise and dispersion algorithms. However, only background (International Paper) sources with significantly lower stack heights than PSP's proposed power plant require Schulman-Scire treatment; PSP itself does not. Since interactions are unlikely, EPA should not insist on additional investigation of ISCST-ISCMX equivalency at the Schulman-Scire sources.

(7) C.T.Main investigated impacts predicted by the three models as receptor elevation increased (from simple through intermediate to complex) with downwind distance (18 distances). However, it did not investigate how flagpole receptors might affect the equivalency determination. Neither did the demonstration consider below stack top effective plume heights. Since PSP need not consider flagpole receptors in Jay and since below stack gas exit plume heights will be highly unlikey, neither omission should invalidate PSP's demonstration.

(8) Under stable conditions, The User's Guide for MPTER suggests that COMPLEX1 cannot consider a lid. On the other hand, the user's guide indicates ISCST will account for a lid under stable conditions but only in an urban area. Since the GAQM only recommends COMPLEX1 for rural conditions, EPA should likewise restrict ISCMX. Although PSP did not investigate how mixing heights interact with model predictions as would be needed in under stable conditions in an urban area, it did input a 5000 m. lid for use under neutral and unstable conditions.

(9) As the GAQM requires, PSP exercised gradual plume rise in its complex terrain calculation, whether in COMPLEX1 or ISCMX's calculations, but not in its simple terrain calculations and equivalency check.

(10) PSP could not check for proper calms treatment in its screening mode investigation but did document proper calms processing (and averaging) when it compared ISCST, COMPLEX1, and ISCMX using 1987 meteorology.

E. Recommendations on Pine State Power

(1) The Director of Region I's Air, Pesticides, and Toxics Management Division should reply for the Administrator to Maine DEP's request for EPA to approve use of a non-GAQM model in PSD permitting.

(2) EPA should accept ISCMX as equivalent to the GAQM dispersion models, ISCST and COMPLEX1, as the ITP requires them to be applied in permitting PSP's new plant in Jay, Maine.

(3) EPA's approval to use ISCMX for this PSD permit application will lapse as of the date that EPA revises the GAQM in a way that would affect PSP's modeling results.

ENCLOSURE LIST (Forwarded Earlier)

(1) Letter dated April 2, 1991 from Lise A. Dietrich, Maine DEP, to Brian Hennessey, Region I. This letter forwarded Region I the following:

a) Memo dated April 2, 1991 by Lise A. Dietrich, "Pine State Power, Jay: Review of Pine State Power Cogeneration Plant Project ISCMX Equivalency Demonstration." (Includes C.T.Main handwitten analysis "Can PSP plume be below stack top?")

b) Meteorology used for part of PSP's ISCMX equivalency demonstration.

(2) Letter dated January 11, 1991 from Jon A. Pollock, C.T.Main, to Brian Hennessey, forwarding:

a) "Pine State Power Cogeneration Plant Project - ISCMX Equivalency Demonstration - Part A: Model Description."

b) "Pine State Power Cogeneration Plant Project - ISCMX Equivalency Demonstration - Part B: Equivalency Demonstration."

(3) Extracts forwarded to Region I on April 3, 1991, from "Pine State Power Cogeneration Plant Project Modeling Protocol Document."

(4) Copies of Attachments B-1 and B-98 to Part B of C.T.Main's equivalency demonstration. These both extracted from the next item:

(5) <u>Available on request:</u> 3.5" of COMPLEX1, ISCST, ISCMX, and associated printouts submitted by C.T.Main in support of its ISCMX equivalency demonstration.